Tocumwal Magazine Storage Upgrade

Environmental Impact Statement

Orica Australia Pty Ltd

03 December 2024

→ **The Power of Commitment**



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Registered Environmental Assessment Practitioner EIS Declaration

EIS Declaration (SSI)		
Project name:	Tocumwal Magazine Storage Upgrade Project	
Application number:	SSD-64923965	
Address of the land in respect of which the development application is made: 431 Newell Highway, Tocumwal NSW		
Proponent details		
Applicant name: Orica Australia Pty Ltd ABN: 99 004 117 828		
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Declaration by registered environmental assessment practitioner		
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Registration number: Certification number: 1666 Specialist Certification number: IA11091 REAP Registration number: R80043		
Organisation registered with: GHD Pty Ltd, Level 15, 133 Castlereagh St, Sydney 2000 NSW		
Declaration	The undersigned declares that this EIS: – Has been prepared in accordance with Schedule 2 and Part 10 of the Environmental Planning and Assessment Regulation 2021. – Contains all available information relevant to the environmental assessment of the development, activity or infrastructure to which the EIS relates. – Does not contain information that is false or misleading. – Addresses the Planning Secretary's environmental assessment requirements (SEARs) for the project. – Identifies and addresses the relevant statutory requirements for the project, including any relevant matters for consideration in environmental planning instruments. – Has been prepared having regard to the Department's *State Significant Infrastructure Guidelines – Preparing an Environmental Impact Statement*. – Contains a simple and easy to understand summary of the project as a whole, having regard to the economic, environmental and social impacts of the project and the principles of ecologically sustainable development. – Contains a consolidated description of the project in a single chapter of the EIS. – Contains an accurate summary of the findings of any community engagement. – Contains an accurate summary of the detailed technical assessment of the impacts of the project as a whole.	
Signature 		
Date: 03 December 2024		

Summary

Orica Australia Pty Ltd (Orica) (ABN: 99 004 117 828) is proposing to redevelop the Tocumwal Explosives Reserve magazines (the 'project') located at Tocumwal, NSW.

The Tocumwal Explosives Reserve magazines were constructed in 1966 by Imperial Chemical Industries of Australia and New Zealand (ICIANZ), the site being previously used as a munitions store by the Department of Defence. The facility is the staging point to supply the full range of explosive product for NSW, VIC, SA and Tasmania and serves as a distribution hub for explosives for the mining and quarrying sectors and has been in operation since 1966. The limited magazine storage in the wider supply chain makes the facility an important stock centre.

The existing magazines are not compliant with the AS2187 Australian Standards Explosives - Storage, Transport and Use (the 'AS2187 Standard'), and the facility operates under an exemption from the NSW regulator. The purpose of the project is to remove the reliance on the exemption and become fully compliant with the AS2187 Standard and codes of practice. To achieve this, Orica proposes to build four new 250 tonne (t)HE magazines and a new detonator magazine in new locations on the site. The same quantity of explosives would be stored, and the operational procedures would remain unchanged. Earthen segregation mounds are proposed in front of three of the proposed 250 t HE magazines to prevent sympathetic detonation.

The site

The site is located at Lot 2 DP 225459, 431 Newell Highway, Tocumwal (the 'site'). The site is four (4) kilometres north of the township of Tocumwal on the NSW/VIC border within the Berrigan Local Government Area (LGA). This site is approximately 750 hectares (ha) of open grazing land. It is fenced, has an office and basic machinery/storage sheds. The existing magazine complex consists of ten (10) approximately 100 t capacity magazines constructed from corrugated iron. The site is surrounded by agricultural land and parts of the site are currently used as grazing land for sheep and cattle via leasing agreements. These leasing agreements will remain in place after the project has been completed. The site also contains several small farm dams and drainage lines, which supports the agricultural use of the site.

The existing facilities on-site include:

– Office and amenities to accommodate five personnel and contractors.
– Ten (10) licensed explosives magazines.
– Storage sheds and shipping containers for storage of blasting accessories and repacking detonators.
– Maintenance workshop and general storage shed.

The explosives magazines are distributed widely across the site to provide safety separation distances between facilities and to ensure adequate buffer zones between the magazines and neighbouring properties.

The activities conducted on the site include:

– Storage and handling of initiating explosives, high explosives and explosives accessories.
– Limited storage and handling of diesel fuel for refuelling forklifts and site vehicles.
– Management of materials that had an expired shelf life via approved regulatory practices and approvals,

The Tocumwal Explosives Reserve is a fenced, open grazing property that is approximately 750 hectares ha in area. The northern and eastern boundaries of the site are formed by the Newell Highway.

The topography of the site is generally flat, and the site has an elevation above sea level of approximately 110 m. The site is not identified as Bushfire Prone Land (BPL), nor is the site mapped as containing Biodiversity Values (BDV). The site is generally cleared.

The project site has several advantages, summarised as follows:

– Within the existing Tocumwal Explosives Reserve, and within a lot owned by Orica.

– In an area that is cleared and disturbed by existing activities and the infrastructure of the Tocumwal Explosives Reserve.
– Remote from sensitive receivers (nearest rural residence is 1.14 km south).
– Buffered on the eastern and northern fronts by the Newell Highway.
– No other Major Hazard Facilities or hazardous chemical storage sites are nearby that could affect the project. It is noted that Development Application No 92-24-DA-DM for an electricity generating works (solar farm) and battery energy storage system at 118 Silo Road, Tocumwal was approved by Berrigan Shire Council on 19 June 2024. The site of the approved solar farm is directly to the south of the site.
– Riverina Murray Regional Plan 2041- The continuation of the existing major hazard facility land use is consistent with Objective 14 to "to protect and promote industrial and manufacturing land.

Project Alternatives

The "do nothing" approach

Currently the existing Tocumwal Explosives Reserve does not comply with the AS2187 Standard and operates under an exemption. Without completing the project, the existing site would continue to operate but the need for the exemption would remain. The project removes the need for this exemption as the project would be fully compliant with Australian Standards and regulations. The project is therefore the preferred option.

Design alternatives

The proposed design considers the risk of a single detonation resulting in a knock-on effect, due to the proposed construction of earthen blast mounds. These blast mounds would be strategically positioned in front of the proposed magazines to reduce risk of knock-on detonation.

The project

Project objectives

The key objectives of the project are to:

– Remove the reliance on the exemption to the AS2187 Standard.
– Become fully compliant with the Australian Standards and codes of practice.
– Have the same capacity to store explosives onsite with unchanged operational procedures (following the later removal of existing magazines).
– Minimise environmental impacts.

Project details

Orica proposes to build four new 250 t HE magazines and a new detonator magazine. The magazine buildings would comply with the construction requirements for the AS2187 Standard, thus removing the requirement for an exemption.

The currently stored explosives will be sequentially moved from the old to new magazines in batches that maintain the safe distances between all magazines so that at no time an initiation at one magazine could cause a subsequent initiation at another magazine.

Eight (8) existing magazines will be demolished. Two (2) existing magazines will be retained for general purpose storage. It is essential that operation of the site continues for the duration of the building of the new magazines to maintain continuity of service.

The project also includes upgrades to the road network currently servicing the site. An access road would be constructed to provide access to each of the four new 250 t HE magazines and one detonator magazine, and an upgraded access to the Newell Highway intersection.

Neither the existing power or water supply and connections require an upgrade.

The estimated capital cost of the project is approximately $14,935,553.41(ex GST) which has been calculated in accordance with the relevant policy.

The main construction activities of this project are planned to commence between financial years 2024 – 2028, with approximately one magazine being constructed per year. A detailed design would be undertaken prior to construction commencing and lodged with the construction certificate application.

– New drainage at each new magazine site.
– New earthen mounds will be constructed at three locations.
– New roads would be built running from the existing entrance to the sites of the new magazines. These roads would be gravel during the construction of the new magazines and would then be sealed prior to normal operations using the new magazines starting.
– Construction of the upgraded access to the Newell Highway.
– Vegetation management, including landscaping, and Asset Protection Zones (APZ) within the subject site is to achieve the specifications of an Inner Protection Area (IPA).

The construction activities would be carried out during the following hours, consistent with the recommended standard hours of the *Draft Construction Noise Guideline* (NSW EPA, 2020):

During construction, operations at the site would continue as normal to avoid disruptions to service. After the four new 250 t HE magazines and one detonator magazine have been constructed, operations would continue as present with no changes to current operational procedures being proposed. After construction is complete, the site would be fully compliant with AS2187 Standard. It is proposed that the facility continue operation indefinitely.

There are currently two (2) to five (5) permanent staff operating the Tocumwal Explosives Reserve magazines at any one time. The operation of the new facility would require the same number of staff after construction has been completed. Currently, from Monday to Thursday, five staff are present on the site (four permanent staff and one permanent part time), on Fridays, four permanent staff are present on the site. Measures employed to manage the site during unstaffed hours will remain the same.

Strategies to avoid or minimise impacts

The project has been presented to SafeWork NSW as a preliminary input to gaining the required explosives storage licences for the project. Other required documentation for the granting of explosives storage licences will be submitted to SafeWork NSW at various times throughout the greater project.

The existing site operates under a number of management plans. Existing operations would continue at the project site during construction of the four (4) additional magazines and one (1) detonator magazine. Existing management plans and strategies to minimise harm would continue to be in place during the construction of the project and would apply to the operation of the additional magazines and detonator magazine.

Statutory context

The key legislation in NSW regulating the use of land is the *Environmental Planning and Assessment Act 1979 as amended* (the 'EP&A Act') and the Environmental Planning and Assessment regulation 2021 (the 'EP&A Regulation'). Part 4, Division 4.7 of the EP&A Act provides for declaration, assessment and approval of SSD. The project requires development consent in accordance with the requirements of Part 4 of the EP&A Act as a result of the operation of *Berrigan Local Environment Plan 2013* (the 'LEP') and as it is considered to be SSD as Major Hazard Facility pursuant to Schedule 1, Clause 10(3) of *State Environmental Planning Policy (Planning Systems) 2021* (Planning Systems SEPP).

The process for environmental assessment and approval for SSD is set out as follows:

– Scoping Report and Application for EIS scope requirements
– Development and issuance of SEARs
– Preparation of an EIS

– Public exhibition of the EIS
– Response to submission(s) received during public exhibition of the EIS
– Assessment of development application
– Determination regarding the development by the Minister

The project has been declared SSD in accordance with section 4.36 of the EP&A Act, and Schedule 1, Clause (10)(3) of the Planning Systems SEPP. The Minister for Planning is the consent authority, and the project is to be assessed in accordance with Division 4.7 of the EP&A Act.

The project site is zoned RU1 Primary Production (the 'RU1 zone') under *Berrigan Local Environmental Plan 2013* (LEP). The project is consistent with the existing land use and zoning of the site as it would be located within the existing Tocumwal Explosives Reserve and does not represent an operational change to the site. Additionally, the project is defined as a 'heavy industrial storage establishment' under the LEP, which is permissible with consent in the RU1 zone.

The following approvals must be obtained before the project may commence:

– Development consent granted pursuant to Division 4.3 the EP&A Act.
– A Section 138 permit application under the *Roads Act 1983.*

Community engagement

Engagement with stakeholders was carried out during the environmental assessment process in accordance with the SEARs. The purpose of consultation was to raise awareness about the project, understand stakeholder issues, and obtain important feedback to help shape the environmental assessment.

Although a wide range of consultation has already been undertaken, future consultation is proposed. This will include Public Notification undertaken during the assessment process and ongoing consultation with relevant stakeholders as required.

Key issues

Soils and water

The topography at the site is predominately flat with elevation varying between 107 – 109 m AHD with small changes in relief. Depressions at the site are evident at the various existing small dam locations, located at the site. The site is located within the Murray Riverina catchment. There are three existing small dams on site and two informal dams/depressions on site which receive rainfall runoff. Surface water flows at the site are currently controlled by small changes in relief and the irrigation channel that traverses the site. Soils at the site are classified as Chromosols and nearby soil profiles indicate clay loam / sandy clay / clay topsoil, with sandy clay / clay / coarse sand subsoil. There are no mapped soil landscapes in proximity to the site. The Groundwater Dependent Ecosystem (GDE) atlas indicates that there are areas of low and moderate potential aquatic GDEs and low, moderate, and high potential terrestrial GDEs within five kilometres of the footprint. There are 15 registered bores within a 1 km radius of the site. The site is located on the edge of the floodplain with shallow flood depths. Most of the flood waters are conveyed to the west of the site in deeper parts of the floodplain, and the site has the potential to be inundated by backwater flooding on the fringes of the floodplain. In all flood events simulated, flood depths are generally less than approximately 0.3 m. As flooding events become less likely, floodwaters extend eastward across the site, however since the topography is flat, shallow flood depths are maintained. Water quality in proximity to the site can is expected to range between poor – moderate. No impacts to riparian zones are anticipated from the project and therefore no management of waterfront lands is proposed.

Implementation of mitigation measures, namely a Construction Environmental Management Plan (CEMP) and SWMP (Soil and Water Management Plan), would reduce the likelihood of erosion and sedimentation during construction. Therefore, the project is not anticipated to result in unacceptable erosion and sedimentation impacts. The project is not anticipated to result in unacceptable water quality risks during construction with relation to the handling of high-risk materials. Changes to the existing water sourcing because of the project is not anticipated, and therefore environmental water availability is not anticipated to be negatively affected. Regarding flooding, the results show that the proposed magazine pad levels are marginally above or at the flood planning level. Groundwater dewatering is not anticipated but may be required if groundwater inflow occurs.

There may be high priority GDEs mapped within five km of the site, associated with the wetlands of the Murray River. However, any such GDEs would be on the boundary of a five km radius from the site and as such would not be impacted by any emergency dewatering procedures. There are no culturally significant sites mapped within five km of the site. Therefore, potential impacts are within the level 1 minimal impact considerations for GDEs and culturally significant sites in the NSW Aquifer Interference Policy.

No groundwater level drawdown is predicted in the bores in response to the construction of the project as no interception of groundwater is anticipated.

The potential impact of the project is within the Level 1 minimal impact considerations for water quality in the NSW Aquifer Interference Policy.

Contamination

A Preliminary Site Investigation (PSI) involving a review of desktop information and site inspection but not sampling of soils, groundwater, sediments or surface water, identified that there is a low potential for contamination to be present within the site for listed sources. The potential impacts of contamination to human health and the environment during construction and future operation of the project is considered to be low.

During operation of the project, it is understood that all fuels and explosive materials will be stored undercover in buildings to prevent any unintended spillage/ runoff of hazardous materials occurring. Given that this will occur under the implementation of the CEMP and SWMP, the operation of the project is not anticipated to result in soil or groundwater contamination.

Air quality and odour

Assessment criteria for the project were taken from the Approved Methods.

The Guidance on the Assessment of Dust from Demolition and Construction (IAQM Guidance) guidance recommends that a detailed risk assessment be undertaken where there is a human receptor within 250 metres of the construction footprint, or where there is a human or ecological receptor within 50 metres of any haulage routes up to 350 metres from the site entrance.

– As there are no human receptors within these distances, a detailed assessment is not required for this project. Regardless, the activities expected to produce the largest dust emissions have been identified and mitigation measures provided to manage these emissions.
– The construction description has been reviewed in order to get an understanding of activities which may be a source of dust. No potential sources of odour were identified and therefore no additional assessment is needed. Activities which generally are a significant source of dust are trucks travelling on unpaved roads, excavations associated with bulk earthworks, importing and spreading fill, and stockpiles.

  Most high-speed winds which contribute to dust lift off, occur from the west and east, meaning that dust impacts would occur to the west and east (downwind). There are no identified sensitive receptors within direct proximity of the project site and the nearest receptors to the southwest are approximately 1.3 kilometres away. The risk of dust impact was found to be low risk for all identified construction activities.
– As there are no proposed changes to the overall operational workforce or activities at the magazine facility an operational assessment is not required for this project.

Noise and vibration

The closest residential receptor to the site is approximately 170 metres from site boundary. Modelling of construction noise indicated that the project Construction Noise Management Levels are not expected to be exceeded at the nearest sensitive receptors during and outside standard construction hours.

An assessment of vibration levels associated with construction indicated no sensitive receptors will be impacted. Notwithstanding this, the application of mitigation measures at the source is considered best practice and should be implemented where reasonable and feasible.

Waste management

The project is not expected to generate large volumes of waste during construction or operation. Waste management for the project is be based on the waste management hierarchy established by the objectives of the *Waste Avoidance and Resource Recovery Act 2001*.

Construction activities have the potential to generate a variety of waste streams. Excavated material potentially contain contamination and if required to be removed from site, it must be classified in accordance with the *Waste Classification Guidelines* (EPA, 2014) prior to disposal. General construction waste generated would include packaging, domestic waste, redundant erosion and sediment controls and sewerage.

The generation of wastes during operation would include maintenance activities such as the removal of redundant equipment and general waste from maintenance personnel. All waste during maintenance activities would be removed from site by licensed contractors, Cleanaway.

Management and mitigation strategies will be implemented for waste generated during construction and operations, including waste disposal using licenced waste transporters and facilities to manage waste from the project. Local waste disposal facilities are available for all anticipated waste from the project.

Waste management activities are not expected to have a significant impact on the environment or human health provided that the controls measures, the waste handling and management measures and mitigation measures are implemented.

Traffic

During construction, the operation at the site would continue as normal to avoid disruptions to service. After the four new 250 t HE magazines and one detonator magazine have been constructed, operations would continue as present with no changes to current operational procedures being proposed. There are currently two to five permanent staff operating the Tocumwal Explosives Reserve at any one time. The operation of the new facility would continue to require the same number of staff after construction has been completed. Currently, from Monday to Thursday, five (5) staff are present on the site (four (4) permanent staff and one (1) permanent part time). The peak hour construction vehicle activity assessment has been undertaken on a first principles basis in accordance with the expected volumes of workers and heavy vehicles as follows:

– Up to ten additional workers are expected at the site during the construction of the project.
– Workers will access the site in the morning and depart the site in the afternoon.
– To be conservative, it has been assumed that two heavy vehicles would access/egress the project site in a single hour during the peak hour.

For the purposes of this assessment, the highest hourly traffic generation for the project under the peak construction scenario is assumed to be up to 14 vehicle trips in total, which will consist of the following:

– AM peak hour:
    - Ten inbound light vehicles
    - Two (2) inbound heavy vehicle movements
    - Two (2) outbound heavy vehicle movements
– PM peak hour:
    - Ten outbound light vehicles
    - Two (2) inbound heavy vehicle movements
    - Two (2) outbound heavy vehicle movements

With respect to the traffic impacts of the project, the following is noted:

– The available information indicates that the roads in proximity to the project site are operating with a good Level of Service during peak periods of road network activity.
– Operational vehicle activity is expected to be negligible.
– The vehicle activity associated with the construction of the project would be minor, up to 14 vehicles in a single hour, at an average of (approximately) one vehicle every four minutes.

Accordingly, the traffic impacts of the project are expected to be negligible and fall within the daily fluctuations of the adjoining arterial road network. The swept path analyses show that a 26 metre B-double truck entering and exiting the subject site via the upgraded access intersection is feasible.

With respect to the access to the project site, it is proposed to spray seal the internal access road, including its intersection with the Newell Highway, in accordance with Austroads Guidelines. An upgrade to the Newell Highway Access is also proposed.

Hazards and risk

A Preliminary Hazard Analysis (PHA) was prepared in accordance with *State Environmental Planning Policy (Resilience and Hazards) 2021 (*Resilience and Hazards SEPP) and the threshold for Dangerous Goods (DGs) has been analysed and will not be exceeded. Transportation volumes of chemicals during construction would be minimal, as low volumes of DGs will be stored in the construction compound. On this basis, the construction of the project has been assessed to not exceed transport screening thresholds.

The results of the DG screening and the transport screening indicate that the project does not exceed the thresholds within the Resilience and Hazards SEPP requirements. Therefore, this element of the project lifecycle is not considered potentially hazardous.

While the preliminary risk screening process confirmed that the project is not considered to be a potentially hazardous industry, a hazard identification exercise was undertaken to demonstrate that potential hazards have been identified and control measures would be in place. Mainly, the following potential personal injury impacts associated with the construction of the project were identified during hazard identification due to the following:

– Vehicle movements in vicinity of personnel.
– Natural hazards such as flooding, bushfire, lightning etc, also potentially leading to asset damage and/or plant shut down.
– Hot works within the project area, posing a fire risk.
– Contact with chemicals, including DGs, during general construction activities and/or vegetation management.

The potential hazardous impacts associated with construction would be controlled through implementation of a safety management system and would not result in any significant off-site impacts.

The only potential impacts associated with construction that could lead to significant off-site impacts and required further analysis in the hazard analysis were:

– Natural hazards (e.g. flooding, earthquake, lightning, bushfire).
– Fire started within the project area (e.g. hot works).

As such, a consequence analysis was undertaken. Excluding the construction risk, diesel and explosive storage hazards have existed on-site since 1966. Since 1966, the site has actively managed explosive storage hazards, demonstrating over 50 years of effective risk control with no major incidents recorded. The proposal will not be increasing the storage quantities on site. Additionally, relocating the magazine storage away from site boundaries reduces the risk of off-site impact or fatality. Nonetheless, due to the nature of the class 1 explosives located on-site during operation, a hazard identification process was completed.

Although mitigation measures have been identified for the potential impacts, the hazard identification process (HAZID) indicated that there are scenarios with the potential for off-site impact. In order to confirm off-site impact, the extent of impact, and applicable mitigation measures, a consequence analysis of these scenarios was completed.

Although potential impacts are still present, the project is considered to act as a mitigating effort itself by minimising the existing potential for impact through increasing the distance of the current magazines from the site boundary, in combination with the proposed safeguards, which would ensure standards are adhered to and potential for an explosion to occur is minimised.

Bushfire

The site is not designated as bushfire prone land (BPL) as per Berrigan Shire Council and NSW Rural Fire Service (RFS) mapping. The closest mapped BPL is located approximately two (2) km to the south and is associated with the riparian vegetation adjacent the Murray River. Site inspections have confirmed the majority of the site is actively grazed by livestock, however seasonal conditions may affect the level of grass growth and accumulation. On site vegetation may be considered a potential bushfire hazard.

The site falls within the Berrigan LGA within the greater Southern Riverina area for which Fire Danger Index of 80 is applicable for bushfire assessment (NSW RFS, 2019).

A desktop review of the State Vegetation Type Map (DPE 2023) indicates the site is dominated by:

– Grasslands Plant Community Type (PCT) 44
– Grassy woodlands

The Biodiversity Development Assessment Report (BDAR) indicates that the site is dominated by PCT 45 Plains Grass grasslands.

The site is generally maintained to a low fuel condition by livestock grazing, ploughing, and slashing adjacent roadways, magazines, and key fence lines.

The site visit confirmed there is substantial adjoining grassland vegetation (associated with agricultural cropping and grazing activities) in the surrounding landscape. Much of the adjoining land is subject to flood irrigation, with water supplied by a series of open irrigation channels.

The site can broadly be characterised as flat, with the main geographic feature surrounding the site being irrigation channels.

A suitable package of Bushfire Protection Measures (BPM) is proposed commensurate with the assessed level of risk associated with hazardous industry, and commercial and industrial development as outlined in Planning for Bushfire Protection 2019.

Emergency management arrangements are described in the site Environmental Management Plan (EMP) which would be updated to cater for the site redevelopment. The EMP notes that Fire and Rescue NSW is the primary party for incident response and control. NSW RFS may also respond.

Landscape character and visual amenity

The landscape character and visual amenity impact assessment was undertaken in accordance with the SEARs and with reference to the requirements of relevant legislation, policies and/or assessment guidelines, including:

– Environmental Impact Assessment Practice Note – Guideline for landscape character and visual impact assessment (Transport for NSW, 2023).

The site has three distinct visual boundaries, including:

– North and East - Newell Highway
– West - Chinamans Road
– South - Lalalty Channel

Vegetation surrounding the project site varies from areas of cleared, modified grassland with patches of remnant.

The magazine buildings and storage sheds are low scale and set well back from Newell Highway and Chinamans Road and are often obscured or screened from view by vegetation.

Due to the flat topography of the site and surrounds and a lack of elevated vantage points, the visual elements are those above ground that would be discernible within the landscape following construction of the project. The visible project elements include:

– Four (4) new 250 t HE magazines and one detonator magazine including earth grid and lightning protection masts and security fencing.
– Three new earthen segregation mounds.
– Some vegetation clearing.

The five (5) proposed single story magazine buildings and earthen segregation mounds are of a scale and materiality consistent with the existing built form on the projects site. The magazine buildings would be arranged around a ring road and would be centrally located on the project site, which again is consistent with the current facility.

The non-visual elements include those which would be below ground or at ground level following construction and would generally include site works. These elements may be visible during construction of the project, due to specific construction plant and equipment requirements, these include:

– Earthworks to establish the concrete slabs and hardstand areas for the five new magazines.
– Construction of new access roads. These roads would be gravel during the construction of the new magazines and would then be sealed prior to normal operations.

The Tocumwal Explosives Reserve occupies the majority of the study area and has been in operation by Orica since 1966 however, large parts of the project site are currently used as grazing land for sheep and cattle via leasing agreements. These leasing agreements would remain in place after the project has been completed. The project site also contains several small farm dams and drainage lines, which supports the agricultural use of the site and contribute to the rural / agricultural character.

The impact assessment generally identifies that visual impacts are negligible – low.

Aboriginal heritage

An Aboriginal Cultural Heritage Assessment (OzArk, 2024) was undertaken to identify any Aboriginal heritage factors within the site and to incorporate consultation with the Registered Aboriginal Parties (RAPs) for the project. The existing environment surrounding the project was reviewed and a search of the Aboriginal Heritage Information Management System (AHIMS) was completed for the project, returning a result of 65 Aboriginal cultural heritage sites. None of the recorded sites are located within the Study Area. No Aboriginal sites were identified within the study area during the Archaeological survey. Three (3) organisations were registered as RAPs for the project and were contacted during the consultation stages. The wider area was found to have social value to the Aboriginal community despite no Aboriginal objects or sites site being located within or near the site. The results from the site survey confirmed that the site is largely covered by bitumen and hardstand from previous land uses. No Aboriginal sites or specific cultural values were recorded during the current assessment, there are no known impacts to Aboriginal cultural heritage from the project.

There is no specific management to be applied to the project as no Aboriginal sites or values have been identified.

Biodiversity

The site is situated on pre-disturbed land and includes existing hardstand and cleared areas. During the scoping stage of the project, a biodiversity constraints assessment was prepared by Ozark (2023) to describe the conservation value of the area being considered for development of the project. Ozark then completed a Biodiversity Development Assessment Report (BDAR).

The proposal would occupy up to 7.05 ha, of which 4.50 ha possesses remnant native vegetation The Biodiversity Assessment Method Calculator (BAM-C) generated 34 ecosystem credit species. The habitat suitability of the subject land for these species was assessed. Three (3) species were removed from the list due to habitat constraints; consequently, 31 species were assumed present as ecosystem credit species, generating a total of 183 Ecosystem Credits.

In total, 25 species credit species were generated by the BAM-C. After consideration of geographical and habitat constraints, six (6) species could be discounted due either to distribution or to the absence of features necessary for breeding and one (Sloane's Froglet, *Crinia sloanei*) due to the lack of suitable plant communities within the specified buffer distance of a waterbody. A further 14 species were eliminated by targeted survey. Four species could not be ruled out by constraints or surveys and have been assumed present, generating a total of 84 species credits.

The proponent intends to satisfy their offset obligations by buying and retiring the necessary credits from the open market or, if appropriate credits are not available, by paying directly into the Biodiversity Conservation Fund.

No significant impact to any threatened entity likely to result in the extinction of a local population was predicted to occur in relation to an *Environment Protection and Biodiversity Conservation Act 1999*-listed threatened, migratory, wetland and marine species, populations and communities within a 10 km search area. The residual ecological impacts of the proposal would be adequately mitigated and offset using the management actions recommended and the offset requirements detailed within the BDAR. A referral of the proposal to the Federal Department of Climate Change, Energy, the Environment and Water (DCCEEW) for these matters is not required.

Other issues

Historic heritage

A search of the State Heritage Inventory administered heritage databases and the LEP did not return any records for historical heritage sites near the study area. No historic heritage sites or historic archaeological deposits were recorded in the study area. As such, it is unlikely that there would be any significant impact to historic heritage from the project during construction or operation.

Cumulative impacts

A search of the DPHI Major Projects database was undertaken on 19 July 2024, but no SSD or State Significant Infrastructure (SSI) projects were identified within the Local Government Area of the project site. Berrigan Shire Council does not have an online Development Application tracking portal. It is noted that Development Application No 92-24-DA-DM for an electricity generating works (solar farm) and battery energy storage system at 118 Silo Road, Tocumwal was approved by Berrigan Shire Council on 19 June 2024. The site of the approved solar farm is directly to the south of the site. Cumulative impacts have the potential to occur for hazards, traffic, and biodiversity. The specialist assessments for each of these impacts were reviewed to understand the cumulative impacts the project would have. The cumulative impacts were found to be negligible to minor.

Environmental management

Orica would carry out the project in accordance with the Project Application documents and the Minister's conditions of approval. The EIS sets out the recommended range of management measures to avoid, mitigate and manage construction and operational impacts of the project. The implementation of these measures and programs through the design, construction, and operation phase of the project would be detailed in the Project Environmental Management system and management plans.

Justification of the project

Detailed environmental investigations have been carried out to understand the existing environment of the project site and surround, inform development of the design and preliminary construction planning, and undertake the environmental impact assessment to prepare the EIS.

All investigations were undertaken by technical specialists experienced in impact assessment using best practice methodologies in accordance with relevant requirement statutory requirements and guidelines. A summary of the investigations undertaken, methodologies applied, and results achieved, are described in the EIS. Further detailed information is provided in the technical reports.

As required under the EP&A Act, the EIS addresses the social and economic considerations, considers the project in relation to the public interest site suitability, Ecologically Sustainable Development, the objects of the EP & A Act.

The EIS demonstrates that the project responds to a strong need to maintain the distribution of explosives for the mining and quarrying sectors, and to remove the reliance on the exemption and become fully compliant with the AS2187 Standard and codes of practice. The project is consistent with the LEP and the objectives of clause 6.11. As described in the EIS, the project would incorporate environmental management and design features to ensure that potential impacts are managed and mitigated as far as practicable.

To manage the potential impacts identified by the EIS, and in some cases remove them completely, the assessment sections outline a range of mitigation measures that would be implemented during construction and operation of the project. The environmental performance of the project would be managed by the implementation of the construction environmental management and operational environmental management framework. The plans and framework would also ensure compliance with relevant legislation and any conditions of approval.

With the implementation of the proposed mitigation and management measures the potential environmental impacts of the project would be adequately managed.

Development consent should be granted for the project because the project is a suitable development for the project site, sited within an existing facility, and would deliver local and regional economic benefits. As such, it is in the public interest.

Public exhibition

The EIS would be publicly exhibited by DPHI. Interested persons and organisations can review the EIS and make a written submission on any aspect of the project during this time. An advertisement would be placed in the relevant newspaper/s to advise of the public exhibition and where the EIS can be viewed. Copies of the EIS will be available for viewing, with locations to be determined and notified by DPE. Submissions on the project during the exhibition period should be made direct to DPHI via email, post, or via the DPHI website.

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Glossary and abbreviations

ACHAR	Aboriginal Cultural Heritage Assessment Report
ACHR	Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010
APZ	Asset Protection Zone
AQMS	Air Quality Monitoring Stations
AS2187 Standard	AS2187 Australian Standards Explosives - Storage, Transport and Use
BAL	Bushfire Attack Level
BC Act	*Biodiversity Conservation Act 2016*
BDAR	Biodiversity Assessment Report
BDV	Biodiversity Values
BHA	Bushfire Hazard Assessment
Biodiversity and Conservation SEPP	*State Environmental Planning Policy (Biodiversity and Conservation) 2021*
Biosecurity Act	*Biosecurity Act 2015*
BOM	Bureau of Meteorology
BOS	NSW Biodiversity Offsets Scheme
BPL	Bushfire Prone Land
CEMP	Construction Environmental Management Plan
CLM Act	*Contaminated Land Management Act 1997*
CMSC Act	*Coal Mine Subsidence Compensation Act 2017*
Council	Berrigan Shire Council
CSM	Conceptual Site Model
CSP	Berrigan Shire Community Strategic Plan 2040
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DCP	Berrigan Development Control Plan 2014
DGs	Dangerous Goods
DPHI	Department of Planning, Housing and Infrastructure NSW
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
EP&A Act	*Environmental Planning and Assessment Act 1979 (as amended*)
EP&A Regulation	Environmental Planning and Assessment Regulation 2021
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
EPIs	Environmental planning instruments
ERP	Emergency Response Plan
FDI	Fire Danger Index
FM Act	*Fisheries Management Act 1994*
FRMP	Fire Risk Management Plan
GHD	GHD Pty Ltd
GDE	Groundwater Dependent Ecosystem
ha	Hectares

HAZID	the hazard identification process
Heritage Act	*Heritage Act 1977*
IAQM Guidance	Guidance on the Assessment of Dust from Demolition and Construction (IAQM Guidance) (Institute of Air Quality Management 2018).
ICIANZ	Imperial Chemical Industries of Australia and New Zealand
IPA	Inner Protection Area
LALC	Local Aboriginal Land Council
LCVIA	Landscape character and visual amenity
LEP	*Berrigan Local Environmental Plan 2013*
LEPs	Local Environmental Plans
LGA	Local Government Area
LSPS	Local Strategic Planning Statement
MNES	Matters National Environmental Significance
Native Title Act	*Native Title Act*
NML	noise management levels
NPW Act	*National Parks and Wildlife Act 1974*
NSW RFS	NSW Rural Fire Service
OEMP	Operation Environment Management Plan
Orica	Orica Australia Pty Ltd
PBP	Planning for Bush Fire Protection 2019 (NSW RFS, 2019)
PCT	Plant Community Type
PHA	Preliminary Hazard Analysis
POEO Act	*Protection of the Environment Operations Act 1997*
PSI	Preliminary Site Investigation
PWB	Protected Works (B)
RAP	Registered Aboriginal Parties
RBL	Rating Background Level
Regional Plan	Riverina Murray Regional Plan 2041
Resilience and Hazards SEPP	*State Environmental Planning Policy (Resilience and Hazards) 2021*
RF Act	*Rural Fires Act 1997*
Roads Act	*Roads Act 1993*
RU1 Zone	RU1 Primary Production
SEARS	Secretary of the Department of Planning and Environment
SEPPS	State Environmental Planning Policies
SSD	State Significant Development
SSMP	Site Safety Management Plan
SSP	Site Security Plan
SWMP	Stormwater Management Plan
t	tonne
TIA	Traffic Impact Assessment
TfNSW	Transport for NSW
the flood study	Tocumwal-Barooga Flood Study

Planning Systems SEPP	*State Environmental Planning Policy (Planning Systems) 2021*
The project	Tocumwal Explosives Reserve magazines
The site	Lot 2 DP 225459, 431 Newell Highway
Transport and Infrastructure SEPP	*State Environmental Planning Policy (Transport and Infrastructure) 2021*
WM Act	*Water Management Act 2000*
WSP	Water Sharing Plan

1. Introduction

This section provides an overview of the Tocumwal Explosives Reserves Magazine upgrade project. It outlines the local context of the project within its locality, identifies the proponent and outlines the structure and purpose of the Environmental Impact Statement.

1.1 Project background

Orica is proposing to redevelop the Tocumwal Explosives Reserve magazines (the 'project') located at Lot 2 DP 225459, 431 Newell Highway, Tocumwal (the 'site'). The Tocumwal Explosives Reserve magazines were constructed in 1966 by Imperial Chemical Industries of Australia and New Zealand (ICIANZ), the site being previously used as a munitions store by the Department of Defence.

Over the years the magazines have been modified to allow the palletisation of explosives product. The site's primary function is to store cast boosters and cord product locally produced by Thales and imported from Philippines, China and Chile. The site is the staging point to supply the full range of explosive product for NSW, VIC, SA and Tasmania and serves as a distribution hub for explosives for the mining and quarrying sectors and has been in operation since 1966. The limited magazine storage in the wider supply chain makes the site a pivotal stock centre.

1.2 Project overview

The existing magazines are not compliant with the AS2187 Australian Standards Explosives - Storage, Transport and Use (the 'AS2187 Standard'), and the facility operates under an exemption from the NSW regulator. The purpose of the project is to remove the reliance on the exemption and become fully compliant with the AS2187 Standard and codes of practice. To achieve this, Orica proposes to build four new 250 tonne (t)HE magazines and a new detonator magazine in new locations on the site. The same quantity of explosives would be stored, and the operational procedures would remain unchanged. Earthen segregation mounds are proposed in front of three of the proposed 250t HE magazines to prevent sympathetic detonation.

Eight (8) existing magazines will be demolished. Two (2) existing magazines will be retained for general purpose storage. It is essential that operation of the site continues for the duration of the building of the new magazines to maintain continuity of service.

The project also includes upgrades to the road network currently servicing the site. An access road would be constructed to provide access to each of the four new 250 t HE magazines and one detonator magazine. These access roads would be gravel during construction and sealed prior to operation. The project also involves an upgraded access intersection to the Newell Highway.

The project is State Significant Development (SSD) as it is a Major Hazard Facility pursuant to Schedule 1, Clause 10(3) of *State Environmental Planning Policy (Planning Systems) 2021* (the 'Planning Systems SEPP'). The Secretary's Environmental Assessment Requirements (SEARs) were issued by the Department of Planning, Housing and Infrastructure (DPHI) for the project on 18 December 2023 (Appendix A).

1.3 Project objectives

The existing magazines are not compliant with the AS2187 Standard, and the facility operates under an exemption from the NSW regulator. The AS2187 Standard applies to portable magazines, relocatable magazines, fixed or permanent magazines, bulk storage and underground storage. This standard sets out requirements and precautions for the storage of explosives, including pyrotechnics as defined in AS 2187.0 and for the location, design, construction and maintenance of magazines.

The key objectives of the project are to:

– Remove the reliance on the exemption to the AS2187 Standard.
– Become fully compliant with the Australian Standards and codes of practice.
– Have the same capacity to store explosives onsite with unchanged operational procedures (following the later removal of existing magazines).
– Minimise environmental impacts.

The operation of the site would continue for the duration of the building of the new magazines.

Compliance with the AS2187 Standard will be achieved because the magazine buildings would be purpose-built new constructions that will comply with the construction requirements for Fixed or Permanent Magazines – Above Ground as defined in AS 2187.1 – 1998.

1.4 Proponent details

The applicant is:

Orica Australia Pty Ltd (Orica)
ABN: 99 004 117 828
ACN: 004 117 828
Address: 1 Nicholson Street, Melbourne Vic. 3000
Phone number: 1300 555 175 (Australia) - +61 3 9665 7111 (International)

Orica is the owner and operator of the site.

1.5 The site

The site is four kilometres north of the township of Tocumwal on the NSW/VIC border within the Berrigan Local Government Area (LGA). This site is approximately 750 hectares (ha) of open grazing land. It is fenced, has an office and basic machinery/storage sheds. The existing magazine complex consists of ten (10) approximately 100 tonne capacity magazines constructed from corrugated iron. The site is surrounded by agricultural land and parts of the site are currently used as grazing land for sheep and cattle via leasing agreements. These leasing agreements will remain in place after the project has been completed. The site also contains several small farm dams and drainage lines, which supports the agricultural use of the site.

The existing facilities on-site include:

– Office and amenities to accommodate five personnel and contractors.
– Ten licensed explosives magazines.
– Storage sheds and shipping containers for storage of blasting accessories and repacking detonators.
– Maintenance workshop and general storage shed.

The explosives magazines are distributed widely across the site to provide safety separation distances between facilities and to ensure adequate buffer zones between the magazines and neighbouring properties.

The activities conducted on the site include:

– Storage and handling of initiating explosives, high explosives and explosives accessories.

Limited storage and handling of diesel fuel for refuelling forklifts and site vehicles.

– Management of materials that had an expired shelf life via approved regulatory practices and approvals.

The location of the site is shown below in Figure 1.1.

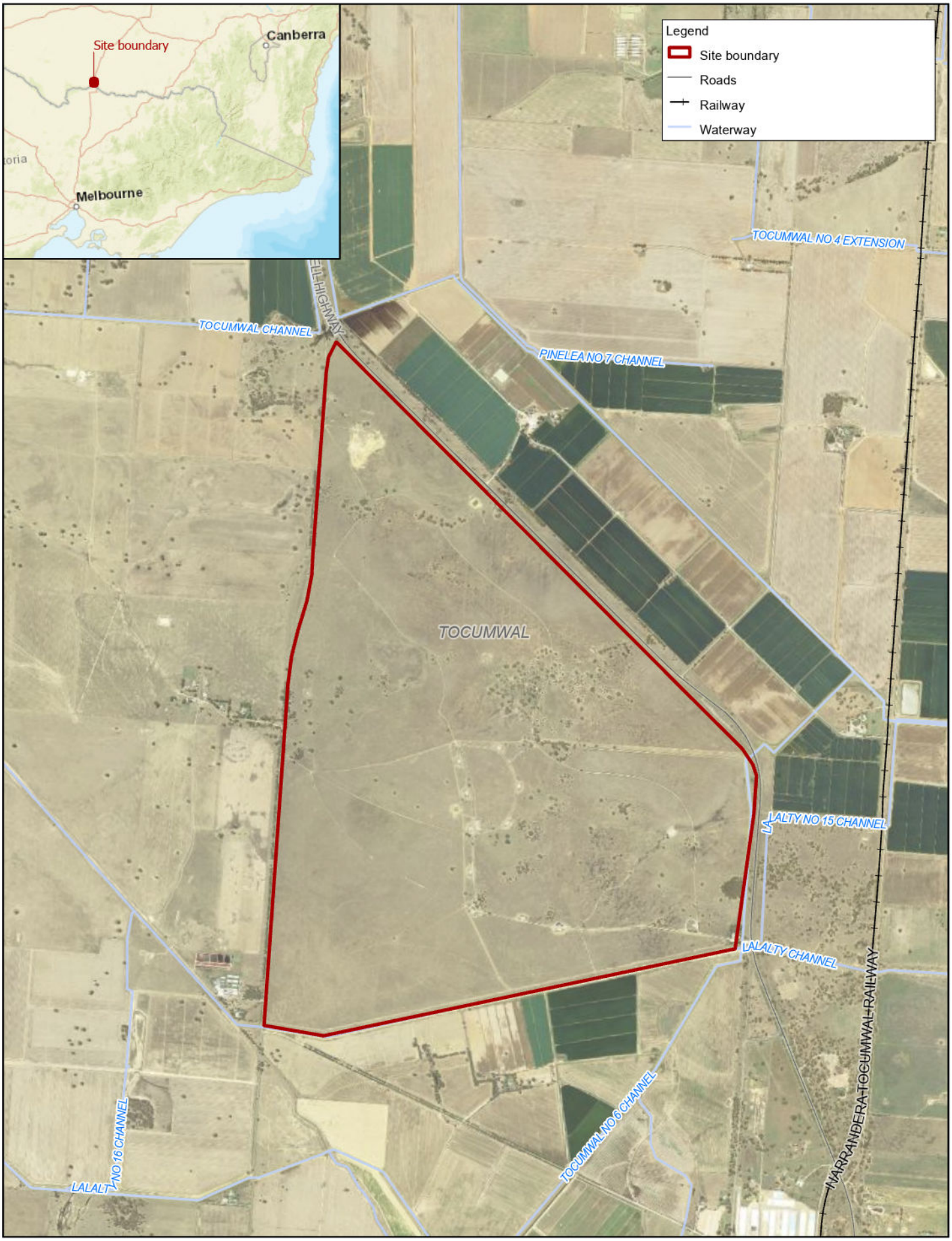
1.6 Site history

The site was originally developed in 1943 as a munitions store for the Department of Defence. The Tocumwal Explosives Reserve was established for the storage and distribution of explosives for the mining and quarrying sector and has been in operation since 1966.

A brief history of the site and related developments is provided below in Table 1.1.

Table 1.1 A brief history of the site and related developments

Year	Development
1943	Australian Army utilized site for the storage of ordnance in several small brick magazines located around the site.
1966	Site leased by ICI ANZ from the department of the Army 1956 - 1966
1966	Army magazines demolished and new magazines constructed by ICIANZ.
2010	Site manager's house converted into office.
2013	Doors on Magazine 3, Magazine 4 and Magazine 6 replaced.
2014	Alteration to pre-start and finish security checklist introduced.
2014	Magazine 2 converted from Division 1.1D to Division 1.1B.
2015	Magazine 2 converted from Division 1.1B back to Division 1.1D.
2016	Doors on Magazine 2, Magazine 5 and Magazine 7 replaced.
2018	Doors on Magazine 1, 8, 9 and 10 replaced.
2020	Site house and office buildings containing asbestos demolished, asbestos removed to a licensed facility. New office installed.
2022	Reduction of Storage Units
2023	Security upgrade Vibration/ Shudder Alarms and CCTV Cameras
2023	Site Explosives Licence renewed for Reduction of Storage Limits
2023	Install Mounding around Magazine 6
2023	Magazine fences relocated to comply with AS2187.1



Paper Size ISO A4

0 1,000

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

Orica Australia Pty Ltd
Orica Tocumwal Magazine Compound Upgrade

Project No. **12597123**
Revision No. **0**
Date **4/05/2023**

Site Location

FIGURE 1.1

\\ghdnet\ghd\AU\Newcastle\Projects\22\12597123\GIS\Maps\Deliverables\12597123_OricaTocumwalCompound.aprx
12597123_001_Location

Data source: Waterways - DFSI, 2023; Roads, Railways - DCS, 2023; NSW_Imagery: © Department of Customer Service 2020
World Street Map: Esri, HERE, Garmin, NGA, USGS. Created by: sperera2

1.7 Purpose of this report

This report has been prepared by GHD Pty Ltd (GHD) on behalf of Orica to address the SEARs as issued by DPHI for the project, dated 18 December 2023 (refer Appendix A) and the EIS form and content requirements of Clause 190 of the Environmental Planning and Assessment Regulation 2021 (the 'EP&A regulation') The EIS supports the application for approval of the project as State significant development under Part 4, Division 4.7 of the *Environmental Planning and Assessment Act 1979 (as amended* (the 'EP&A Act'). This EIS provides an assessment of the potential impacts that may arise from the construction and operation of the project, and recommends management measures to avoid, mitigate, or manage identified impacts.

1.8 Structure of EIS

This EIS has been prepared having regards to the *State Significant Development guidelines –preparing an environmental impact statement* (DPIE, 2022).

Table 1.2 provides a summary of each chapter of the main volume of the EIS.

Table 1.2 Structure of the EIS

Chapter No.	EIS chapter	Contents
1	Introduction	Provides an overview of the project, the proponent, location outlines the purpose and structure of the EIS.
2	Strategic context	Describes the national, state, regional and local context of the project and outlines alternatives considered during development of the project.
3	Project description	Provides a detailed description of the project. Includes a description of the project area, the physical layout and design, uses and activities, and timing (phases and sequencing) of the project.
4	Statutory context	Describes the applicable environmental legislation and policy.
5	Consultation	Describes the consultation that has been undertaken prior to and during the environmental assessment process, and what further consultation is proposed during the exhibition of the EIS.
6	Assessment and mitigation of impacts	Assesses the key environmental impacts associated with the project and provides management measures to avoid or minimise these impacts.
7	Environmental management	Outlines the proposed environmental management system that we be put in place during the construction and operation of the project.
8	Justification and conclusion	A review of the project against the principles of Ecologically Sustainable Development and objects of the EP&A Act.
9	References	References of all documentation and online resources used in the preparation of the EIS.

The EIS addresses the SEARs which are attached in full in Appendix A, referenced throughout this EIS as relevant.

1.9 Scope and limitations

This report has been prepared by GHD for Orica Australia Pty Ltd and may only be used and relied on by Orica Australia Pty Ltd for the purpose agreed between GHD and Orica Australia Pty Ltd as set out in Section 1.7 of this report.

GHD otherwise disclaims responsibility to any person other than Orica Australia Pty Ltd arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

Accessibility of documents

If this report is required to be accessible in any other format, this can be provided by GHD upon request and at an additional cost if necessary.

2. Strategic context

This section describes the need for the project and the alternatives that were considered as part of the development of the project. The section also provides a review of the context of the project in relation to corporate policy, the global, national, state, regional and local strategic contexts.

2.1 Need for the project

Tocumwal is the staging point to supply the full range of explosive product for NSW, VIC, SA and Tasmania, and serves as a distribution hub for explosives for the mining and quarrying sectors. There is limited magazine storage in the wider supply chain, making Tocumwal a pivotal stock centre.

The existing magazines are not compliant with the Australian Standard, and the facility operates under an exemption from the NSW regulator. The purpose of the project is to remove the reliance on the exemption and become fully compliant with the AS2187 Standard and codes of practice. To achieve this Orica proposes to build four new 250 tonne (t)HE magazines and a new detonator magazine in new locations on the existing site.

The project would bring the Tocumwal site in line with the AS2187 Standard.

2.1.1 Economic benefits

The project would bring a range of economic benefits to both the region and the NSW economy. Throughout the construction phase an estimated $14,935,553.41 million (ex GST) investment. would be made over a five (5) year period into the NSW economy. Once the project is fully operational, it will maintain five (5) full time jobs. Additional jobs will be created during construction. The project has other benefits to the region including:

– Creating economic uplift for local communities through job creation.
– Having a positive social impact on unemployment.
– Creating increased government revenue through tax revenue, and rates uplift, which is then reinvested in the region for the benefit of the community as a whole.

2.2 Consistency with strategies, plans, policies, and guidelines

Project alignment with local and regional policy is summarised in Table 2.1.

Table 2.1 Strategic Consistency

Policy	Objective	Project Alignment
Riverina Murray Regional Plan 2041	The Riverina Murray Regional Plan 2041 is an update to the Riverina Murray Regional Plan 2036, which provided the NSW Government's vision for land uses in the Riverina Murray region. That plan saw the NSW Government work with councils, stakeholders and the community to achieve priority actions. The updated regional plan is a 20-year land use plan with a targeted delivery focus on the next 5 years. A key Objective of the plans is to protect and promote industrial and manufacturing land. (Objective 14).	The project will ensure that the existing land use is sustainable and compliant with the relevant Australian Standard. Subsequently, this will retain existing employment at the site. In addition, Transport for NSW (TfNSW) has requested an upgrade to the intersection of the site at the Newell Highway entrance. The continuation of the existing major hazard facility land use is consistent with Objective 14.

Policy	Objective	Project Alignment
Local Strategic Planning Statement 2020-2040	The Local Strategic Planning Statement (LSPS) is the LGAs 20-year land use vision and identifies how growth and change can sustainably be managed across the LGA. The LSPS gives effect to the Riverina Murray Regional Plan 2041. The LSPS would inform changes to the LEP, the DCP and land use planning documents. The key planning priorities detailed in this plan that are relevant to this project include transport and logistics and to protect and enhance natural environmental assets.	The project aligns with this planning statement as it would continue to serve as a distribution hub for explosives for the mining and quarrying sectors , and make efficient use of an existing asset with the ability to offset environmental impacts as detailed in Section 6.11 and Appendix K.
Community Strategic Plan	The Berrigan Shire Community Strategic Plan 2040 (CSP) documents the aspirations and priorities of the community. It sets out a long-term vision for the shire to 2040 and identifies the key priorities and strategies for achieving this. The vision outlined in the CSP is: *"Our diverse population and productive natural landscape fuel a vibrant economy and a harmonious and thriving community".* A key component of the CSP's vision is: *"A resilient and prosperous economy that supports employment and learning opportunities.".*	The project aligns with this aspect of the vision by sustaining an appropriate land use and employment for the project and supporting an existing business.

2.3 Key features of project surrounds

The Tocumwal Explosives Reserve is located at 431 Newell Highway, approximately four kilometres north of the township of Tocumwal. The site is situated within the Berrigan LGA on Lot 2 DP 225459 and is currently operated by Orica. The Tocumwal Explosives Reserve is a fenced, open grazing property that is approximately 750 hectares (ha) in area, with a northern and eastern frontage of 4.7 km to the Newell Highway. The closest townships to the Tocumwal Explosives Reserve are Tocumwal and Finley (approximately 20 km to the north).

The site together with surrounding land to the north, east and west are zoned RU1 Primary Production (the 'RU1 zone') under *Berrigan Local Environmental Plan 2013* (the 'LEP'). Land to the south is also zoned RU1, and IN1 General Industrial. Activities undertaken on adjacent land include:

– North – crop farming
– South – crop farming
– East – Crown land
– West – intensive animal production and cropping

There is a Crown Reserve area mapped to the east of the site, which extends along the whole eastern/north-eastern boundary of Lot 2 DP 225459 including the Newell Highway.

The Newell Highway:

– Forms the eastern and northern boundary of the site.
– Is the main transport corridor between Victoria and Queensland.
– Is located 1.56 km east of the easternmost proposed magazine.
– Effectively creates a buffer between the project site and agriculture on the eastern side of the Highway.

There are no hospitals, schools, day-care centres, retirement homes, churches, shopping centres, sporting facilities, or other places where it could be expected for large gatherings of people to congregate in the immediate proximity of the site. There are also no other Major Hazard Facilities or hazardous chemical storage sites nearby that could affect the safety of the Tocumwal Explosives Reserve.

There are no areas surrounding the Tocumwal Explosives Reserve where a major industrial incident may cause substantial harm. It is noted that Development Application No 92-24-DA-DM for an electricity generating works (solar farm) and battery energy storage system at 118 Silo Road, Tocumwal was approved by Berrigan Shire Council on 19 June 2024. The site of the approved solar farm is directly to the south of the site.

2.3.1 Site Conditions

The Tocumwal Explosives Reserve is a fenced, open grazing property that is approximately 750 hectares ha in area. The northern and eastern boundaries of the site are formed by the Newell Highway.

The southern extent of Lot 2 DP 225459 is bordered by Lalalty Channel, a canal drain. The Tocumwal No 6 canal drain is located further south. At its closest point, the Murray River is approximately 2.5 km south of the project location. The western portion of the lot is bound by Chinamans Road.

The topography of the site is generally flat, and the site has an elevation above sea level of approximately 110 m. The site is not identified as Bushfire Prone Land (BPL), nor is the site mapped as containing Biodiversity Values (BDV). The site is generally cleared.

Currently the site contains:

– Office and amenities to accommodate five personnel.
– Ten licensed explosives magazines, consisting of nine magazines that hold Division 1.1D products and one magazine that holds Division 1.1B, 1.4B and 1.4S products.
– Storage sheds and shipping containers for storage of blasting accessories and repacking detonators.
– Maintenance and general storage shed.
– A self-bunded diesel tank with 2,000 litre capacity is located between Magazine 2 and Magazine 3.
– A sand mine disposal area with general inert waste.

The existing site layout is shown below in Figure 2.1.

The project site has a number of inherent advantages, summarised as follows:

– Within the existing Tocumwal Explosives Reserve, and within a lot owned by Orica.
– In an area that is cleared and disturbed by existing activities and the infrastructure of the Tocumwal Explosives Reserve.
– Remote from sensitive receivers (nearest rural residence is 1.14 km south).
– Buffered on the eastern and northern fronts by the Newell Highway.
– No other Major Hazard Facilities or hazardous chemical storage sites are nearby that could affect the project.

2.3.1.1 Agreements

Orica is currently negotiating agreements with neighbouring landowners to the south and west of the site for deeds of covenant over their land titles precluding these landowners from constructing buildings capable of human domestic or high occupation rates within the area of their land that falls within the Protected Works B (PWB) ring defined by the quantitative displacement calculations for the new magazines. i.e. – No houses, offices, etc within the PWB area.

2.4 Project Alternatives

2.4.1 The “do nothing” approach

Currently the existing Tocumwal Explosives Reserve does not comply with the AS2187 Standard and operates under an exemption. Without completing the project, the existing site would continue to operate but the need for the exemption would remain. The project removes the need for this exemption as the four new 250 t HE magazines and one detonator magazine would be fully compliant with Australian Standards and regulations. The project is therefore the preferred option.

2.4.2 Design alternatives

The proposed design considers the risk of a single detonation resulting in a knock-on effect, due to the proposed construction of earthen mounds. These mounds would be strategically positioned in front of the proposed magazines to reduce risk of knock-on detonation.



Paper Size ISO A4

0 60 120 180

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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GHD

Orica Australia Pty Ltd
Orica Tocumwal Magazine Compound Upgrade

Project No. **12597123**
Revision No. **0**
Date **5/05/2023**

Existing Site Layout

FIGURE 2.1

Data source: Roads, - DCS, 2023; NSW_Imagery: © Department of Customer Service 2020. Created by: sperera2

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12597123_002_Layout

3. Project description

This chapter provides a description of the project and includes a description of the infrastructure proposed and land requirements. It also provides an outline of the indicative construction activities likely to be used to construct the project, indicative construction methodology, timing, and likely resources.

3.1 Project overview

The project will ensure that the existing development is compliant with the AS2187 Standard, and that Orica can continue to provide explosives for the quarrying and mining sector. The estimated capital cost of the project is approximately $14,935,553.41 million (ex GST) which has been calculated in accordance with *PS 24-002 Changes to how development costs are calculated for planning purposes* and the *Standard Form of Estimated Development Cost Report (State significant projects)*.

The key project characteristics are summarised in Table 3.1 and the project footprint is shown below in Figure 3.1.

Table 3.1 Key project characteristics

Feature	Description
Project summary	Orica proposes building four new 250 t HE magazines and a new detonator magazine in new locations on the existing Orica site. The magazine buildings would be purpose built new constructions that would comply with the construction requirements for the AS2187 Standard, removing the requirement for an exemption from same. The currently stored explosives will be sequentially moved from the old to new magazines in batches that maintain the safe distances between all magazines so that at no time is there a situation where an initiation at one magazine could cause any subsequent initiation at any other magazine. Refer to the proposed development plans (Appendix B).
Project site and area	Lot 2 DP 225459, approximately 750 hectares (ha)
Zoning	RU1 Primary Production
Proponent	Orica Australia Pty Ltd
Operator	Orica Australia Pty Ltd
Construction hours	7:00 am to 6:00 pm Monday to Friday 8:00 am to 1:00 pm Saturdays No work on Sundays or Public Holidays
Operating hours	No change to existing operation of 6:30 am to 15:30 pm Monday to Friday
Waste disposal	During construction, waste would be categorised and disposed of at a licensed facility. In operation, the project would follow existing waste procedures. Refer to Section 6.5. Domestic waste is disposed or recycled by contract with Cleanaway.
Estimated employment	Construction workforce: Up to ten (10) staff at any one time. In operation, the site would continue to operate as it currently does with no change to workforce (between two and five people).
Power Supply	The existing power supply and connection does not require an upgrade.
Water Supply	The existing water supply and connection does not require an upgrade.
Traffic and Access	It is proposed to spray seal the internal access road, including its intersection with the Newell Highway, in accordance with Austroads Guidelines. As the number of workers at the site is not expected to change, the traffic generated from operation of the facility would remain the same. The peak hour construction vehicle activity has been undertaken on a first principles basis in accordance with the expected volumes of workers and heavy vehicles as follows: – Up to ten additional workers are expected at the site during the construction of the project. – Workers will access the site in the morning and depart the site in the afternoon. – To be conservative, it has been assumed that two heavy vehicles would access/egress the project site in a single hour during the peak hour. A full assessment of the Traffic and Access impacts in relation to the project are provided at. Appendix E.



Legend

- Roads
- Earthen blast mound
- Phase 1 layout
- Light vehicle passing lane
- Site boundary

Paper Size ISO A4

0 50 100 150 200

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

Orica Australia Pty Ltd
Orica Tocumwal Magazine Compound Upgrade

Project No. **12597123**
Revision No. **1**
Date **13/09/2023**

Project Footprint

FIGURE 3.1

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Print date: 13 Sep 2023 - 11:57

Data source: Phase 1 layout, Blast mound - Orica, 2023; Roads - DCS, 2023; NSW_Imagery: © Department of Customer Service 2020. Created by: egubatanga

3.2 Construction

3.2.1 Method

The main construction activities of this project are planned to commence between financial years 2024 – 2028, with approximately one magazine being constructed per year. A detailed design would be undertaken prior to construction commencing and lodged with the construction certificate application.

Construction activities include:

- The construction of four (4) new 250 t HE magazines including:
  - An earth grid and lightning protection masts and conductors.
  - A security system which would include the following functions: CCTV surveillance, entry alarms on both doors and vibration alarms on the internal structures of the magazine.
  - A standalone solar power system to supply power for its security systems and lights, which includes:
    - Two (2) 450 watt solar panels per magazine totalling five (10) solar panels.
    - Four (4) security cameras, one on each corner of the Magazine, totalling twenty (20) Security cameras.
    - Security sensors including shudder alarms.
    - Door reed switches.
    - Movement sensors.
    - Small scale battery system-one (1) per magazine- 200 amp hour 12 volt battery (via a controller).
    - Emergency siren.
    - Security siren and comms back to office.
    - Emergency system activation, comms back to office.
    - Two cameras in the location of the access gate/road and office building.
- The project would include the construction of earthen mounds in front of three of the proposed 250 t HE magazines. These mounds would be strategically positioned to minimise risk of knock-on detonation. The construction of these mounds would be finalised in detailed design.
- The construction of a single 10,000,000 capacity detonator (IE) magazine.
- Earthworks to establish the concrete slabs under the four new 250 t HE magazines and one detonator magazine.
- Hard stand would be constructed at each new magazine site upon which the concrete slab would be built.
- The new magazines would be constructed on concrete slabs which would include an approximately nine-metre-wide apron across the front of the new building to allow parking of B-double trucks for loading and unloading.
- New drainage would be constructed at each new magazine site.
- New earthen mounds will be constructed at three locations.
- Construction of new access roads. New roads would be built running from the existing entrance to the sites of the new magazines. These roads would be gravel during the construction of the new magazines and would then be sealed prior to normal operations using the new magazines starting.
- Security Sensitive Ammonium Nitrate compliant fence/fences as required, which may be comprised of either a single or potentially two fences around the magazines to create an “Asset Protection Zone” which would make it easier to manage firebreak requirements.
- Construction of the upgraded access to the Newell Highway.
- Vegetation management, including landscaping, and Asset Protection Zones (APZs) within the subject site is to achieve the specifications of an Inner Protection Area (IPA) (Refer Appendix F).

3.2.2 Construction hours

The construction activities would be carried out during the following hours, consistent with the recommended standard hours of the *Draft Construction Noise Guideline* (NSW EPA, 2020):

– 7:00 am to 6:00 pm Monday to Friday
– 8:00 am to 1:00 pm Saturdays
– No work on Sundays or Public Holidays

3.2.3 Construction workforce

The construction workforce is expected to include up to ten workers per day.

3.2.4 Construction traffic

Workers will access the site in the morning and depart the site in the afternoon.

To be conservative, it has been assumed that two heavy vehicles would access/egress the project site in a single hour during the peak hour.

For the purposes of this assessment, the highest hourly traffic generation for the project under the peak construction scenario is assumed to be up to 14 vehicle trips in total, which will consist of the following:

– AM peak hour:
  - Ten inbound light vehicles
  - Two inbound heavy vehicle movements
  - Two outbound heavy vehicle movements
– PM peak hour:
  - Ten outbound light vehicles
  - Two inbound heavy vehicle movements
  - Two outbound heavy vehicle movements

3.2.5 Construction equipment and materials

An indicative list of standard civil construction equipment that may be required for the project is provided in Table 3.2.

Table 3.2 Indicative list of construction equipment

Plant and equipment		
Excavators- Various Sizes	Concrete Trucks	Welding machines
Bulldozers	Contractor service vehicles	Site Sheds
Dump Trucks	Rollers	Boring machines
Mobile Cranes- various sizes	Rock breakers	Asphalting machines
Elevated Work Platforms	Semi-Trailers	Compactor
Concrete pumps	Vacuum Trucks	Smooth drum roller
Bobcat	Forklift	Grader

3.3 Operation

3.3.1 Overview

During construction, operations at the Tocumwal Explosives Reserve would continue as normal to avoid disruptions to customer deliveries. After the four new 250 t HE magazines and one detonator magazine have been constructed, Procedures and documents will be updated to reflect the site changes from ten to five (5) magazines and the changes to internal site roads and traffic management.

After construction is complete, the site would be fully compliant with AS2187 Standard.

Currently, the site operates in line with a number of existing procedures including:

– Site Operating & Maintenance Manual
– Environmental Management Plan (EMP)
– Site Safety Management Plan (SSMP)
– Emergency response plan (ERP)
– Site Security Plan (SSP)
– Fire Risk Management Plan (FRMP)
– MHF Safety Case

These operational procedures would remain in place after the project has been constructed.

3.3.2 Hours of operation

Existing operational hours, which would remain unchanged, are as follows:

– Facility operating hours 6:30 am to 15:30 pm Monday to Friday
– Traffic arrival 24 hours, seven days a week

3.3.3 Operational workforce

There are currently two to five permanent staff operating the Tocumwal Explosives Reserve at any one time. The operation of the new facility would continue to require the same number of staff after construction has been completed. Currently, from Monday to Thursday, five staff are present on the site (four permanent staff and one permanent part time), on Fridays, four permanent staff are present on the site. There is no proposed change to the overall operational workforce at the facility due to the project.

3.3.3.1 Operations During Unstaffed Hours

The following measures are employed to manage operations at the project site during unstaffed hours”

– Magazine reserve gates are locked.
– All Magazine doors are locked.
– Magazine Keys secured in safe in office.
– Security System at each magazine is enabled with 24-hour monitoring, door switches, motion sensing, vibration sensing.
– CCTV cameras operate 24 / 7.
– Individual magazine gates are locked.
– End of Shift Security Checks Completed.
– All internal office doors locked.
– Security system enabled in office.
– Truck drivers can only access kitchen and amenities through security keypad.(Arrivals pre-arranged).

3.3.4 Traffic and Access

As the number of workers at the site is not expected to change, the traffic generated from operation of the facility would remain the same and as such has not been considered further in this assessment.

The peak hour construction vehicle activity has been undertaken on a first principles basis in accordance with the expected volumes of workers and heavy vehicles as follows:

– Up to ten additional workers are expected at the site during the construction of the project.
– Workers will access the site in the morning and depart the site in the afternoon.
– To be conservative, it has been assumed that two heavy vehicles would access/egress the project site in a single hour during the peak hour.

For the purposes of this assessment, the highest hourly traffic generation for the project under the peak construction scenario is assumed to be up to 14 vehicle trips in total, which will consist of the following:

– AM peak hour:
  - Ten inbound light vehicles
  - Two inbound heavy vehicle movements
  - Two outbound heavy vehicle movements
– PM peak hour:
  - Ten outbound light vehicles
  - Two inbound heavy vehicle movements
  - Two outbound heavy vehicle movements

With respect to the access to the project site, it is proposed to spray seal the internal access road, including its intersection with the Newell Highway, in accordance with Austroads Guidelines.

With respect to impacts on parking, the following is noted:

– Due to on-street parking not being permitted on Newell Highway in proximity to the project site, there is not expected to be any impact to on street parking.
– Parking for workers would be provided within the project site.

Accordingly, the impacts on parking associated with the construction and operation of the project are expected to be negligible.

3.3.5 Closure

The existing Tocumwal Explosives Reserve would continue to operate whilst the four new 250 t HE magazines and one detonator magazine are constructed to avoid disruptions to service. It is intended that the facility continue operation indefinitely.

3.3.6 Strategies to avoid or minimise impacts

The project has been presented to SafeWork NSW as a preliminary input to gaining the required explosives storage licences for the project. Other required documentation for the granting of explosives storage licences will be submitted to SafeWork NSW at various times throughout the greater project.

The existing site operates under a number of management plans:

– EMP, including sub-plans such as the Traffic Management Plan, Environment Management and Waste Plan
– SSMP
– ERP
– SSP
– FRMP

Existing operations would continue at the project site during construction of the four (4) additional magazines and one (1) detonator magazine. Existing management plans and strategies to minimise harm would continue to be in place during the construction of the project and would apply to the operation of the additional magazines and detonator magazine.

The project triggers entry into the NSW Biodiversity Offsets Scheme (BOS) by virtue of its status as a SSD, consequently, the project requires a Biodiversity Development Assessment Report (BDAR) and to offset impacts to biodiversity. Based on the number of ecosystem and species credits, the proponent intends to satisfy their offset obligations by buying and retiring the necessary credits from the open market or, if appropriate credits are not available, by paying directly into the Biodiversity Conservation Fund. The proponent is required to satisfy 183 Ecosystem credits. This will offset and therefore minimise biodiversity impacts.

4. Statutory context

This chapter provides a summary of the planning approval requirements for the project under relevant legislation. The approval pathway and permissibility of the project are summarised, relevant planning instruments and legislation are considered, and a summary of other approvals that are required is provided.

The relevant statutory requirements for the project, identifies:

– The legal pathway under which approval is sought, why the pathway applies, and who the consent authority is.
– Relevant state approvals (outlining approvals that are not required for SSD and approvals that are required and that should be substantially consistent with SSD).
– Mandatory matters for consideration, including relevant state and local environmental planning instruments.
– Relevant federal approvals.

Table 4.1 outlines the SEARs requirements in regard to statutory compliance and provides a summary of the statutory requirements of the project with reference to relevant legislation and environmental planning instruments.

A statutory compliance table is contained in Appendix C.

Table 4.1 Statutory Context SEARs

Requirements	Comment.
Statutory and strategic context – including:	
A detailed description of the history of the site, including the relationship between the proposed development and all development consents and approved plans previously and/or currently applicable to the site	Refer to Section 1
Demonstration that the proposal is consistent with all relevant planning strategies, environmental planning instruments, adopted precinct plans, draft district plan(s) and adopted management plans and justification for any inconsistencies. This includes, but is not limited to: – *State Environmental Planning Policy (Biodiversity and Conservation) 2021* – *State Environmental Planning Policy (Industry and Employment) 2021* – *State Environmental Planning Policy (Planning Systems) 2021* – *State Environmental Planning Policy (Resilience and Hazards) 2021* – *State Environmental Planning Policy (Transport and Infrastructure) 2021* – Riverina Murray Regional Plan 2041	Refer to Section 2.2, Section 4, and Appendix C
Power to grant approval	The project has been declared SSD in accordance with section 4.36 of the EP&A Act, and Schedule 1, Clause (10)(3) of the Planning Systems SEPP. The Minister for Planning is the consent authority, and the project is to be assessed in accordance with Division 4.7 of the EP&A Act.
Permissibility	The project site is zoned RU1 Primary Production under the LEP. The project is consistent with the existing land use and zoning of the site as it would be located within the existing Tocumwal Explosives Reserve and does not represent an operational change to the site. Additionally, the project is defined as a 'heavy industrial storage establishment' under the LEP, which is permissible with consent in the RU1 zone.

Requirements	Comment.
Approvals required and that should be substantially consistent with approved SSD	Any authorisations under certain legislation, identified in section 4.42 of the EP&A Act, cannot be refused if it is necessary for carrying out an approved SSD project that is authorised by a development consent under Division 4.7 and is to be substantially consistent with the SSD approval. The project also seeks consent under section 138 of the Roads Act.
Approvals not required for approved SSD	An authorisation under certain other legislation, identified in section 4.41 of the EP&A Act, is not required for SSD. In relation to the project, none of these approvals would be applicable if it were not approved SSD.
Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999 approvals	The project is not anticipated to result in a significant impact on any Matters of National Environmental Significance (MNES) under the Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act). A referral under the EPBC Act has not been made for this project.
Pre-conditions to exercising the power to grant approval	Identification of the project as being one which meets the definition of SSD under the Planning Systems SEPP is detailed in Appendix C. A consent authority must be satisfied that the land is suitable with any existing contamination for the development to be carried out as detailed in Appendix C.
Mandatory matters for consideration	Relevant matters that must be satisfied before the consent authority may grant project approval include consideration of the following legislation and planning instruments. References are provided to the section of these EIS where each are reviewed in detail: – Accompanying BDAR as required under Part 4 of the Refer Section 6.11. – Duty to notify (if required) under section 60 of the *Contaminated Land Management Act 1997* (CLM Act) (NSW). Refer Section 6.2. Relevant environmental planning instruments including: – *State Environmental Planning Policy (Transport and Infrastructure) 2021* (Transport and Infrastructure SEPP). Refer Appendix C. – Planning Systems SEPP. Refer Appendix C. – *State Environmental Planning Policy (Resilience and Hazards) 2021* (Resilience and Hazards SEPP). Refer Appendix C. – *State Environmental Planning Policy (Biodiversity and Conservation) 2021* (Biodiversity and Conservation SEPP). Refer Appendix C.

5. Community engagement

This chapter summarises the community and stakeholder engagement undertaken prior to and during preparation of the EIS, and the consultation proposed to be undertaken during design and delivery of the project. The key issues relevant to the EIS are summarised.

5.1 Introduction

This section includes issues raised and identifies where, if applicable, the design or work program has been amended in response to those issues. Table 5.1 details the SEARs in relation to project consultation, and the location within the EIS of the responses to the consultation SEARs.

Table 5.1 Consultation SEARs

Requirements	Where addressed:
Community and Stakeholder Engagement – a community and stakeholder engagement strategy consistent with the Department's Undertaking Engagement Guidelines for State Significant Projects for all stages of the development, including (but not limited to):	
– Details of how issues raised, and feedback provided during engagement activities have been considered and responded to in the development	Refer to Section 1.2 and Table 5.2.
– Details of the proposed approach to future community and stakeholder engagement based on the results of consultation.	
During the preparation of the EIS, you must consult with the relevant local, State and Commonwealth Government authorities, infrastructure and service providers, community groups and affected landowners. In particular you must consult with: – Berrigan Shire Council – SafeWork NSW – Fire & Rescue NSW – Department of Planning and Environment: • Environment and Heritage Group • Heritage NSW – Department of Regional NSW, specifically the Department of Primary Industries – Agriculture – Transport for NSW – NSW Rural Fire Service – WaterNSW – surrounding local landowners, businesses and stakeholders – local and regional community and environmental groups – Cummeragunja Local Aboriginal Land Council – Any other utilities or community service providers	

5.1.1 Consultation context

In response to SEARs, Orica is required to consult with relevant local, State or Commonwealth government authorities, service providers, community groups and affected landowners.

5.1.2 Consultation strategy

Orica maintains a stakeholder consultation standard which it applies across all its business sectors in the development of new projects, expansions of existing infrastructure, and ongoing operations. The standard requires Orica to:

– Conduct consultation with stakeholders, including government groups, asset owners, local community groups, businesses, residents, and local media as relevant.
– Establish constructive working relationships and communication channels with stakeholders.

– Consider Aboriginal cultural heritage issues in the consultation process.
– Seek community feedback.
– Provide regular updates to interested communities on the progress of projects.

As detailed in Section 5.1 the SEARs require a minimum level of consultation to be undertaken to comply with DPHI requirements. Orica's approach to consultation as part of the project, and more generally in association with any of its operations or activities, is to undertake thorough and comprehensive consultation with all stakeholders, above a level which may otherwise be deemed standard.

5.2 Summary of consultation undertaken for the EIS

Engagement with community and stakeholders was carried out during the environmental assessment process. The purpose of consultation was to raise awareness about the project, understand stakeholder issues, and obtain important feedback to help shape the environmental assessment. Orica values the input of stakeholders and the wider community and sees it as an opportunity to improve project development. Consultation with stakeholders has been ongoing prior to and during the development of the EIS and would continue through the project lifespan. A summary of engagement carried out at this point is provided below in Table 5.2. The summary includes the matters raised by government agencies and relevant stakeholders and how the matters have been addressed.

Table 5.2 Stakeholder consultation outcomes

Stakeholder	Date	Details	Issues raised	How addressed
Berrigan Shire Council (Council)	17 January 2024	Requested details of Flood Modelling data as required by the SEARs.	Provision of data to assess Flood Impacts to the site.	Councils' consultant was engaged to provide data to undertake Flood Assessment. Refer Section 6.1.
	14 May 2024	Requested confirmation re developer contributions.	The Berrigan Shire Section 7.11 (formerly Section 94) Developer Contributions Plan includes developer contributions for: – Public Open Space – Carparking – Stormwater Drainage The proposed development does not appear to trigger the nexus for these contribution categories. Similarly, it does not appear that the proposal would trigger S64 contributions under the and Section 64 Developer Contributions Plan.	Council confirmed via email that development would not be subject to any of the contributions listed. This is addressed in Appendix C.
Safework NSW	21 December 2023	Safework NSW provided additional commentary to that in the SEARs via email.	SWNSW's expectation is that: – *"Orica's final plans/facility complies with AS 2187 as outlined in the Scoping Report, and* – *Orica continues to communication to SafeWork NSW as part of the ongoing stages of their project.* *Specific comments are as follows:* – *In Table 3.1 the definition of PWA "…where no human occupied buildings should be built" is not correct. PWA is to an open area where a people may congregate.* – *Similarly, where the report states the PWA will remain within the site boundary, for a magazine containing 250 tonnes the distance is 940m.* – *For human occupied buildings (known as PWB), a store containing 250 tonne requires a distance of 1,400 m.*	Orica provided Safework NSW with a compliance checklist of the proposed design. The Agency was satisfied with the compliance of the project as it relates to Safework NSW and the AS2187 standard (Appendix D).

Stakeholder	Date	Details	Issues raised	How addressed
			– *SWNSW has not assessed the distances to off-site facilities at this stage as the requirement is the final design & location of the explosive magazines will need to comply accordingly.* – *We query how the land has been assessed as not bushfire prone.* – *Specifically with regards the design of the magazine doors then if Orica can provide some guidance on how you determined the design to be suitable and providing an equivalent if not better level of safety and security to that currently prescribed in AS 2187 that would be helpful. Note SafeWork NSW will not sign off on the design as such but once you have provided further information we will advise if anything further is required from Orica to justify the design.*	
Fire & Rescue NSW	27 May 2024, 18 June 2024, 26 June 2024, and 4 July 2024	Requested meeting on multiple occasions via email to consultation.	– Preliminary Hazard Analysis (PHA) (12597123-RPT- 0-Orica Tocumwal Magazine Compound Upgrade, dated 15 May 2024) for proposed hazard mitigation measures relating to fire safety intervention. – EP and FRMP for current fire response plans, including FRNSW and NSW Rural Fire Service (NSW RFS) responsibilities, to existing magazines. – Changes will be proposed to the response plans for the new works, where advised by the PHA or by Orica.	No response was received, from 4 July 2024. GHD advised Fire & Rescue NSW via email that the consultation was considered complete for the purpose of the EIS submission, with receipt of 'no comments'.
Department of Planning and Environment	20 November 2023	Request SEARS	SEARs provided. Meeting held to discuss project and extent of changes to existing facility.	SEARs addressed throughout EIS.
Department of Planning and Environment – Environment and Heritage Group – Heritage NSW	18 December 2023	SEARs included comments from the DPHI.	SEARs provided. Refer Appendix A.	Refer Appendix A.
Department of Regional NSW, - Department of Primary Industries – Agriculture	8 May, 2024	Requested review and comment.	*"For infrastructure developments on rural zoned land we would normally require your assessment to consider biosecurity impacts on agriculture (not just biodiversity), potential land use conflict and site rehabilitation measures. Details on these requirements can be found on our webpage (https://www.dpi.nsw.gov.au/agriculture/lup), with specific reference to:* *https://www.dpi.nsw.gov.au/agriculture/lup/development-assessment/development-assessment2/infrastructure-proposals* *https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0018/1271241/managing-biosecurity-risks-in-land-use-planning-and-development-guide.pdf* *https://www.dpi.nsw.gov.au/agriculture/lup/development-assessment/development-assessment2/lucra*	SEARs addressed throughout EIS.

Stakeholder	Date	Details	Issues raised	How addressed
			It is noted that the scoping report talks about Protected Works A and Protected Works B "circles" having been identified. Although the report indicates there are agreements with some neighbouring landholders, these "circles" are not mapped and thus the EIS should clarify the physical and inhibiting extent of PWB agreements impacting on agricultural lands and activities".	
TfNSW	May 15 2024	Requested review and comment.	*"TfNSW has reviewed the Traffic Impact Assessment (Local Environmental Plan) dated Dec 2023 prepared by GHD in respect to the SEARs provided for the proposed development and provides the following comments for your attention.* – *Section 1.2 refers to the site having two entrances from Newell Highway (A39) located at the south-eastern and northern corners of the site and two access points from Chinamans Road. Recent imagery appears to indicate that there is only one used access driveway to the Newell Hwy.* – *Section 1.5 identifies that "The site will generate negligible additional operational vehicle activity". However the document does not appear to address the standard of the current driveway to the Newell Highway or provide and assessment of its adequacy for the proposed development including access for heavy vehicles. An assessment of the driveway against the requirements of the Austroads Documents for the posted speed limit on the Newell and swept paths for the largest vehicle proposed to access the development should be provided,* – *Section 2.5 identifies that part of the Newell Hwy near to the subject site as being B-Double approved. This section of the Newell Hwy also allows for Road-train heavy vehicle configurations under Travel Conditions* – *Fig 2.2 appears to be an old image of the intersection of Chinamans Road and the Newell Hwy. Recent imagery shows an updated intersection providing for a channelised right and auxiliary left turn treatment for that intersection.* – *The submitted document does not appear to address the provisions of SEPP Transport & Infrastructure 2021 particularly clause 2.119.* *TfNSW considers that the assessment needs to address the adequacy of the driveway for the proposed development is respect to road safety and appropriate guidelines e.g. Austroads documentation. The document does not appear to address the current standard of the existing access points to the road network particularly the standard of the unsealed access to the Newell Highway for the proposed development.* *The Newell Highway is a significant freight route. Access to the site is located within a high speed environment. Whilst TfNSW acknowledges that the traffic volumes on the Newell Highway and the traffic generation of the development may not warrant consideration of capacity issues on the surrounding road network, as access is proposed from the Newell Highway road safety matters for access to the site and motorist on the highway needs to be addressed.*	The Traffic Impact Assessment (TIA) was amended to address these comments (Appendix E).

Stakeholder	Date	Details	Issues raised	How addressed
			Whilst the site does have an existing access driveway to the Newell Highway has the adequacy and potential benefits of access via the upgraded intersection of Chinamans Road with the Newell Highway been considered as part of the redevelopment".	
	11 July 2024	The amended TIA was issued to TfNSW for further comment.	TfNSW advised via email: "*I refer to our recent phone discussion. As advised I confirm that preliminary consultation has been undertaken with TfNSW for preparation of the Traffic Impact Assessment (TIA) for the proposed redevelopment of the Tocumwal Magazine Compound. TfNSW has reviewed the content of the revised TIA and considers that the document includes sufficient detail for assessment as part of the application for upgrade of the current facility when submitted".*	The TIA is provided as part of this EIS package for assessment.
NSW Rural Fire Service (RFS)	19 December 2023	Pre-DA Consultation	RFI re aircraft exclusion zones.	Information incorporated into Bushfire Hazard Assessment (BHA) (Appendix F).
	26 March 2024	Pre-DA Consultation	RFI re aircraft exclusion zones.	As above.
	30 April 2024	Provision of BHA	That that EIS should address matters raised in Sears.	BHA has addressed matters raised in SEARs (Appendix F).
	13 May 2024	Provision of amended BHA	No response received.	N/A.
WaterNSW	22 May 2024	Requested review and comment.	The Department of Climate Change, Energy, the Environment and Water (DCCEEW) recommends that you submit this documentation in the NSW Major Projects Portal. Submission of your documents in the NSW planning portal will ensure that your documents are correctly associated with your portal account, and enable you to communicate directly with NSW DCCEEW Water, including to seek progress updates. NSW DCCEEW Water will commence review of your documents once received in the portal.	The Agency will review when the Development Application (DA) is lodged.
Surrounding local landowners, business and stakeholders	Orica maintains ongoing relationships with surrounding local landowners, businesses and other local stakeholders through its Stakeholder team. All relevant stakeholders were consulted regarding the project. No concerns have been raised during preparation of the EIS.			
Local and regional community and environmental groups				

Stakeholder	Date	Details	Issues raised		How addressed
Cummeragunja Local Aboriginal Land Council	12 July, 2023		A letter seeking information from various agencies was sent on 12 July 2023 (Appendix 1 Figure 2). These agencies were: Office of the Registrar, Aboriginal Land Rights Act 1983; Heritage NSW; National Native Title Tribunal; National Native Title Services Corporation Ltd (NTSCORP); Cummeragunja Local Aboriginal Land Council (LALC), Berrigan Shire Council, and the Murray Local Land Services.	Cummeragunja LALC did not respond. Please refer to Appendix G for a detailed list of the Consultation undertaken in relation to the ACHAR.	Refer to the Aboriginal Cultural Heritage Assessment (ACHAR) (Appendix G).
Any other utilities or community service providers.		No consultation with utility or community service providers was considered necessary as no upgrades to services are required.			

5.3 Proposed future and ongoing consultation

As summarised above in Table 5.2, although a wide range of consultation has already been undertaken, future consultation is proposed. This will include Public Notification (refer Appendix C), and ongoing consultation with relevant stakeholders as required.

6. Assessment and mitigation of impacts

This chapter provides a summary of the impacts of the project on key environmental aspects as identified in the SEARs. For each environmental aspect the existing environment is defined, the projects potential construction and operational impacts identified, and management measures identified to avoid or mitigate those potential impacts. The assessment of key impacts is supported by technical studies as referenced throughout this chapter and appended to this EIS.

6.1 Soils and water

The section provides a summary of the potential soil and water impacts of constructing and operating the project.

6.1.1 Approach and method

6.1.1.1 Legislative and policy context to the assessment

The assessment was undertaken in accordance with the SEARs and with reference to the requirements of relevant legislation, policies and/or assessment guidelines, including:

– The EP&A Act.
– *Protection of the Environment Operations Act 1997* (POEO Act).
– *Water Management Act 2000* (WM Act).
– Policies relevant to the assessment of impacts:
  - NSW Aquifer Interference Policy (NSW DPI, 2012).
  - NSW Groundwater Strategy (NSW DPE, 2022).
  - Guide to Groundwater Management in NSW (NSW DPE, 2023).
– Guidelines relevant to the assessment of impacts:
  - Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC & ARMZANA, 2000) and (ANZG, 2018).
  - Approved Methods for the Sampling and Analysis of Water Pollutants in NSW (NSW EPA, 2022).
  - Flood Risk Management Manual (NSW DPE, 2023).
  - Managing Urban Stormwater: Soils and Construction – Volume 1 (Landcom, 2004).

While it is acknowledged that the project will be assessed as SSD under Part 4, Division 4.7 of the EP&A Act, the LEP and the Berrigan Development Control Plan 2014 (DCP) provide relevant guiding controls with respect to flood management.

6.1.1.2 Method

Impacts in relation to soil and water were identified and assessed generally based on the following approach:

– General consideration of water related risks undertaken through the concept development resulted in measures in-built into the project in relation to water management. These measures are outlined throughout this section.
– Based on the nature and location of the project, surrounding environment, and relevant legislation, potential risks for assessment were identified in relation to the following areas:
  - Surface water quality, both during construction and operation.
  - Groundwater impacts, both during construction and operation.
  - Flooding impacts, both on and from the project.
  - Water sourcing.

– The above risks were assessed firstly through identification of potential direct sources of the above impacts, followed by identification of the potential location and magnitude of impact, as well as the relevant potentially affected receptors.
– Mitigation measures for the identified likely adverse impacts were developed, and the residual impact after implementation of mitigation predicted.

Key aspects of the assessment approach relevant to this project are:

– Due to the nature of the structures and ground, shallow footings are anticipated to be required, resulting in minimal excavation below ground level (e.g., no deep piles are required). On this basis, the site is anticipated to be located well above local groundwater levels with no groundwater interception. Dewatering of minor groundwater inflow is not anticipated but any minor inflow would require dewatering.
– No works on waterfront lands (as defined by the WM Act) are anticipated and no direct impacts to waterways are expected. Riparian zone impacts have not been further assessed on this basis.
– Potentially hazardous materials such as fuels and explosives would be bunded and/or contained/roofed per Australian Standards to maintain separation from site stormwater.
– For the assessment of the project's flood immunity and flood impact, use was made of Berrigan Shire Council's revision of the Tocumwal-Barooga Flood Study (the 'flood study'). Since this study is currently underway, GHD approached the modellers, WMA Water, to provide the most recent flood data for the existing conditions, and to simulate the impact of the proposed design in the flood model. WMA Water were engaged by Orica to undertake these services with suitable permission provided by Berrigan Shire Council.

6.1.2 Existing environment

6.1.2.1 Climate

The average annual climatic data for the site was sourced from SILO Long Paddock patched point grid data (Queensland Government, 2023) which provides spatially and temporally continuous climatic data. SILO data is shown below in Figure 6.1, which identifies that:

– The hottest months occur typically during summer, from December – February, with coldest months typically in winter from June – August. Median maximum daily temperatures range from 13 – 34 degrees Celsius throughout the year, with median minimum daily temperatures ranging from 2 – 18 degrees Celsius throughout the year.
– Median monthly rainfall does not vary much throughout the year and ranges typically between 21.4 – 42.3 mm.
– In terms of median rainfall, the driest months are typically in summer and early autumn (December – March) and the wetter months are typically in winter and early and late spring (July – September, and November).
– Generally, potential evapotranspiration exceeds precipitation with the median annual total precipitation 423.7 mm, and typically ranging from 260.4 – 605.4 mm per annum.
– The median potential evapotranspiration is greater than median precipitation for all months.

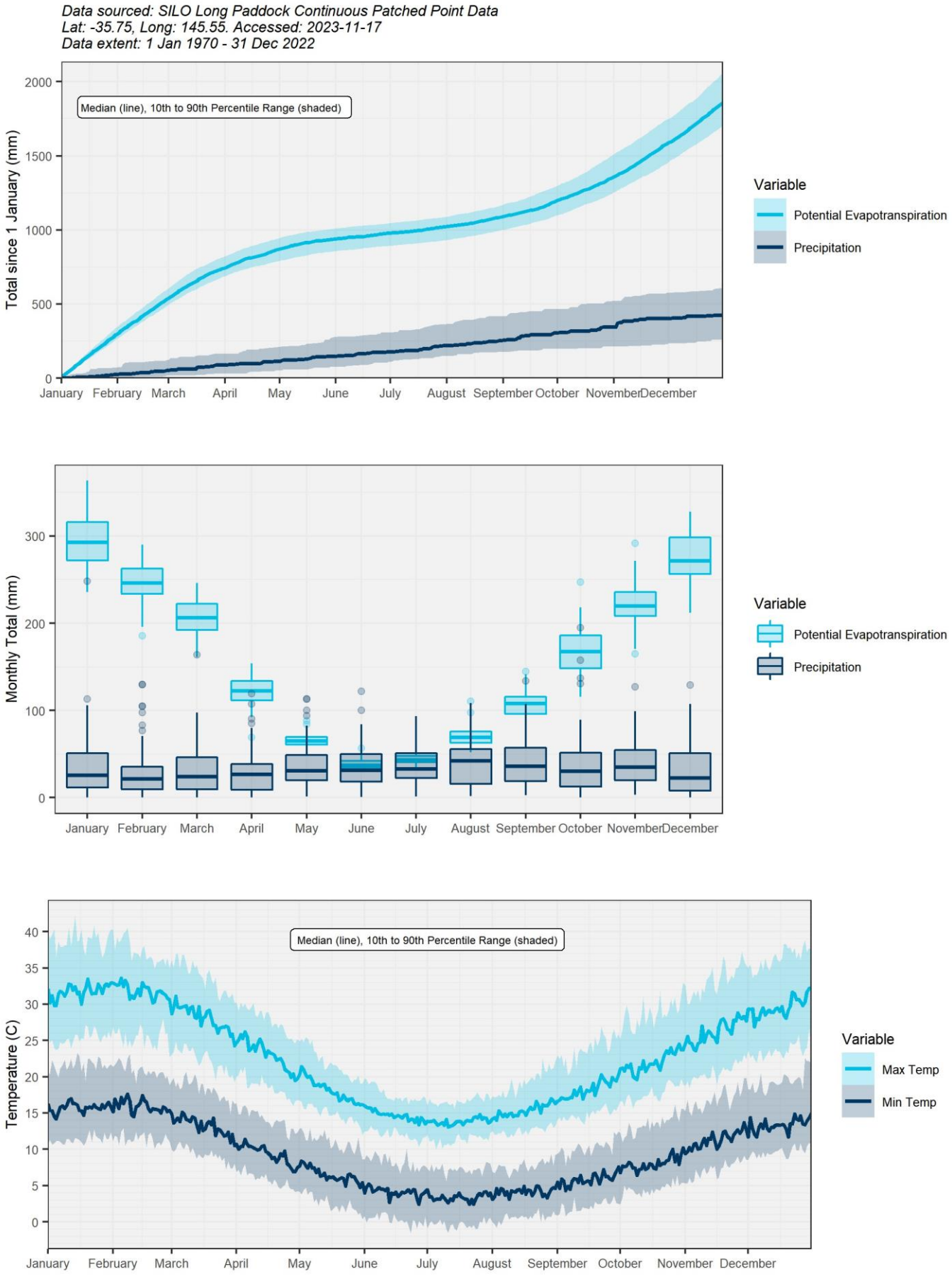


Figure 6.1 Local climate data

6.1.2.2 Topography

The topography at the site is predominately flat with elevation varying between 107 – 109 m AHD with small changes in relief. Depressions at the site are evident at the various existing small dam locations, located at the site.

The topography of the surrounding land is also relatively flat.

The site and the surrounding area generally fall towards the north-west.

6.1.2.3 Hydrology

6.1.2.3.1 Regional hydrology

The site is located within the Murray Riverina catchment (refer Figure 6.2). This regional catchment covers the regulated portion of the Murray River, from the Hume Dam to the Murrumbidgee River junction, with an area of approximately 14,950 km^2 (NSW Government, 2023c). The catchment is regulated per the Murray Alluvial Groundwater Sources 2020, and Murray Unregulated River Water Sources 2011 Water Sharing Plans (WSPs).

The Murray River, located approximately 2.5 km south of the site, forms the southern boundary of the Murray Riverina catchment (the regulated portion of the Murray River per WSPs) and drains most of inland NSW, northern Victoria, and south-western Queensland. It forms the NSW-Victorian border for 1880 km and begins in the Southern Alps of NSW and Victoria and flows in a westerly direction for over 2500 km to its outlet near Goolwa on the South Australian coast (NSW Government, 2023c).

The major tributaries and anabranches in this region are the Edward River (approximately 50 km to the west of the site), Wakool River (approximately 65 km north-west of the site), Niemur River (approximately 105 km north-west of the site), Billabong Creek (approximately 44 km north of the site), Yallakool Creek (approximately 76 km north-west of the site) and Colligen Creek (approximately 77 km north-west of the site).

Water storages within the Murray Riverina catchment include Hume Dam spanning both NSW and VIC (the main operational storage for the Murray River, located approximately 140 km south-east of the site), Dartmouth Dam within VIC (the largest storage in the catchment, located just under 200 km south-east of the site), and Eildon Dam within VIC (located approximately 140 km south of the site).

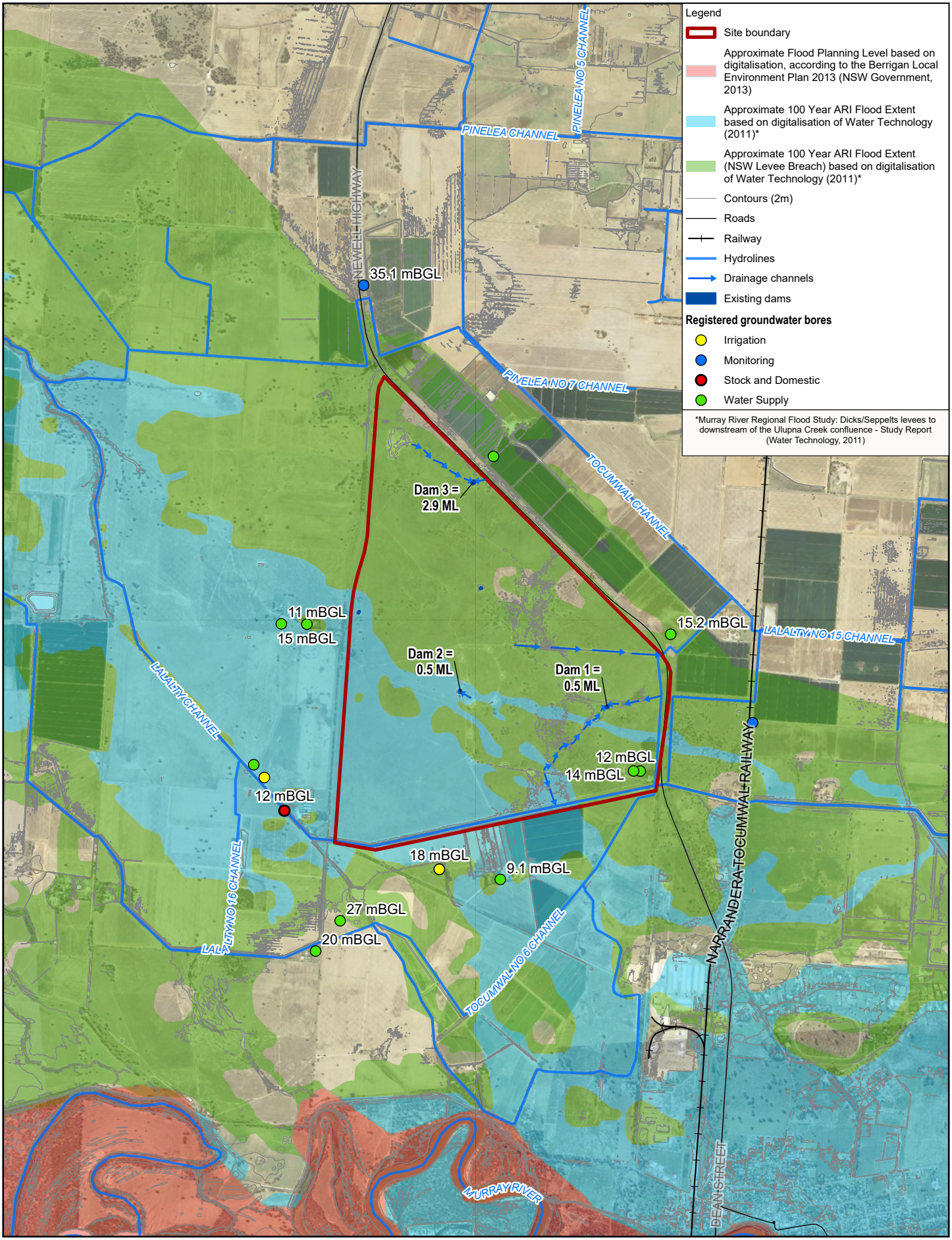
There are several channels in close proximity to and transferring through the site. These include Lalalty Channel along the southern boundary of the site and to the west of the site, Tocumwal No.6 Channel along a portion of the eastern boundary of the site, and Tocumwal Channel running approximately 800 m to the east of the site and 100 m to the north of the site (refer Figure 6.2).

6.1.2.3.2 On-site water management

There are three existing small dams on site and two informal dams/depressions on site which receive rainfall runoff (refer Figure 6.2). The primary dams have a combined capacity of approximately 3.9 ML according to the *Tocumwal Explosive Magazine – Environmental Management Plan* (Orica, 2019). The informal depressions receive surface flow during low – moderate rainfall events.

Surface water flows at the site are currently controlled by small changes in relief (refer Section 6.1.2.2) and the irrigation channel that traverses the site. Several drainage channels are connected to the primary small dams located at the site and direct small surface flow to these dams (Figure 6.2).

Higher flow events are expected to follow a natural north-south drainage course that intersects with the Lalalty Channel near the centre of the southern site boundary. This drainage course has been slightly deepened/modified from near the magazine access road to the channel.



Paper Size ISO A4

0 500 1,000 1,500

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

Orica Australia Pty Ltd
Orica Tocumwal Magazine Compound Upgrade

Project No. **12597123**
Revision No. **A**
Date **09/01/2024**

Existing site environment

FIGURE 6-2

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12597123_008_ExistingSiteEnvironment

Data source: Waterways - DFSI, 2024; Roads, - DCS, 2024; Zoning - DPIE, 2024; NSW_Imagery: © Department of Customer Service 2020. Created by: rvillalon

6.1.2.4 Soils and geology

Regional geology has been interpreted based on the MinView (Version: 2023.7.17) NSW Geological Mapping Tool (NSW Government, 2023a). The site is underlain by CZ_af (alluvial floodplain) which comprises silt, very fine-to-medium grained lithic to quartz-rich sand, and clay.

Soil units identified at the site have been interpreted based on the Australian Soil Classification mapping (eSpade v2.2, NSW Environment and Heritage (2023)). Soils at the site are classified as Chromosols and nearby soil profiles indicate clay loam / sandy clay / clay topsoil, with sandy clay / clay / coarse sand subsoil.

There are no mapped soil landscapes in proximity to the site.

6.1.2.5 Hydrogeology

6.1.2.5.1 Environmental values of groundwater

A search of the Groundwater Dependent Ecosystems Atlas (BOM, 2023a) was undertaken to identify Groundwater Dependent Ecosystems (GDEs) within five kilometres of the site. Potential GDEs are identified based on regional assessments of groundwater levels, remote sensing of vegetation and surface topography.

The GDE Atlas indicates that there are areas of low and moderate potential aquatic GDEs and low, moderate, and high potential terrestrial GDEs within five kilometres of the footprint. These are predominately associated with the Murray River and its floodplain. It is noted that the site itself is within a low potentially terrestrial GDE identified area.

Review of the Murray Alluvial Groundwater Sources 2020 WSP indicates that there may be high priority GDEs mapped within 5 km of the site, associated with the wetlands of the Murray River. The map is unclear, however, and any such GDEs would be on the boundary of a five km radius from the site. There are no culturally significant sites mapped within five km of the site.

6.1.2.5.2 Landholder bores

A search of Australian Groundwater Explorer (BOM, 2023b) was undertaken to identify registered bores in the vicinity of the site. There are 15 registered bores within a 1 km radius of the site (refer Figure 6.2). Bore depths range from 10 – 131 mBGL. Groundwater levels (sourced from WaterNSW, 2023) in the vicinity of the site range from 9.1 – 35.1 mBGL.

Registered bore details are summarised in Table 6.1.

The registered bores in proximity to the site have the following purposes:

– 10 water supply
– Two monitoring
– One stock and domestic
– Two irrigation

Groundwater is present in alluvial sediments comprising clays and sand bands. Generally, clays are present to depths of greater than six m below ground levels. Below this depth, layers of clay and sand occur with the presence of sand increasing with depth (a 22 m thick layer of sand was observed at a depth of approximately 100 m just north of the site).

Bore GW273107 (refer Table 6.1) was installed by the Office of Water and is used to monitor water levels in an aquifer significantly deeper (approximately 100 m below ground level) than that intercepted by bores at/near the site. Water levels in this deeper system vary significantly and are likely affected by large scale extraction in areas remote from the site.

Table 6.1 Registered landholder bores

Bore ID	Bore depth (mBGL)	Standing water level (mBGL)	Yield (L/s)	Drilled date	Purpose	Easting (MGA Zone 55)	Northing (MGA Zone 55)
GW012744.1.1	33.5	15.2	-	01/01/1956	Water supply	369741	6041204
GW034602.1.1	20.7	9.1	0.63	01/02/1972	Water supply	368114	6039146
GW061544.1.1	28.0	-	-	01/01/1980	Water supply	366013	6040286
GW273107.1.1	131.0	35.1	3.0	24/05/2009	Monitoring	367236	6044432
GW502436.1.1	42.0	20.0	2.0	28/01/2004	Water supply	366455	6038618
GW502509.1.1	10.1	-	-	08/05/1995	Monitoring	370413	6040385
GW504065.1.1	61.0	27.0	5.0	02/09/2009	Water supply	366687	6038870
GW504216.1.1	38.0	12.0	2.0	25/09/2007	Stock and domestic	366257	6039866
GW504638.1.1	20.0	-	-	26/05/2011	Water supply	368282	6042861
GW504683.1.1	36.0	11.0	1.0	01/01/1955	Water supply	366331	6041506
GW504902.1.1	40.0	12.0	-	01/01/1958	Water supply	369401	6040021
GW505522.1.1	42.0	15.0	1.0	02/11/2011	Water supply	366555	6041490
GW505624.1.1	41.0	14.0	4.0	07/06/2013	Water supply	369343	6040026
GW505753.1.1	66.0	18.0	50.0	04/05/2018	Irrigation	367585	6039268
GW505965.1.1	114.0	-	-	15/10/2018	Irrigation	366099	6040168

A groundwater bore located approximately 6.6 km west of the site (GW036282.3.3) has daily instantaneous data recorded regarding its groundwater level from 2010 – 2023 (refer Figure 6.3) (WaterNSW, 2023). Figure 6.3 displays that the groundwater level within GW036282.3.3 varies between 74.2 – 89.8 mAHD between 2010 – 2023, which corresponds to a depth of 16.6 – 32.2 mBGL. This supports the data in Table 6.1 that groundwater levels in proximity to the site are generally deep.

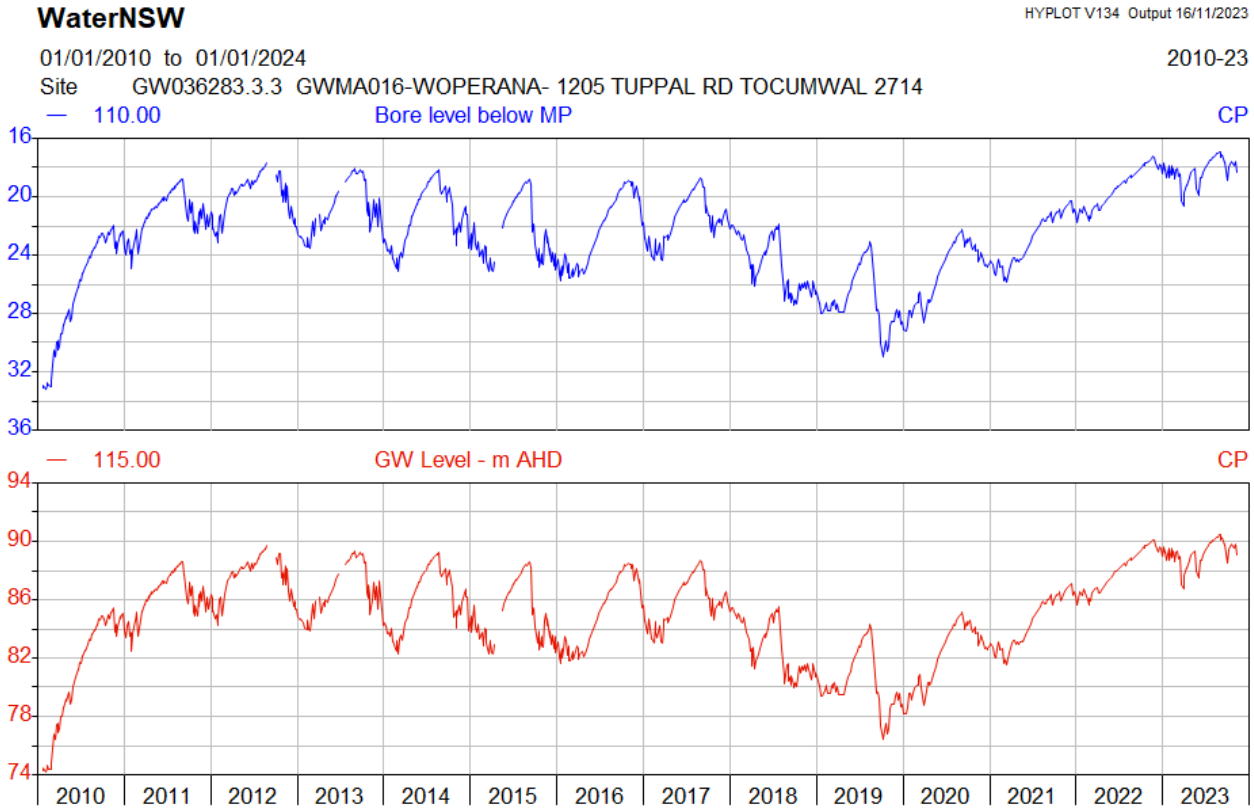


Figure 6.3 Daily groundwater data for GW036282.3.3 from 2010 – 2023 (WaterNSW, 2023)

6.1.2.6 Flooding

Appendix H provides flood mapping for existing conditions for the 1% AEP, 0.5% AEP and 0.2% AEP flood events. This data was provided by WMA Water (see Section 6.1.2) following simulation of the latest version of Berrigan Shire Council's revision of the Flood Study. With reference to the mapping:

- The site is located on the edge of the floodplain with shallow flood depths. Most of the flood waters are conveyed to the west of the site in deeper parts of the floodplain, and the site is inundated by backwater flooding on the fringes of the floodplain. In all flood events simulated, flood depths are generally less than approximately 0.3 m. As flooding events become rarer, floodwaters extend eastward across the site, however since the topography is flat, shallow flood depths are maintained.
- The nature of flooding and location on the fringe of the floodplain result in slow moving flood waters. For all the events simulated flood velocities are generally less than 0.05 m/s.
- The shallow flow depths and slow-moving flood waters result in relatively benign flow conditions for the majority of the site, without vulnerability constraints. In accordance with the NSW Flood Risk Management Manual 2023 Guideline FB03, Hazard Category H1 is simulated (Figure 6.4). There are some localised areas where the flood risk increases to H2, particularly in rarer events such as the 0.2% AEP flood event.

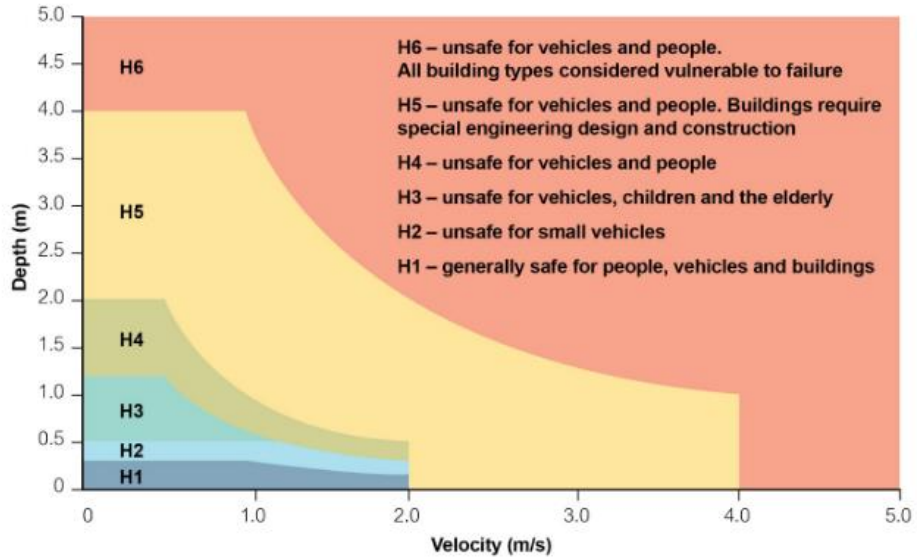


Figure 1 General flood hazard vulnerability curve

Note: Categories H1 to H4 in this guideline are equivalent to low hazard and H5 to H6 equivalent to high hazard in the 2005 *Floodplain development manual* (DIPNR 2005).

Source: Figure 6 AIDR 2017b.

Figure 6.4 NSW Flood Risk Management Manual 2023 Guideline FB03, Hazard Category

6.1.2.7 Surface water quality

6.1.2.7.1 Murray River

As mentioned in Section 6.2.3, the site is located within the Murray Riverina catchment with the Murray River and floodplain located 2.5 km south of the site. Water quality within the Murray Riverina catchment is managed in partnership by the Australian Government and the Basin state governments.

Water quality is generally good throughout the Basin but can be compromised by several threats, including:

– High salinity
– Blue-green algae
– Low dissolved oxygen
– Nutrients
– Bushfires runoff
– Turbidity
– Natural events such as droughts, floods and sustained high temperatures (Murray Darling Basin Authority, 2023)

The most recent water quality report for the Murray River, published by the NSW Department of Planning and Environment (2022b) is from July 2021 – June 2022, characterised by heavy rain falling across much of the catchment. Water quality data for the report was collected on a monthly frequency at 13 sites in the Murray Valley for the State Water Quality Assessment and Monitoring Program and the River Murray water quality monitoring program on behalf of the Murray Darling Basin Authority.

In the report, a Water Quality Index (WQI) is used as a tool to communicate complex and technical water quality data in a simple and consistent way. The WQI score was calculated for each monitoring site using total nitrogen, total phosphorus, turbidity, pH, dissolved oxygen, and electrical conductivity. The index compares the monthly water quality results against a set of predetermined water quality targets to calculate a score between 1 and 100. A score of 100 represents a site in pristine condition, while a score of one is a very highly degraded result.

The proposal site is located in between two water quality sites, with the following WQI recorded at these sites:

– Murray River at Moama (station number 40910087). Received a 'poor' WQI of 48 as the site recorded high turbidity, total phosphorus, and electrical conductivity.
– Murray River at downstream Yarrawonga Weir (station number 409025). Received a 'moderate' WQI of 78.

Water quality in proximity to the site can therefore be expected to range between poor – moderate.

The pH largely ranged between 7 and 8 at all sites in the Murray valley and would not impact on the health of aquatic ecosystems of agricultural enterprises.

There was a slight increase in turbidity with distance down the catchment, reflecting the impact of the cumulative effects of land use, soil disturbance, and human activity on water quality. Total nitrogen and total phosphorus followed similar patterns.

6.1.2.7.2 Water Quality Objectives (WQOs)

Water Quality and River Flow Objectives have been developed by the NSW Government (NSW Department of Environment, Climate Change and Water, 2006) to guide plans and actions to achieve healthy waterways. The objectives are based on measurable environmental values for protecting aquatic ecosystems, recreation, visual amenity, drinking water and agricultural water.

The site is in proximity to "waterways affected by urban development" according to NSW Water Quality and River Flow Objectives for the Murray River catchment (Department of Environment, Climate Change and Water, 2006). Therefore, WQOs that apply to the site are:

– Aquatic ecosystems
– Visual amenity
– Secondary contact recreation
– Primary contact recreation

6.1.2.8 Riparian zones

Controlled activities carried out in, on, or under waterfront land, are regulated by the *Water Management Act 2000* (refer Appendix C). Waterfront land includes the bed and bank of any river, lake or estuary and all land within 40 metres of the highest bank of the river, lake of estuary.

There are two waterbodies relevant to the proposal: Lalalty Channel on the southern boundary of the site, and Tocumwal No.6 Channel on the south-eastern boundary of the site and transversing the site. No works would occur within 40 metres of either of these channels, and therefore no riparian zone impacts are anticipated for these waterways.

On this basis, no impacts to riparian zones are anticipated from the project and therefore no management of waterfront lands is proposed.

6.1.2.9 Water sourcing

Existing water sourcing for the site is per:

– The three existing small dams on the site (refer Figure 6.2) in which rainwater is collected. The dams have a combined capacity of 3.9 ML and operate as Harvestable Rights Dams.
– To service the existing office amenities areas, water is sourced from the existing bore water pump.
– External licensed water sources are available within the site's water entitlements.

Water sourcing for the project is assessed in Section 6.1.3.2.

6.1.3 Impact assessment

6.1.3.1 Surface water quality

6.1.3.1.1 Construction phase surface water quality

Construction activities for the project will include site clearing, establishing hardstands and concrete slabs, magazine construction and construction of sealed access roads to each of the magazines.

Works associated with the construction include various activities that have the potential to impact surface water quality. These activities include:

– Earthworks, excavations and disturbing of soils. These have the potential to mobilise surface sediments resulting in impacts associated with erosion and sedimentation as well as impacts associated with in-situ sediments.
– Handling hazardous material such as fuels (diesel) and explosive material.

6.1.3.1.1.1 Erosion and sedimentation

Disturbance of in situ soils has the potential to result in erosion and sedimentation. Potential activities that could result in erosion and sedimentation include earthworks and excavations. Once disturbed, this sediment is prone to being mobilised into downstream waterways primarily from rainfall-derived runoff. This could result in erosion and sedimentation which could impact the downstream water quality and pose a risk to fauna and flora.

These impacts apply to most construction projects and can be appropriately managed through the implementation of appropriate strategies, in accordance with Managing Urban Stormwater: Soils and Construction – Volume 1 (Landcom, 2004), informally known as the 'Blue Book'. As the disturbed area is larger than 2500 m2, a Soil and Water Management Plan (SWMP) as an addendum to a Construction Environmental Management Plan (CEMP) is required to be implemented as mitigation measures, as described in Section 6.1.4, and are to be developed prior to construction in accordance with the Blue Book. It is noted that based on the Blue Book, where the sediment generation rate is predicted at less than 150 m3 per year, the construction of a sediment basin may not be necessary, and that the erosion risk is very low. The revised Universal Soil Loss Equation (RUSLE) was utilised, as per the parameters of the Blue Book, and sediment generation from the project is estimated as being significantly less than this threshold, primarily based on the minimal area of disturbance and the flat nature of the site. Additionally, the site is considered to have a low erosion hazard in accordance with the Blue Book, due to the low Rainfall Erosivity and Slope. Collection of onsite runoff in surface water drains and erosion and sediment control measures would be required, as discussed in Section 6.1.4.

Therefore, implementation of mitigation measures, namely a CEMP and Soil and Water Management Plan (SWMP), would reduce the likelihood of erosion and sedimentation during construction. Therefore, the project is not anticipated to result in unacceptable erosion and sedimentation impacts.

6.1.3.1.1.2 Handling of high-risk materials with water quality risks

The handling of materials hazardous to downstream waterways (excluding those associated with erosion and sedimentation) is required to permit construction of the project. Potential activities where handling of hazardous materials could occur may include accidental spills of stored materials (e.g., fuels (diesel) and explosive material).

The potential impact associated with the handling of these components includes the potential mobilisation into downstream waterways either via direct flow of the material itself, or through washing from either rainfall derived runoff, or from applied water (e.g., during dust suppression). Once mobilised into downstream waterways, impacts to both flora and fauna are likely and would vary in terms of persistence and severity.

It is understood that all fuels and explosive materials will be stored undercover in buildings to prevent any unintended runoff of hazardous materials occurring. Additionally, it is noted that the risk of handling these materials is typical of works of this nature and well understood control measures, such as bunding, safely storing hazardous materials, and visual inspections of the works area and waterways, are commonly employed during implementation of CEMP and SWMPs which are stipulated as required mitigation in Section 6.1.4. On this basis, with the specified required mitigation and plans and on the basis that these materials will be stored undercover, the project is not anticipated to result in unacceptable water quality risks during construction with relation to the handling of high risk materials.

6.1.3.1.2 Operational phase surface water quality

Potential water quality risks occur during the operational phase, and include the risks associated with the storage of fuels and explosives at the site as well as the potential increase in nutrient load and total suspended solids to downstream waterways via increasing impervious area at the site.

These risks have been assessed as below.

As discussed in Section 6.1.1.2, there are a number of in-built mitigation measures to reduce operational surface water quality risk, namely that potentially hazardous materials such as fuels and explosives would be bunded and/or contained/roofed per Australian Standards to maintain separation from site stormwater.

Notwithstanding the above, handling of materials that pose enhanced water quality risks will occur, although infrequently, during the site's operation. These potential risks include:

– Potential risks associated with the handling of fuels and explosives
– Leakage from site storage facilities of fuels and explosives

The potential impacts associated with handling and managing these materials may result in potential mobilisation of materials into downstream waterways either via direct flow of the material itself or through washing from rainfall derived runoff. Once mobilised into downstream waterways, impacts to both fauna and flora could occur and would vary in terms of persistence and severity.

Typical control measures such as bunding, safely storing hazardous materials and visual inspection of the works area and waterways are commonly employed during implementation of an Operation Environment Management Plan (OEMP) with these stipulated as required mitigation in Section 6.1.4. (was Stakeholder. Other management plans such as a Pollution Incidence Response Management Plan (PIRMP) can also be utilised to manage these impacts.

During operation of the facility, residual risk (other than those described above) are typical of urban stormwater and typical urban development. Increases in nutrients and total suspended solids in receiving waters may occur as a result of increases in impervious areas. As discussed, existing water quality in proximity to the site, within the Murray River, ranges between poor – moderate due to recorded high turbidity and nutrients. However, given the development is located within a large catchment that is not anticipated to urbanise and the proposed increase in impervious area is relatively minor, significant impacts to receiving waters from the development are not anticipated. The Berrigan Shire *Engineering Guidelines for Subdivisions and Development – Stormwater Drainage* (2014) stipulates that any stormwater drainage design is to include the principles of Water Sensitive Urban Design in accordance with the general principles outlined in the following references:

– *Water Sensitive Urban Design Guidelines* (Melbourne Water, 2005).
– *Urban Stormwater – Best Practice Environmental Management Guidelines* (Victorian Stormwater Committee, 1999).
– *Australian Runoff Quality: A guide to water sensitive urban design* (Engineers Australia, 2006).

The consideration of these guidelines in site stormwater design is stipulated as a mitigation measure per Section 6.1.4. With implementation of these measures, the proposal is not anticipated to result in unacceptable impacts with relation to specific surface water quality risks during operation.

6.1.3.2 Water sourcing

Water demands for the project are anticipated to include:

– **Amenities**: It is not anticipated that water demands due to staff amenities will significantly increase during the construction and operation of the project compared to the existing demands. Water can continue to be sourced from the existing bore water pump or external licensed sources (Section 6.1.3.2). Roof rainwater tanks can also be installed on magazine buildings for non-potable applications.

– **Dust suppression**: Approximately 9,600 m^2 of new road is proposed to be constructed for the project that will require the regular application of water as part of the site dust management. Assuming that dust suppression is typically applied at a rate of 20% of evaporation (~1750 mm/year, refer Section 6.1.2.1), the demand for dust management could be approximately around 3.4 ML/year. These relatively minor demands for dust suppression can be supplied from the existing dams on site (which have a combined capacity of 3.9 ML/ year, refer Section 6.1.2.1). Bore water is also available and any excess water can be sourced externally. Any overflows can be re-captured within the existing dams on site.

Berrigan Shire Council's *Engineering Guidelines for Subdivisions and Development – Stormwater Drainage* (2014) stipulates that any stormwater drainage design is to include the principles of Water Sensitive Urban Design in accordance with the general principles outlined in the following references:

– *Water Sensitive Urban Design Guidelines* (Melbourne Water, 2005).

– *Urban Stormwater – Best Practice Environmental Management Guidelines* (Victorian Stormwater Committee, 1999).

– *Australian Runoff Quality: A guide to water sensitive urban design* (Engineers Australia, 2006).

On the basis of the above, changes to the existing water sourcing as a result of the project is not anticipated, and therefore environmental water availability is not anticipated to be negatively affected.

6.1.3.3 Flooding

While it is acknowledged that the project will be assessed as SSD under Part 4, Division 4.7 of the EP & A Act , the DCP was adopted as guiding flooding controls. Given the site is inundated by the flood events simulated, the site would be designated as a Flood Planning Area. In addition, given the low flooding hazard that has been simulated, the flood category under the LEP would be 'Low Hazard Flood Storage' refer Figure 6.5 and Figure 6.6.

In accordance with the LEP, this would designate the Flood Planning Level to be 0.5 m above the 1% AEP flood level. Following the DCP, for commercial and industrial development, the magazine floor levels would need to be at least the height of the Flood Planning Level.

For the impact assessment, the flood model was re-simulated, inserting the proposed bulk earthworks design comprising roadworks, magazine pads and mounds into the model. Appendix H provides flood mapping for these design conditions simulations for the 1% AEP, 0.5% AEP and 0.2% AEP flood events. The flood mapping shows that the proposed design does not materially change the flooding conditions at the site. The flood impact mapping shows that:

– In the 1% and 0.5% AEP events there is a small, localised impact (up to 0.13 m) associated with the western side of the ring road.

– In the 0.2% AEP flood event the proposed works result in a marginal obstruction to the flood waters as the floodplain inundation extends. Flood levels increase to the east of the proposed works by up to 0.085 m in this rare event. All impacts are contained within the lot boundary. In consideration of the vast floodplain, small impacts and impacts being contained within the lot boundary, this outcome is considered acceptable.

An assessment has been undertaken for the magazine pads compared to the 1% AEP flood level in Table 6.2 below. The results show that the proposed magazine pad levels are marginally above or at the flood planning level.

Table 6.2 Assessment of magazine pads to Flood Planning Level

Pad	Pad Level (mAHD)	1% AEP Flood Level mAHD	Flood Planning Level (1% AEP plus 0.5m) mAHD
A	108.18	107.67	108.17
B	108.18	107.67	108.17
C	108.18	107.67	108.17
D	108.18	107.67	108.17
E	108.18	107.68	108.18

Referring to flood mapping in Appendix H, it is noted that a north-western part of the ring road is inundated in the 1% AEP flood event to depths of approximately 0.4 m. However, other parts of the ring road are simulated as generally flood free, thus providing access to the magazine pads in the 1 % AEP flood event and from the site.

Under the NSW Flood Risk Management Manual 2023 Guideline FB01, the 0.5% and 0.2% AEP events are in the order of 15% and 30% more rainfall than the current 1% AEP flood event respectively, although the actual difference varies with location and should be considered in individual studies. These events are considered to provide reasonable proxies for the scale of change to the 1% AEP event for changes to flood-producing rainfall events under RCP4.5 and RCP8.5 at 2090 respectively, with the 0.5% AEP event also similar to RCP8.5 between 2050 and 2060. Since both these events have been considered in the simulations, future climate impacts have been addressed.

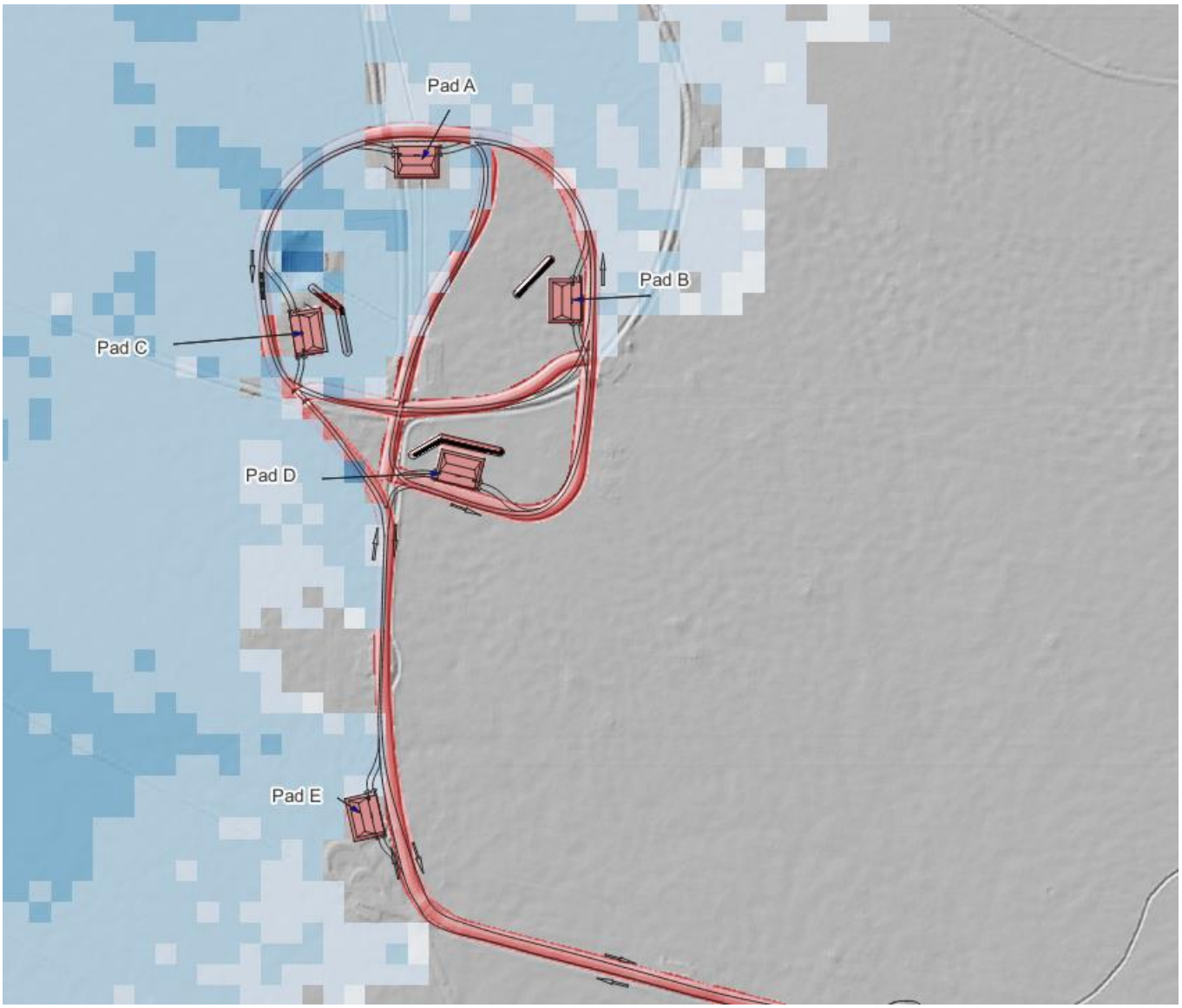
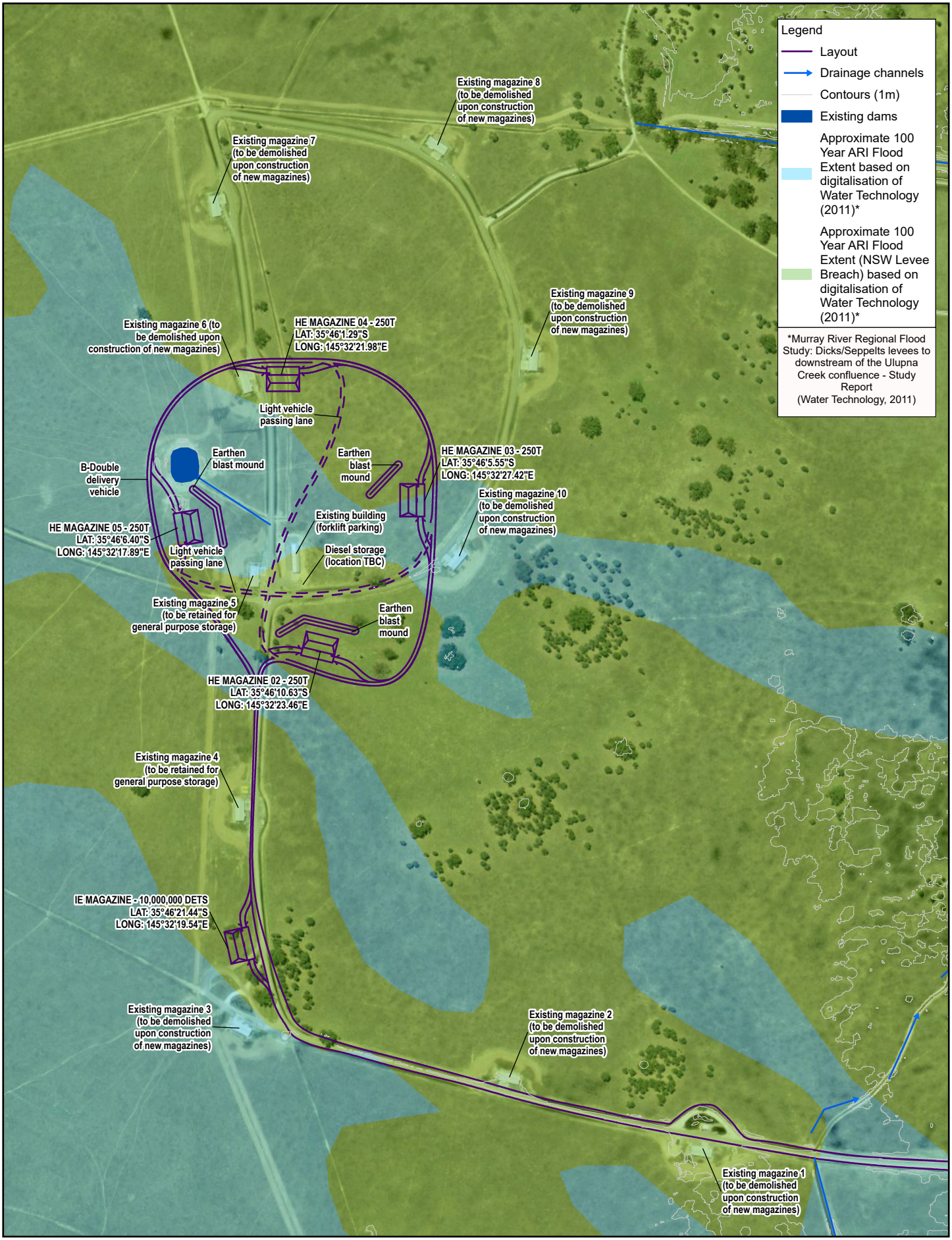


Figure 6.5 Building Pads



Paper Size ISO A4

0 50 100 150

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

GHD

Orica Australia Pty Ltd
Orica Tocumwal Magazine Compound Upgrade

Project No. **12597123**
Revision No. **A**
Date **09/01/2024**

Proposed site layout

FIGURE 6-6

\\ghdnet\ghd\AU\Newcastle\Projects\22\12597123\GIS\Maps\Deliverables\12597123_OricaTocumwalCompound.aprx
12597123_010_SiteGenerallayout
Print date: 09 Jan 2024 - 13:55

Data source: Phase 1 layout, Blast mound - Orica, 2023; Roads - DCS, 2024; NSW_Imagery: © Department of Customer Service 2020. Created by: rvillalon

6.1.3.4 Groundwater

The potential groundwater impacts have been assessed in accordance with the NSW Aquifer Interference Policy. The Aquifer Interference Policy requires that potential impacts on groundwater sources, including their users and GDEs, be assessed against the Minimal Impact Considerations, outlined in Table 1 of the policy. If the predicted impacts meet the Level 1 Minimal Impact Considerations, then these impacts will be considered as acceptable.

The NSW Aquifer Interference Policy divides groundwater into “highly productive” and “less productive” groundwater sources. Highly productive groundwater is defined in this policy as having:

– Total dissolved solids of less than 1,500 mg/L
– Contains water supply works that can yield water at a rate greater than 5 L/s

Bores in proximity to the site are summarised in Table 6.1. The yield in the majority of bores varies between 0.6 – 5 L/s. One bore, GW505753 has a yield of 50 L/s, however there is no data on the total dissolved solids measured within the groundwater. As the majority of nearby groundwater bores have low yields, and there is uncertainty around the water quality within GW505753, groundwater at the site is defined as “less productive” as per the NSW Aquifer Interference Policy.

As discussed in Section 6.1.2.5 groundwater sources at the site include alluvial sources (Murray Alluvial Groundwater Sources). Level 1 Minimal Impact Considerations for Less Productive Groundwater Sources – ‘Alluvial Water Sources’ have therefore been adopted and are defined as follows:

– Water table:
  - Less than or equal to 10% cumulative variation in the water table, allowing for typical climatic ‘post-water sharing plan’ variations, at a distance of 40 m from any high priority groundwater dependent ecosystem or high priority culturally significant site listed in the schedule of the relevant WSP. A maximum of two m decline cumulatively at any water supply work unless make good provisions should apply.
  - If more than 10% cumulative variation in the water table, allowing for typical climatic ‘post-water sharing plan’ variations, 40 m from any high priority GDE, or high priority culturally significant site listed in the schedule of the relevant WSP then appropriate studies will need to demonstrate to the Minister’s satisfaction that the variation will not prevent the long-term viability of the dependent ecosystem or significant site. If more than two m decline cumulatively at any water supply work, then make good provisions should apply.
– Water pressure:
  - A cumulative pressure head decline of not more than 40% of the ‘post-water sharing plan’ pressure head above the base of the water source to a maximum of a two m decline at any water supply work.
  - If the predicted pressure head decline is greater than the requirement above, then appropriate studies are required to demonstrate to the Minister’s satisfaction that the decline will not prevent the long-term viability of the affected water supply works unless make good provisions apply.
– Water quality:
  - Any change in the groundwater quality should not lower the beneficial use of the category of the groundwater source beyond 40 m from the activity. If not met, then appropriate studies will need to demonstrate to the Minister’s satisfaction that the change in groundwater quality will not prevent the long term viability of the dependent ecosystem, significant site or affected water supply works.
  - No increase of more than 1% per activity in long-term average salinity in a highly connected surface water source at the nearest point to the activity. If not met, then appropriate studies are required to demonstrate to the Minister’s satisfaction that the River Condition Index category of the highly connected water source will not be reduced at the nearest point to the activity.
  - Redesign of a highly connected surface water source that is defined as a ’reliable water supply’ is not an appropriate mitigation measure to meet the above considerations.

- No mining activity to be below the natural ground surface within 200 m laterally from the top of high bank or 100 m vertically beneath (of the three dimensional extent of the alluvial material – whichever is the lesser distance) of a highly connected surface water source that is defined as a 'reliable water supply'. If not met, then appropriate studies are required to demonstrate to the Minister's satisfaction that there will be negligible riverbank or high wall instability risks during the activity's operation and post-closure, levee banks and landform design should prevent the PMF from entering the activity's site.
- Low-permeability barriers between the site and the highly connected surface water source will be appropriately designed, installed, and maintained to ensure their long-term effectiveness at minimising interaction between saline groundwater and the highly connected surface water supply.

6.1.3.4.1 Impacts to existing groundwater

As outlined in Section 6.1.2.5, groundwater levels at the site are anticipated to be fairly deep, with groundwater in nearby bores varying between 9.1 – 35.1 mBGL. It has been assumed that no piling would be undertaken during construction activities and that only shallow footings will be utilised, On this basis, the site is anticipated to be located well above local groundwater levels with no groundwater interception anticipated.

Groundwater dewatering is not anticipated but may be required if groundwater inflow occurs, as discussed as a mitigation measure in Section 6.1.4. With the implementation of this mitigation measure, the potential impacts would be within the Level 1 minimal impact considerations for water supply works in the NSW Aquifer Interference Policy.

6.1.3.4.2 Impacts to GDEs

There may be high priority GDEs mapped within five km of the site, associated with the wetlands of the Murray River. However, any such GDEs would be on the boundary of a five km radius from the site and as such would not be impacted by any emergency dewatering procedures. There are no culturally significant sites mapped within five km of the site. Therefore, potential impacts are within the level 1 minimal impact considerations for GDEs and culturally significant sites in the NSW Aquifer Interference Policy.

6.1.3.4.3 Impacts to neighbouring landholder bores

As discussed in Section 6.1.2.5 there are a number of existing landholder bores within one km of the project. No groundwater level drawdown is predicted in these bores in response to the construction of the project as no interception of groundwater is anticipated.

6.1.3.4.4 Impacts to groundwater quality

There are no proposed discharges from the project and on this basis the construction and operation of the project is not anticipated to cause any significant changes to groundwater quality. General construction and operational phase water quality risks are discussed in Sections 6.1.3.1.1 and 6.1.3.1.2 respectively. These water quality risks and corresponding mitigation measures would also apply to groundwater management. On this basis, the potential impact of the project is within the Level 1 minimal impact considerations for water quality in the NSW Aquifer Interference Policy.

6.1.4 Mitigation and management measures

The measures listed in Table 6.3 would be implemented to manage the risk of soil and water impacts during the construction and operation of the project.

Table 6.3 Soil and water mitigation and management measures

ID	Impact	Environmental Safeguard	Timing	Responsibility
SW1	Surface water	Incoming clean surface water flowing from surrounding terrain would be diverted around the project site via diversion drains/banks.	Design Construction Operation	Contractor

ID	Impact	Environmental Safeguard	Timing	Responsibility
SW2		A detailed Soil and Water Management Plan is to be developed prior to construction of the project to manage the risk of erosion and sedimentation during the construction and operation of the project, as well as manage the handling of any high-risk materials. It is noted that sediment basins are not required, and, on this basis, focus would be placed on controlling pollutants at the source and collection of onsite runoff in surface water drains.	Design Construction Operation	Contractor
SW3		A detailed Operation Environment Management Plan (OEMP) is to be developed and applied during the operational phase of the project. The OEMP will address operational activities that may pose a risk to water quality, the bunding and storage of all fuel and explosives on site, maintenance of plants and equipment, measures to manage accidental spills, water quality monitoring at the site, and inspection and maintenance requirements.	Operation	Contractor
SW4		Any stormwater drainage design is to include the principles of Water Sensitive Urban Design in accordance with the general principles outlined in the following references: – *Water Sensitive Urban Design Guidelines* (Melbourne Water, 2005). – *Urban Stormwater – Best Practice Environmental Management Guidelines* (Victorian Stormwater Committee, 1999). – *Australian Runoff Quality: A guide to water sensitive urban design* (Engineers Australia, 2006).	Design Construction Operation	Consultant Contractor Orica
SW6		A Flood Response Plan should be compiled for the site. This plan should, amongst others, describe flood response responsibilities, monitoring of impending flood, flood preparation and flood evacuation.	Design	Consultant
SW7	Groundwater	Groundwater dewatering is not anticipated but may be required if groundwater inflow occurs, to minimise impacts to groundwater. A procedure for emergency dewatering, and the associated triggers, shall be established by the contractor in the SWMP to prepare for the case where groundwater inflow could occur unexpectedly.	Construction	Contractor

6.2 Contamination

The section provides a summary of the potential contamination impacts of constructing and operating the Project Site. A full copy of the assessment results if provided in the Preliminary Site Investigation (PSI) in Appendix I.

6.2.1 Approach and method

A summary of the approach to the assessment is provided in this section, including the legislation, guidelines and/or policies driving the approach and methodology used to undertake the assessment.

6.2.1.1 Legislative and policy context to the assessment

The assessment was undertaken in accordance with the SEARs and with reference to the requirements of relevant legislation, policies and/or assessment guidelines, including:

– *Contaminated Land Management (CLM) Act 1997*
– POEO Act
– *NSW EPA Guidelines for Consultants Reporting on Contaminated Sites* (NSW EPA, 2020)

6.2.1.2 Method

The assessment generally involved:

– A site history review including a review of current and historical aerial photographs, a review of EPA notices under the CLM Act and other publicly available information.
– A review of previous investigations pertaining to the site including the project area, and any other information held by Orica.
– A review of geology, hydrology, hydrogeology and topography information for the site including the project area.
– Completion of a site inspection of the site and project area to identify areas of potential contamination, documenting and mapping important features, and confirming features identified in the desktop review.
– Preparation of this report with reference to the *Guideline for Consultants Reporting on Contaminated Sites* (NSW EPA, 2020) detailing the results of the investigations, discussions and conclusions with respect to the requirement for further investigations or remediation (if required).

The assessment was limited to a review of desktop information and site inspection and did not include sampling of soils, groundwater, sediments or surface water. Planning certificates and historical titles were not included in this review.

6.2.2 Existing environment

The existing environment in relation to contamination is described in the PSI in Appendix I. Potential sources of contamination that were identified for the project site based on the site inspection include:

– Within the project area:
  - Explosives currently stored onsite.
  - Leaks and spills associated with use of the diesel above ground storage tank (AST).
  - Leaks and spills during vehicle use and maintenance activities.
  - Potential contamination associated with materials sourced from the former sand mine area used in the earthen mounds outside of Magazine 6.
  - Contamination associated with the potential use of pesticides and fertilizers onsite.
– On-site but outside of the project area:
  - Containment cell which was used as a remediation site for contaminated soils resulting from an offsite detonator disposal area.
  - Areas of historical burning of explosives located within the fenced area of the containment cell.

- Operation of the former sand mine/quarry in the northern portion of the site.
- Disposal of uncontrolled wastes in the former sand mine area (timber, scrap metal, etc).
- Potential asbestos contamination from demolition of former site buildings.
- Fill and imported materials from unknown sources used in the containment cell and sand mine.

An assessment for the potential of each of the contaminant sources listed above was carried out in the PSI. The assessment identified that there is a low potential for contamination to be present within the project area. The potential impacts of contamination to human health and the environmental during construction and future operation of the project is also considered to be low.

6.2.3 Impact assessment

A preliminary conceptual site model (CSM) was developed to evaluate the risk posed by the potential contamination sources listed above to the identified receptors and whether remediation or management are required to manage that risk.

The primary pathways by which current and future receptors could be exposed to the potential sources of contamination are considered to be:

– Direct contact (including ingestion) with potentially contaminated soil, surface water or groundwater
– Inhalation of potential contaminants in soil, if disturbed (particularly asbestos if present)
– Lateral migration of potential contaminants via surface water run-off to impact surface water
– Vertical and horizontal migration of potential contaminants within the groundwater

The key populations or receptors to potential contamination are considered to include:

– Human health receptors:
  - Current and future workers, visitors and contractors at Orica including those accessing the site and project area under Orica work permits.
  - Current agricultural leaseholders.
  - Intrusive maintenance or construction workers during the construction phase of the project.
  - Current and future occupants and visitors of surrounding properties.
  - Potential off-site users of groundwater (consumption or stock watering).
– Environmental receptors:
  - Flora and fauna within the Orica site and surrounding land and waterways.
  - Drainage lines and dams throughout the site and surrounding area.
  - Groundwater beneath and downgradient of the site.

The only potentially complete source-pathway-receptor linkages identified in the CSM during construction of the project relate to soil potentially impacted from spills from storage, spillage or leakage of fuels / oils in the vicinity of the diesel above ground storage tank.

During operation of the proposal, it is understood that all fuels and explosive materials will be stored undercover in buildings to prevent any unintended runoff of hazardous materials occurring. Given that this will occur under the implementation of Construction Environmental Management Plans (CEMPs) and Soil and Water Management Plans (SWMPs), the operation of the project is not anticipated to result in soil or groundwater contamination.

6.2.4 Mitigation and management measures

– The measures listed in Table 6.4 would be implemented to manage the risk of contamination during the construction of the project.

Table 6.4 Contamination mitigation measures

ID	Impact	Environmental Safeguard	Timing	Responsibility
C1	Contamination	The soil in the vicinity of the diesel above ground storage tank be further assessed if it is to be disturbed.	Construction	Contractor
C2		The CEMP for the project would include an 'unexpected finds protocol', to manage any potential impacts associated with the disturbance of potentially contaminated soils (if encountered) during works of the project. It would include actions to cease work on discovery, test suspected contaminated material, and safely store, treat, and dispose of the material as relevant. The procedure would also address any legislative requirements for reporting and/or approval.		

6.3 Air quality and odour

This section assesses the potential air quality impacts associated with construction and operation of the project and provides mitigation measures to reduce potential air quality impacts associated with the construction of the project. As there are no proposed changes to the operational workforce size or activities at the magazine facility, a detailed operational assessment is not required for this project.

6.3.1 Approach and method

6.3.1.1 Government plans, policies and guidelines

The air quality assessment was prepared with reference to the following plans/policies/guidelines:

– Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (the Approved Methods) (NSW EPA 2022).
– Guidance on the Assessment of Dust from Demolition and Construction (IAQM Guidance) (Institute of Air Quality Management 2018).

6.3.1.2 Desktop assessment

A qualitative air quality impact assessment was undertaken to estimate the potential air quality impacts associated with the construction and operation of the project. The assessment included:

– Review of the existing environment (land use, ambient air quality, and meteorology).
– Review of the proposed construction methodology, including equipment and processes.
– Identification of construction activities which may lead to emissions.
– Identification of nearby sensitive receptors to construction activities.
– A qualitative air quality assessment with a focus on construction particulates and dust.
– Identification of project-specific mitigation measures to manage the potential for dust impacts.

6.3.1.3 Assessment criteria

Assessment criteria for the project were taken from the Approved Methods.

The objective of the criteria is ambient air quality that minimises the risk of adverse health impacts from exposure to air pollution. There is an obligation during construction and operation of the project to comply with the criteria.

Relevant assessment criteria for the primary pollutants associated with construction and operation of the project are presented in Table 6.5. The criteria apply to the total impact (increment plus background) and must be reported as the 100th percentile (maximum).

Table 6.5 Air quality impact assessment criteria

Pollutant	Averaging period	Impact location	Impact type	Criteria (µg/m^3)
TSP	Annual	Sensitive receptor	Cumulative	90

Pollutant	Averaging period	Impact location	Impact type	Criteria (µg/m³)
PM_{10}	24 hour	Sensitive receptor	Cumulative	50
	Annual	Sensitive receptor	Cumulative	25
$PM_{2.5}$	24 hour	Sensitive receptor	Cumulative	25
	Annual	Sensitive receptor	Cumulative	8
Deposited dust	Annual (maximum increase)	Sensitive receptor	Cumulative	2 g/m²/month
	Annual (maximum total)	Sensitive receptor	Cumulative	4 g/m²/month

6.3.1.3.1 Field surveys

Field surveys were not undertaken as part of the qualitative air quality assessment for the Tocumwal Explosives Reserve.

6.3.2 Existing environment

6.3.2.1 Ambient air quality

DPE operates air quality monitoring stations (AQMS) in many locations across NSW. The nearest active stations to the project site are Albury and Wagga Wagga North, 132 km East and 180 km north-east from the site respectively.

A summary of the ambient air quality data recorded at the AQMS is provided in Table 6.6. There are no exceedances of the criterion. PM_{10} and $PM_{2.5}$ data were elevated in 2019, likely due to the widespread bushfires in the state of NSW. 2021 and 2022 show improved air quality, likely due to higher-than average rainfall and fewer bushfire events.

Table 6.6 Summary of available background air quality data recorded at DPE Wyong AQMS

Pollutant	Averaging Period	Concentration (µg/m³)				
		2018	2019	2020	2021	2022
Albury						
PM_{10}	Maximum 24 hour average	45.3	57.1	45.3	32.0	26.3
	Annual average	19.8	23.4	20.1	14.4	11.7
$PM_{2.5}$	Maximum 24 hour average	17.3	24.2	29.1	21.9	17.6
	Annual average	7.3	10.1	11.1	7.4	5.6
Wagga Wagga North						
PM_{10}	Maximum 24 hour average	74.3	105.9	68.7	48.4	33.3
	Annual average	27.4	35.3	23.2	17.8	13.1
$PM_{2.5}$	Maximum 24 hour average	21.0	27.9	31.0	19.2	16.1
	Annual average	8.4	11.3	10.7	6.4	5.3

6.3.2.2 Climate and meteorology

The local climate and meteorology (weather) within the project area is of critical importance when assessing the potential for air quality impacts at sensitive receptors. As there are no Bureau of Meteorology (BOM) weather observation stations within proximity of the project area, most representative weather observation station (Wagga Wagga ID: 72150) has been selected to provide representative data for this project.

6.3.2.2.1 Temperature

The monthly mean temperature statistics for the data measured at the BOM Wagga Wagga for the period 2018 through 2022 were reviewed. The monthly maximum and minimum temperatures range from 32/18 (Jan) °C to 13/3 (July) °C.

6.3.2.2.2 Rainfall

Average monthly rainfall statistics for data measured at BOM Wagga Wagga for the period 2018 through 2022 were reviewed. The data indicates the highest number of rain days occurred, on average over the five year data period, in June, July and August. The highest rain fall amount occurred, on average, in November (100 mm), March (69 mm) and October (67 mm).

6.3.2.2.3 Wind

The average wind rose of the period of 2018-2022 was generated from information obtained from BoM. The following features are observed:

– The average wind speed measured was 3.7 metres per second (m/s).
– Calm conditions (wind speeds less than 0.5 m/s) occurred 4 per cent of the time.
– High wind speeds (winds greater than 5 m/s which are often attributed to dust lift off) mostly occur from the east and west.

Low wind speeds (winds less than 1 m/s) mostly occur from the east.

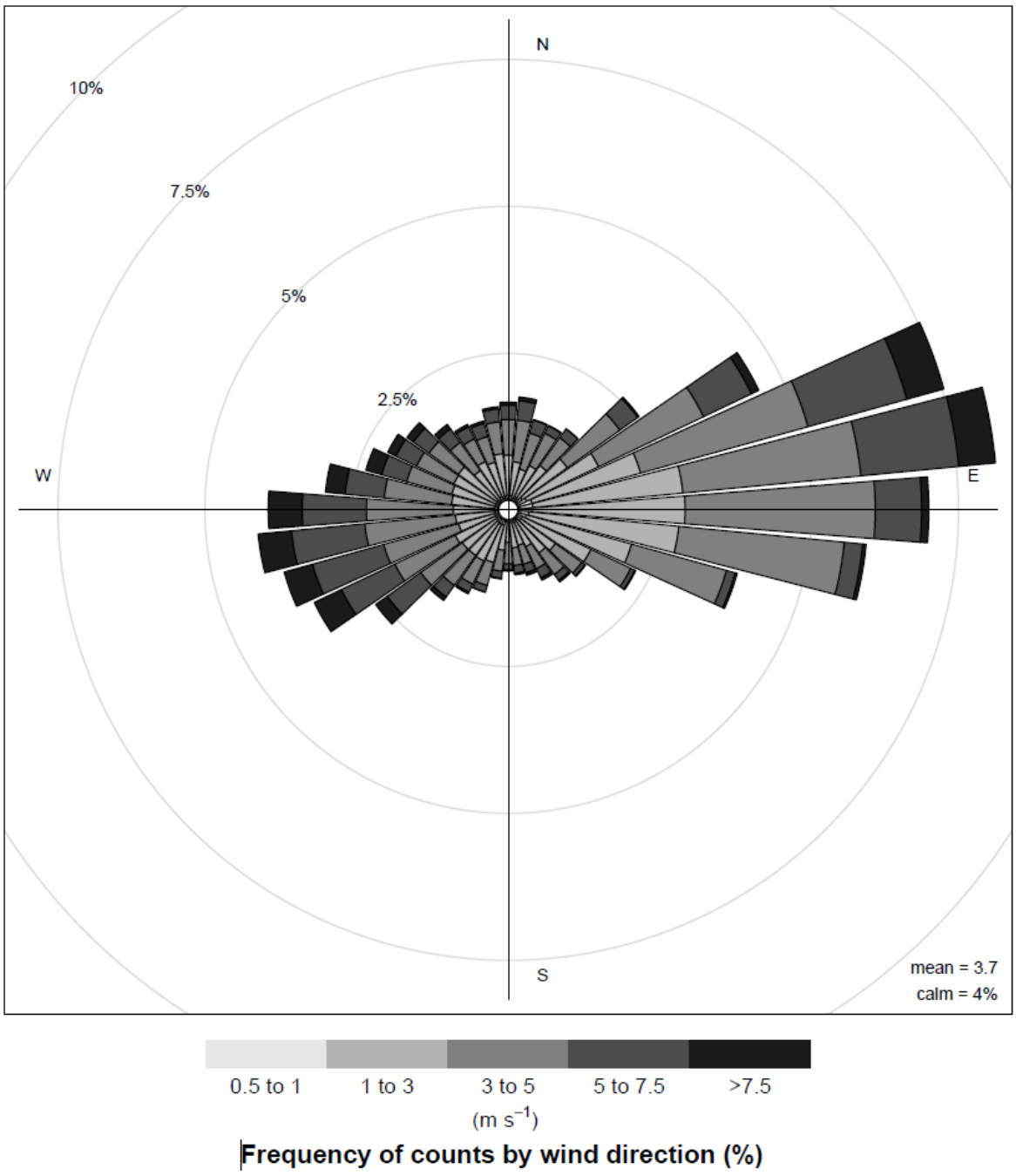


Figure 6.7 2018-2022 average wind direction and speed. Source: BOM weather observation station Wagga Wagga (ID 72150)

6.3.2.3 Sensitive receptors

The Approved Methods defines sensitive receptors as locations where people are likely to work or reside and may include a dwelling, school, hospital, office or recreation areas. The site is bounded by rural agricultural properties. The nearest receptor lies one km south of the site. In total there are 5 residential receptors within 2.3 km of the project site. Receptor details are outlined in Table 6.7.

Table 6.7 Identified receivers within 2.5 km of construction works

ID	Receptor type	Easting, Northing	Direction from construction footprint	Distance from construction footprint, km
R1	Residential	366478.8,6039669.6	South-west-west	1.5

ID	Receptor type	Easting, Northing	Direction from construction footprint	Distance from construction footprint, km
R2	Residential	368081.7,6039151.8	South	1
R3	Residential	371041.1,6039769.0	East	1.4
R4	Residential	370342.8,6041210.8	North-east	1.5
R5	Residential	367571.1,6043124.0	North-north-east	2.2
R6	Residential	366625.4,6041487.3	North-west	1.3

6.3.3 Impact assessment

6.3.3.1 Construction

A risk-based approach in accordance with Guidance on the Assessment of Dust from Demolition and Construction (IAQM Guidance) was adopted to assess potential particulate matter impacts during construction of the proposal.

The IAQM guidance recommends that a detailed risk assessment be undertaken where there is a human receptor within 250 metres of the construction footprint, or where there is a human or ecological receptor within 50 metres of any haulage routes up to 350 metres from the site entrance.

– As there are no human receptors within these distances, a detailed assessment is not required for this project. Regardless, the activities expected to produce the largest dust emissions have been identified and mitigation measures provided to manage these emissions.
– The construction description in Section 3.2 has been reviewed in order to get an understanding of activities which may be a source of dust. No potential sources of odour were identified and therefore no additional assessment is needed.

A summary table of the assessment findings are presented in Table 6.8. Activities which generally are a significant source of dust are trucks travelling on unpaved roads, excavations associated with bulk earthworks, importing and spreading fill, and stockpiles.

Most high-speed winds which contribute to dust lift off, occur from the west and east, meaning that dust impacts would occur to the west and east (downwind). There are no identified sensitive receptors within direct proximity of the project site and the nearest receptors to the southwest are approximately 1.3 kilometres away.

Table 6.8 Dust risk assessment of the construction stage

Dust risk assessment of the construction stage			
Step 1: Screen the need for a detailed assessment			
There are no residences within 350 metres of the magazines. A detailed assessment is not needed.			
Step 2A: Define the potential dust emission magnitude			
Construction activity	**IAQM Construction stage classification**	**Description**	**Dust emission magnitude**
Vegetation clearing	Earthworks	Removal of existing vegetation from areas planned for building and road construction.	Large
Earthworks and hardstand construction	Earthworks	Earthworks will involve the construction of three earthen mounds, drainage systems and hard stand areas for each concrete slab, which will be set under the new structures.	Large

Dust risk assessment of the construction stage			
New building construction	Construction	Construction of magazine facilities (four new high explosive magazines and a detonator magazine) will involve an earth grid and lightning protection system (earth stakes and trenches encircling magazines) , security systems (CCTV & door alarms) and a stand-alone solar power system for security and light systems.	Medium
Fencing installation	Construction	New magazines will require Security Sensitive Ammonium Nitrate (SSAN) compliant fences to ensure physical security.	Medium
Access road construction	Trackout & Earthworks	New access roads will be established from the existing entrance to the site of the new magazines. Roads will be gravel during construction and will be sealed prior to operation of new magazines.	Large
Demolition	Demolition	After the construction of new magazine facilities has been finalised, the eight of the existing 10 magazine facilities will be decommissioned and demolished.	Large
Step 2B: Define the sensitivity of the area			
There are no residences within 250 metres of the site. Thus, the sensitivity to impacts is low.			
Step 2C Define the risk of impacts			
Vegetation clearing	Earthworks	Low Risk	
Earthworks and hardstand	Earthworks	Low Risk	
New building construction	Construction	Low Risk	
Fencing installation	Construction	Low Risk	
Access road construction	Trackout & Earthworks	Low Risk	
Demolition	Demolition	Low Risk	

The dust emission magnitude has been identified as large for vegetation clearing, earthworks, access road construction, demolition and hardstand construction, and medium for new fencing installation and new building construction. Due to the distance between the receptors and the project site, dust impacts are not expected to be significant regardless of the estimated dust magnitude. Mitigation measures would reduce risk even further (refer Section 6.3.4).

The risk of dust impact was found to be low risk for all identified construction activities.

6.3.3.2 Operation

It is expected the following activities would be carried out during operation of the project:

– Maintenance and management of equipment
– Some operational traffic
– Storage and removal of explosive materials
– Waste removal

As there are no proposed changes to the overall operational workforce or activities at the magazine facility an operational assessment is not required for this project.

6.3.4 Mitigation and management measures

Mitigation measures proposed to avoid or minimise potential air quality impacts during construction and operation of the project are listed in Table 6.9.

Table 6.9 Mitigation measures – air quality

ID	Impact	Environmental Safeguard	Timing	Responsibility
AQ1	Dust emissions are minimised during construction.	Prepare a construction dust control protocol that details management measures, a method for recording dust complaints, and monitoring requirements.	Pre-construction	Contractor
AQ2	Dust emissions are minimised during construction and demolition.	On days with forecast and actual high winds (i.e., over 10 m/s), reduce work effort accordingly if wind-blown dust is observed to be leaving the site boundary.	Construction and demolition	Contractor
AQ3	Dust emissions are minimised during construction and demolition.	Undertake dust suppression, as required, using water sprays, water extension agents, soil stabilising polymers or other media on: – Unpaved work areas subject to traffic or wind. – Spoil and aggregate stockpiles. – During the loading and unloading of dust generating materials. – Unpaved access tracks.	Construction and demolition	Contractor
AQ4	Ignition risk, spills, and air emissions are minimised during construction and operation.	Maintain plant and equipment in good condition to minimise ignition risk of fuel or chemicals, spills, and air emissions that may cause nuisance.	Construction and operation	Contractor

6.4 Noise and vibration

This section assesses the potential noise and vibration impacts associated with construction and operation of the project and provides mitigation measures to reduce potential noise and vibration impacts associated with the construction and operation of the project.

6.4.1 Approach and method

A summary of the approach to the assessment is provided in this section, including the legislation, guidelines and/or policies driving the approach and the methodology used to undertake the assessment.

6.4.1.1 Legislative and policy context to the assessment

The assessment was undertaken in accordance with the SEARs and with reference to the requirements of relevant legislation, policies and/or assessment guidelines, including:

– Interim Construction Noise Guideline (ICNG) (DECC, 2009)
– NSW Road Noise Policy (RNP) (DECCW, 2011)
– Noise Policy for Industry (NPI) (EPA, 2017)
– Assessing Vibration: A Technical Guideline (DEC, 2006)
– DIN 4150-3 Structural Vibration – effects of vibration on structures (German Standards, 2016)

6.4.1.2 Method

6.4.1.2.1 Key tasks

The key potential sources of noise and vibration impacts considered by the assessment are:

– Noise and vibration generated by construction activities.
– Noise generated by construction traffic travelling to and from the Explosive Reserve.
– Noise generated by operating the Explosive Reserve.
– Noise generated by vehicles travelling to and from the Explosive Reserve during operation.

The noise and vibration assessment generally involved:

– Conducting a document review to ensure requirements of the project are in line with the relevant regulations described in Section 6.4.1.1, as well as the proposed design documentation.
– Undertaking a desktop review to identify potential external noise sources and sensitive receivers surrounding the project site, from aerial photography.
– Determining the Rating Background Level (RBL) and noise criteria at the nearest noise sensitive receivers with consideration to relevant legislation and guidelines.
– Determining noise emissions sound power levels for various external noise sources. Sound power levels of all acoustically significant existing plant and equipment. Where site specific information could not be obtained, GHD made conservative assumptions using past project experience and the GHD noise source database.
– Developing a noise model utilising the ISO 9613 prediction methodology within CadnaA modelling software.
– Providing design recommendations to achieve established criteria, where required.

6.4.1.2.2 Construction noise and vibration assessment

The assessment of potential construction noise and vibration impacts involved:

– Determining construction noise and vibration management levels/criteria in accordance with the methods provided in the relevant guidelines and regulations, including determining the rating background noise levels.
– Identifying potential noise sources during construction, including a list of likely construction activities and plant and equipment.
– Sourcing noise levels for the construction plant and equipment from relevant guidelines and GHD measures of similar equipment.
– Defining construction scenarios based on worst-case assumptions about the use of several items of construction plant and equipment at the same time within individual construction scenarios.
– Undertaking noise modelling for the identified construction scenarios using CadnaA noise modelling software.
– Identifying safe working distances to comply with the human comfort and the cosmetic damage criteria for the expected construction plant and equipment based on the buffer distances in the *Construction Noise and Vibration Strategy (Public Transport Infrastructure)* (TfNSW 2023).
– Identifying if any residential receivers or structures were within the minimum vibration working distances for human comfort and cosmetic damage.
– Assessing the significance of predicted noise levels by comparing the modelling results to the management levels/criteria.
– Recommending feasible and reasonable measures to be implemented as is considered best practice.

6.4.1.2.3 Operation noise and vibration assessment

The purpose of the site is to store explosive materials in a safe and secure manner. The project is proposing to construct new storage magazines, which are compliant with the Australian Standards and codes of practice, to replace the existing. There are no changes in the operations on the Explosives Reserve post construction.

Although the operational noise and vibration impacts are expected to be the same as existing. The assessment of potential operational noise and vibration impacts involved:

– Determining operational noise and vibration management levels/criteria in accordance with the methods provided in the relevant guidelines and regulations, including determining the rating background noise levels.
– Identifying potential noise sources during operation, including a list of likely operational activities, plant and equipment.
– Undertaking noise modelling for the identified site operations using CadnaA noise modelling software.
– Assessing the predicted noise levels by comparing the modelling results to the established noise targets/criteria.
– Identifying if any residential receivers or structures were within the minimum vibration working distances for human comfort and cosmetic damage.
– Recommending noise and vibration mitigation measures, if required.

6.4.2 Existing environment

6.4.2.1 Sensitive receivers and noise catchment areas

Potentially sensitive receivers are those that may be affected by changes in noise and vibration levels within the study area. Noise sensitive receivers are defined based on the type of occupancy and activities performed in the surrounding land uses.

Within the study area, five (5) nearest receivers have been identified. Compliance at these receivers should result in compliance at all other nearby receivers. The sensitive receivers are listed in Table 6.10 and shown graphically Figure 6.8.

Table 6.10 Key residential sensitive receivers

ID	Address	Type	Distance from nearest site boundary	Coordinates (EPSG 7855)	
				X (m)	Y (m)
R01	404 Chinamans Rd, Tocumwal	Residential	170 m West	366476.7901	6039670.012
R02	240 Chinamans Rd, Tocumwal	Residential	250 m West	366633.8193	6041486.186
R03	774 Newell Hwy, Tocumwal	Residential	620 m North East	368609.2578	6043131.919
R04	Newell Hwy, Tocumwal (Lot 173 DP 752296)	Residential	730 m East	370339.9318	6041217.951
R05	Chinamans Rd, Tocumwal (Lot 196 DP 752296)	Residential	510 m South	368080.6114	6039161.484

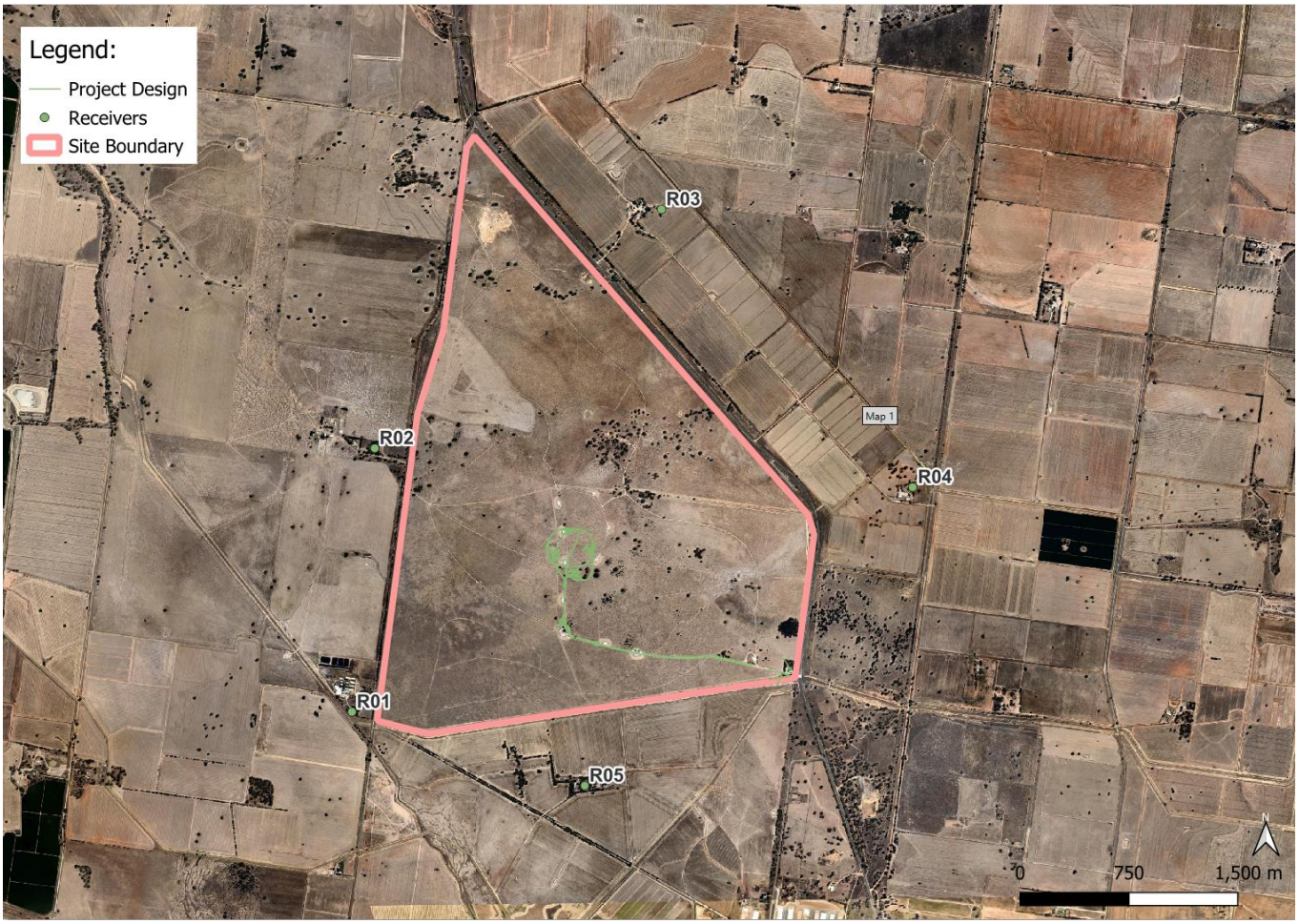


Figure 6.8 Sensitive receivers (Aerial: Nearmaps)

6.4.2.2 Existing noise levels

In the absence of background noise monitoring, GHD has assumed the minimum Rating Background Levels (RBLs) in accordance with the Noise Policy for Industry (refer to Table 6.11). This has been considered appropriate for the assessment due to the remote nature of the site and would result in the most conservative criteria.

Table 6.11 Minimum assumed rating background noise levels

Time of Day	Minimum assumed rating background noise level (dBA)
Day	35
Evening	30
Night	30

Note 1: Daytime 7.00 am to 6.00 pm; Evening 6.00 pm to 10.00 pm; Night-time 10.00 pm to 7.00 am
On Sundays and Public Holidays, Daytime 8.00 am to 6.00 pm; Evening 6.00 pm to 10.00 pm; Night-time 10.00 pm to 8.00 am.

6.4.3 Criteria

6.4.3.1 Construction noise criteria

Interim Construction Noise Guideline

Noise management levels

Construction noise management levels for noise at residential receivers are defined by the ICNG (see Table 6.12). Construction is expected to occur during the day time period (recommended standard hours) only.

Table 6.12 Residential construction noise management levels, dBA (ICNG, 2009)

Time of day	Noise management level, $L_{Aeq(15\ min)}$	Application notes
Recommended standard hours	Noise affected: RBL + 10 dBA	The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured $L_{Aeq(15\ min)}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected: 75 dBA	The highly noise affected level represents the point above which there may be strong community reaction to noise. Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: – Times identified by the community when they are less sensitive to noise (such as before and after school, or mid-morning or mid-afternoon for works near residences). – If the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside recommended standard hours	Noise affected: RBL + 5 dBA	A strong justification will typically be required for works outside the recommended standard hours. The proponent should apply all feasible and reasonable work practices to meet the noise affected level. Where all feasible and reasonable measures have been applied and noise is more than 5 dBA above the noise affected level, the proponent should negotiate with the community.

Project-specific noise management levels

Construction noise management levels for noise at residential receivers are defined by the ICNG (see Table 6.12 and have been based on the RBLs presented in Table 6.13.

Table 6.13 Project specific noise management levels

Sensitive receptor type	Construction Noise Management Levels, $L_{Aeq(15min)}$	
	Standard construction hours	
	Noise affected	Highly noise affected
Residential – R01 to R05	45	75

Sleep disturbance

Construction works are expected to be only conducted during standard construction hours only (Monday to Friday 7:00 am to 6:00 pm and Saturday 8:00 am to 1:00 pm). Hence, no sleep disturbance impacts are anticipated during the construction phases of the project.

If activities are required to be undertaken during the night period (10:00 pm to 7:00 am Monday to Saturday and 10:00 pm on Saturday to 8:00 am on Sunday), it would be limited to activities which are not audible at the nearest sensitive receptor, or discreet events which need to be undertaken outside standard hours for safety reasons.

6.4.3.2 Operational noise criteria

Noise Policy for Industry (NPI)

The NPI provides both intrusive and amenity criteria for industrial noise sources, , it can be used for guidance to identify any potential noise impacts from the proposal.

The project noise trigger level is the lower value of the intrusiveness noise level and the project amenity noise level. The intrusiveness noise aims to protect against significant changes in noise levels and amenity noise levels aims to protect against cumulative noise impacts from existing industry.

The intrusiveness noise trigger level is defined as the prevailing rating background noise level (RBL) + 5 dB. The project RBLs have been conservatively assumed to be the minimum allowable background noise levels as per Table 2.1 of the NPI (refer to Section 6.4.2.2). The intrusiveness noise level is only applicable for residential receivers.

The project amenity noise levels are derived by subtracting 5 dB from the recommended amenity noise level for the relevant for the relevant receiver type and a +3 dB adjustment is applied to convert to a 15 minute time period.

Project specific noise trigger levels

Based on the NPI, a summary of the PNTLs for residential land uses are presented in Table 6.14. All identified residential receivers have been classified as 'rural residential'. Compliance with the residential PNTLs ensure compliance with the less-stringent non-residential PNTLs.

Table 6.14 Project noise trigger levels for suburban residential receivers

Assessment period	Rating Background Level (RBL), $L_{90,T}$-dBA[2]	Intrusive noise level, $L_{Aeq(15min)}$	Project amenity noise level[1] $L_{Aeq(15min)}$	Project noise trigger level, $L_{Aeq(15min)}$) dBA
Day	35	40	48	40
Evening	30	35	43	35
Night	30	35	38	35

Notes:

1. Project amenity noise level (ANL) is a rural ANL (NPI Table 2.2) minus 5 plus 3 dB(A) to convert from a period level to a 15-minute level.
2. The background noise level is based on the minimum assumed rating background noise level (NPI).

Modifying factor corrections

The NPI requires that corrections for annoying characteristics are applied if the noise sources contain tonal, intermittent or low frequency characteristics, which have the potential to increase annoyance. The modifying factor adjustments are detailed in Table 6.15. At this point in time, it is assumed that no equipment operating on site will result in any annoying characteristics at the receiver.

Table 6.15 NPI modifying factor corrections

Factor	Assessment/ measurement	When to apply	Correction[1,2]
Tonal noise	One-third octave or narrow band analysis	Level of one-third octave band exceeds the level of the adjacent bands on both sides by: – 5 dB or more if the centre frequency of the band containing the tone is above 400 Hz. – 8 dB or more if the centre frequency of the band containing the tone is 160 to 400 Hz inclusive. – 15 dB or more if the centre frequency of the band containing the tone is below 160 Hz.	5 dBA[2]

Factor	Assessment/ measurement	When to apply	Correction[1,2]
Low frequency noise	Measurement of C-weighted and A-weighted level	Measure/assess C and A weighted $L_{eq,T}$ levels over same time period. Correction to be applied if the difference between the two levels is 15 dB or more and: – Where any of the one-third octave noise levels in Table C2 are exceeded by up to and including 5 dB and cannot be mitigated, a 2 dBA positive adjustment to measured/predicted A-weighted levels for the evening/night period. – Where any of the one-third octave noise levels in Table C2 are exceeded by more than 5 dBA and cannot be mitigated, a 5 dBA positive adjustment to measured/predicted A-weighted noise levels applies for the evening/night period and a dBA positive adjustment for the daytime period.	5 dBA[2]
Intermittent noise	Subjectively assessed	When the night-time noise level drops to that of the background noise level with a noticeable change in noise level of at least 5 dBA.	5 dBA

Notes:

1. Where two or more modifying factors are present the maximum correction is limited to 10 dBA.
2. Where a source emits a tonal and low-frequency noise, only one 5 dB correction should be applied if the tone is in the low frequency range.

Sleep disturbance

The NPI provides guidance for assessing sleep disturbance due to short-term maximum noise events. Sleep disturbance is considered to be both awakenings and disturbance to sleep stages. To assess potential disturbance during night time hours of operation for the proposed stabling facility (first light to 7:00 am) the NPI recommends the following as a screening criterion:

– $L_{Aeq,15min}$ 40 dB(A) or the prevailing RBL plus 5 dB, whichever is the greater, and/or

– L_{AFmax} 52 dBA or the prevailing RBL plus 15 dB, whichever is greater

Assuming the minimum night time RBL of 30 dBA, the sleep disturbance screening criterion is $L_{Aeq,15min}$ 40 dB(A) and L_{AFmax} 52 dBA.

6.4.3.3 Road traffic noise (construction and operational)

The RNP (DECCW, 2011) provides traffic noise target levels for residential receivers in the vicinity of existing roads and are applied to road upgrades. For this assessment, these levels are applied to traffic associated with construction works and the traffic generated due to operations to identify potential traffic impacts. The RNP road types are based on the functional roles shown in Table 6.16 and noise criteria in Table 6.17.

Table 6.16 Road Categories from RNP

Road category	Functional role	Public roads used by project
Freeways or motorways/ arterial roads	Support major regional and inter-regional traffic movement. Freeways and motorways usually feature strict access controls via grade separated interchanges.	Newell Highway

Table 6.17 Road traffic noise criteria, dBA

Development type	Applicability to assessment	Day 7:00 am to 10:00 pm	Night 10:00 pm to 7:00 am
Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments.	– Newell Highway	60 $L_{eq(15hr)}$	55 $L_{eq(9hr)}$

The RNP also considers the relative increase in total traffic noise at a location for Freeway/arterial/ sub-arterial roads and transitways as shown in Table 6.18.

Table 6.18 Increases in Traffic noise

Development type	Applicability to assessment	Day 7:00 am to 10:00 pm	Night 10:00 pm to 7:00 am
New road corridor/redevelopment of existing road/land use development with the potential to generate additional traffic on existing road.	– Newell Highway	Existing traffic $L_{Aeq, (15\ hour)}$ + 12 dB (external)	Existing traffic $L_{Aeq, (9\ hour)}$ + 12 dB (external)

However, the RNP does state that in assessing feasible and reasonable mitigation measures, an increase in road traffic noise of up to 2 dB represents a minor impact that is considered barely perceptible to the average person.

Further guidance is provided in the CNVG (TfNSW 2023) which states the following in relation to construction related traffic noise goals:

> "For existing residences and other sensitive land uses affected by *additional traffic on existing roads generated by land use developments*, any increase in the total traffic noise level should be limited to 2 dB above that of the corresponding 'without construction' scenario."

6.4.3.4 Vibration (construction and operational)

Human comfort

The criteria for intermittent vibration from construction are based on the vibration dose value identified in Assessing Vibration: A Technical Guide (DEC, 2006) and are shown in Table 6.19.

Table 6.19 Acceptable vibration dose values for intermittent vibration

Location	Daytime [1] ($m/s^{1.75}$)		Night-time [1] ($m/s^{1.75}$)	
	Preferred value	Maximum value	Preferred value	Maximum value
Critical areas [2]	0.10	0.20	0.10	0.20
Residences	0.20	0.40	0.13	0.26
Offices, schools, educational institutions, and places of worship	0.40	0.80	0.40	0.80
Workshops	0.80	1.60	0.80	1.60

Notes:
1. Daytime is 7:00 am to 10:00 pm and night-time is 10:00 pm to 7:00 am.
2. Examples include hospital operating theatres and precision laboratories where sensitive operations are occurring. These criteria are only indicative, and there may be a need to assess intermittent values against the continuous or impulsive criteria for critical areas.

Humans are capable of detecting vibration at levels well below those that risk causing damage to a building. The degrees of perception for humans are suggested by the vibration level categories given in British Standard *BS* 5228-2:2009 Code of practice for noise and vibration on construction and open sites – Part 2: Vibration as listed in Table 6.20.

Table 6.20 Guidance on the effects of vibration levels

Approximate vibration level	Degree of perception
0.14 mm/s	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.
0.30 mm/s	Vibration might be just perceptible in residential environments.
1.00 mm/s	It is likely that vibration of this level in residential environments will cause complaint but can be tolerated if prior warning and explanation has been given to residents.
10.00 mm/s	Vibration is likely to be intolerable for any more than a very brief exposure to this level.

Structural damage to standard and heritage structures

The minimum working distances for structural (cosmetic) damage used for this assessment have been based on 'DIN 4150-3 Structural Vibration – effects of vibration on structures' (German Standards, 2016) levels from ground borne vibration which enables the likelihood of building damage from ground vibration to be assessed as per Table 6.21. The vibration levels in this standard are adopted as building damage criteria and are presented for industrial premises, domestic premises, and heritage structures.

No heritage structures have been identified near the project area, therefore no impacts to heritage structures are anticipated.

Table 6.21 DIN 4150-3:2016 guideline values for short term vibration velocity

Line	Type of building	Guideline values for velocity, (mm/s)		
		Vibration at the foundation at a frequency of		
		1 Hz to 10 Hz	10 Hz to 50 Hz	50 Hz to 100 Hz[3]
1	Offices and industrial premises	20	20-40	40-50
2	Domestic houses and similar construction	5	5-15	15-20
3	Structures that, because of their particular sensitivity to vibration, cannot be classified under lines 1 and 2 and are of great intrinsic value (e.g. listed buildings under preservation order).	3	3 to 8	8 to 10

Notes:

1. Values referred to are at the base of the building.
2. At frequencies below 4 Hz, a maximum displacement of 0.6 mm (zero to peak) should not be exceeded.
3. At frequencies above 100 Hz the values given in this column may be used as minimum values.

6.4.3.5 Noise criteria summary

A summary of the noise criteria for the assessment of operational noise, road noise and sleep disturbance impacts for the proposed horse stabling facility is presented below in Table 6.22.

Table 6.22 Project criteria summary

Criteria applicability	Assessment type	Type of receiver	Time of day	Criteria
Interim Construction Noise Guideline	Construction noise	Residential	Day (7:00 am to 6:00 pm) (Recommended standard hours)	$L_{Aeq(15min)}$ 45 dBA Noise affected $L_{Aeq(15min)}$ 75 dBA Highly noise affected
Noise Policy for Industry	Operational noise	Residential	Day (7:00 am to 6:00 pm)	$L_{Aeq(15min)}$ 40 dBA
			Evening (6:00 pm to 10:00 pm)	$L_{Aeq(15min)}$ 35 dBA
			Night (10:00 pm to 7:00 am)	$L_{Aeq(15min)}$ 35 dBA
	Sleep disturbance at residences	Residential	Night (10:00 pm to 7:00 am)	$L_{Aeq(15min)}$ 40 dBA L_{Amax} 52 dBA
Road Noise Policy	Road traffic noise levels along public roads at sensitive receivers	Residential	Day (7:00 am to 10:00 pm)	$L_{Aeq, 1hr}$ 55 (external) $L_{Aeq, 1hr}$ 2 dB increase
			Night (10:00 pm to 7:00 am)	$L_{Aeq, 1hr}$ 50 (external) $L_{Aeq, 1hr}$ 2 dB increase
BS 5228-2:2009	Vibration	Human comfort	All	1 mm/s
DIN 4150-3:2016		Structures	All	5 mm/s (Residential structures)

6.4.4 Impact assessment

6.4.4.1 Construction noise

Construction would require the use of heavy machinery, which can generate high noise and vibration levels. The potential impacts at nearby receivers may vary greatly depending on the intensity and location of construction activities, the type of equipment used, existing background noise levels, intervening terrain, and prevailing weather conditions.

6.4.4.1.1 Noise modelling methodology

Acoustic modelling was undertaken using CadnaA 2023 MR2 to predict the effects of construction noise generated by the project.

CadnaA is a computer program for the calculation, assessment and prognosis of noise propagation. Computer modelling has been undertaken according to the ISO 9613-2 (1996), Acoustics - Attenuation of Sound During Propagation Outdoors, Part 2: General Method of Calculation prediction algorithm, as implemented in CadnaA software. The noise model predicts sound pressure levels under meteorological conditions favourable to propagation (mild temperature inversion with slight downwind) from sources of known sound emission.

The general noise model parameters used in CadnaA are presented below in Table 6.23.

Table 6.23 Noise model parameters

Variable	Parameter Used
Calculation method	ISO 9613 prediction algorithm
Meteorology	Average temperature of 10 °C Average humidity of 70%
Ground absorption coefficient	0.7 – mix of hard and soft ground. (0 represents hard ground and 1 represents soft ground)
Reflection from surfaces	Order of reflection = 0
Ground topography	Flat terrain
Receiver heights	1.5 m above ground level.
Source heights	1.5 m above ground level
Shielding	The modelled scenarios assume the equipment/plant is in free-field environment – not inside buildings and no shielding around it. Existing site buildings have not been included in the model.

6.4.4.1.2 Noise sources

The noise model includes noise sources that are modelled moving point sources around the site. The anticipated plant and equipment to be used for each construction scenario is shown in Table 6.24, along with corresponding sound power levels used in the noise model.

The noise levels for the construction equipment have been sourced from the following sources:

– Australian Standard AS2436 – Guide to Noise Control on Construction, Maintenance and Demolition Site (2010).
– British Standards BS5228-1 - Code of practice for noise and vibration control on construction and open sites (2014).
– NSW Roads and Maritimes Services – Construction Noise and Vibration Guideline (2016).
– GHD measurements of similar equipment.

It has been understood that all construction activity associated with the project would be conducted during the recommended standard construction hours. No corrections/penalties for annoying characteristics have been applied.

Table 6.24 Construction scenarios and associated equipment

Scenario ID	Activity	Equipment	Qty	Operational time	Sound Power Level (dB(A))	Equivalent Sound Power Level (dB(A))
S1	Road installation	Excavator (22 T)	1	100%	106	114
		Drum roller	1	100%	103	
		Dump truck	1	100%	111	
		Asphalt Paver	1	100%	104	
		Front end loader	1	100%	103	
S2	Vegetation Removal	Dump truck	1	100%	111	123
		Dozer (20 T)	1	100%	109	
		Excavator (22 T)	1	100%	106	
		Chainsaw (4-5 hp)	1	100%	114	
		Mulcher (40-50 hp)	1	100%	122	
S3	Earthworks and hardstand	Dozer (20 T)	1	100%	109	120
		Excavator (22 T)	2	100%	106	
		Asphalt paver	1	100%	105	
		Vibratory Roller	1	100%	103	
		Grader	1	100%	115	
		Water truck	1	100%	109	
		Dump trucks	2	100%	111	
		Concrete Truck	1	100%	108	
		Concrete Pump	1	100%	103	
S4	New building construction	Crane (30 T)	1	100%	98	112
		Delivery trucks	1	100%	108	
		Hand held power tools	1	100%	101	
		Compressor	1	100%	95	
		Generator	1	100%	94	
		Concrete Truck	1	100%	108	
		Concrete Pump	1	100%	103	
S5	Fencing installation	Delivery Truck	1	100%	108	116
		Post Hammer/Driver	1	100%	115	
		Hand held power tools	1	100%	101	
S6	Demolishing works (buildings/hardstand)	Excavator (22 T)	1	100%	106	118
		Dump truck	1	100%	111	
		Hydraulic hammer	1	100%	122	

6.4.4.1.3 Results

Construction noise levels have been predicted at the sensitive receivers within the study area with consideration to the acoustic requirements of the ICNG. The predicted $L_{Aeq(15min)}$ noise levels at the most-affected sensitive receivers are presented in Table 6.25. The noise modelling assumes that all pieces of equipment in the scenario are operating at maximum capacity simultaneously at the closest distance between the construction works and the receiver. As such, the predicted noise levels are often highly conservative and actual noise levels are likely to be lower than those the levels presented below for most of the time.

Table 6.25 Predicted noise levels $L_{Aeq(15min)}$

Receiver	Criteria	Predicted Construction Scenario Noise Level $L_{Aeq(15min)}$, dBA						Comply
		Access Road Construction	Vegetation Clearing	Earthworks and Hardstand	Magazine Construction	Magazine Fencing	Magazine Demolition	
R01	45	32	38	39	30	31	34	Yes
R02	45	34	40	41	32	32	36	Yes
R03	45	28	33	33	25	25	30	Yes
R04	45	33	38	39	26	26	30	Yes
R05	45	38	44	45	35	35	41	Yes

It is assumed that the equipment used will not result in have annoying characteristics at the receiver.

Predictive modelling indicates that at all receivers in the study area, noise levels for all assessed scenarios are predicted to be below NML during adverse meteorological conditions with all equipment operating simultaneously. Notwithstanding this, the application of reasonable and feasible mitigation measures at the source is considered best practice and should be implemented where reasonable and feasible.

6.4.4.2 Construction traffic noise

For the purposes of this assessment, the highest hourly traffic generation for the project under the peak construction scenario is assumed to be up to 14 vehicle trips in total, which will consist of the following:

– AM peak hour:
  - Ten inbound light vehicles
  - Two inbound heavy vehicle movements
  - Two outbound heavy vehicle movements
– PM peak hour:
  - Ten outbound light vehicles
  - Two inbound heavy vehicle movements
  - Two outbound heavy vehicle movements

These vehicles would be accessing/egressing the project site via Newell Highway.

Based on the additional construction vehicles accessing the Explosives Reserve when compared to existing traffic numbers, traffic noise impacts due to the construction of the project are anticipated to remain within 2 dB of current levels, and therefore additional mitigation measures are not required.

6.4.4.3 Construction vibration

6.4.4.3.1 Vibration safe working distances

Safe working distances for vibratory intensive equipment to comply with the human comfort and cosmetic damage criteria are shown in Table 6.26. These buffer distances (the distance between the nearest receiver and the closest point that works are proposed) have been adopted from the *Construction Noise and Vibration Strategy (Public Transport Infrastructure)* (TfNSW, 2023). Works undertaken outside these distances from the nearest receiver are not expected to result in human comfort or cosmetic damage impacts.

Table 6.26 Vibration safe working distances

Equipment	Human comfort (OH&E Assessing Vibration – A Technical Guideline)	Cosmetic damage (BS 7385)
Piling rig – Bored <800 mm	N/A	2 m (nominal)
Piling rig–Hammer (12 t down force)	50 m	15 m

Equipment	Human comfort (OH&E Assessing Vibration – A Technical Guideline)	Cosmetic damage (BS 7385)
Piling rig – Vibratory (sheet piles)	20 m	2 m to 20 m
Vibratory roller (>18 tonnes)	100 m	25 m
Vibratory roller (13-18 tonnes)	100 m	20 m
Vibratory roller (7-13 tonnes)	100 m	15 m
Vibratory roller (4-6 tonnes)	40 m	12 m
Vibratory roller (2-4 tonnes)	20 m	6 m
Vibratory roller (1-2 tonnes)	15 m	5 m
Small hydraulic hammer 300 kg (5-12 t excavator)	7 m	2 m
Medium hydraulic hammer 900 kg (12-18 t excavator)	23 m	7 m
Large hydraulic hammer 1600 kg (18-34 t excavator)	73 m	22 m
Jackhammer (handheld)	Avoid contact with structure	1 m (nominal)

6.4.4.3.2 Human comfort

The most vibration intensive activities associated with the works are anticipated to be during earthworks where the use of a medium to large excavator and compactor is anticipated. Grading of the access road will also be a vibration intensive activity.

Earthworks activities have the potential to exceed the human comfort vibration criteria should these works occur within 100 metres of residences. The nearest residential receiver is 170 metres from the site boundary and the works are expected to occur further inside of the Site. Therefore, no adverse vibration impacts to human comfort are anticipated as a result of the project.

6.4.4.3.3 Structural damage

Earthwork activities have the potential to exceed the cosmetic damage criteria should these works occur within 25 metres of a sensitive receptor building. The nearest building is 170 metres from the site boudnary and the works are expected to occur further away than that. Therefore, no adverse vibration impacts to structural damage are anticipated as a result of the project.

6.4.4.4 Operational noise

The purpose of the Site is to store explosive materials in a safe and secure manner. The Project is proposing to construct new storage magazines, which are compliant with the Australian Standards and codes of practice, to replace the existing. There are activities and equipment that generate noise as part of the operations of the Site.

6.4.4.4.1 Noise modelling methodology

Noise modelling was conducted with a similar methodology as that conducted for construction noise (refer to Section 6.4.4.1.1).

6.4.4.4.2 Noise sources

The main noise generating operations on the Site are:

– Truck movements.
– Handling of explosive materials (Loading and unloading into/out of the storage magazines.
– Utilities for the building.

The truck movements and handling of explosive material will remain the same and occur during the Site's operating hours of 6:30 am to 3:30 pm.

Each magazine storage building (5 in total) will be serviced by a two (2) 450 watt solar panel connected to a 200 amp hour 12 volt battery (via a controller).

6.4.4.4.3 Results

Due to the limited acoustic data available for small solar power system, calculations/predictions were undertaken to determine the required Sound Power Level (SWL) of the noise sources, which would cause an exceedance at the Site boundary.

The most stringent operational noise criteria for the Site is 35 dBA. Noise modelling showed that a SWL of over 100 dBA is required to produce a noise contribution of 35 dBA at the Site boundary. It should be noted that the identified receivers are also over 100 m further from the Site boundary.

The activities on the Site are expected to have SWLs below that and therefore the Site is expected to comply with the operational noise criteria (including sleep disturbance).

6.4.4.5 Operational traffic noise

The purpose of the Site is to store explosive materials in a safe and secure manner. The Project is proposing to construct new storage magazines, which are compliant with the Australian Standards and codes of practice, to replace the existing. There are no expected changes to the existing vehicle movements associated with the Site on public roads and the Site is expected to be compliant with the road traffic noise criteria established.

6.4.4.6 Operational vibration

The Site has no intensive vibration generating equipment/plant and therefore is expected to comply with the vibration limits established.

6.4.5 Mitigation and management measures

It is predicted that activities associated with the project would comply with the NMLs in accordance with the ICNG, and operational noise levels are not expected to change. Nonetheless, measures should be taken to minimise the potential for noise and vibration impacts where reasonable and feasible.

Section 6.4.5.1 provides general guidance on methods to reduce noise and vibration impacts.

Section 6.4.5.2 provides general mitigation measures related to construction.

6.4.5.1 In-principle noise control methods

The measures provided below are best practice and should be implemented to minimise potential noise and vibration impacts where reasonable and feasible.

In principle, there are three approaches to controlling noise and vibration:

– Control at the source
– Control on the source-to-receiver pathway
– Control at the receiver

6.4.5.1.1 Control at the source

Control at the source is considered to be the most cost-effective in the reduction of noise and vibration levels and as such should be given highest priority when considering mitigation options. The solutions available include:

– Substitution of equipment:
  - Substitution involves where reasonably practicable the use of less noisy or vibration intensive. Equipment should be selected to meet the needs of the project or process it is required for and not be excess.
– Modification of existing equipment:
  - Modification of equipment involves the addition of acoustic treatments to parts of the machinery. These include but are not limited to improved mufflers, stiffening of panels and surface coating of resonance dampening material. These options would often require discussion with the supplier and manufacturer of the equipment.

– Use and siting of equipment:
  - Plant should always be used in accordance with the manufacturer's instructions. Where possible the location of equipment should be away from noise and vibration sensitive areas. This includes taking into consideration the emission direction of equipment and directing this away from sensitive receivers. Plant used intermittently should be shut down during the intervening periods or throttled down to a minimum.
– Regular and effective maintenance:
  - Maintenance should be carried out to ensure equipment is running at optimal conditions.

6.4.5.1.2 Control along the path

There are two ways of mitigating noise along the transmission path:

– Increasing the distance between the source and receiver.
– Where distance is limited, screening of noise may be considered. In some circumstances it may also be possible to enclose the equipment during the operation.

Table 6.27 provides typical noise attenuation provided by noise control methods.

Table 6.27 Typical attenuations for source to receiver noise control methods

Control by	Nominal noise reduction possible, in total A-weighted sound pressure level LpA dB
Distance	Approximately 6 for each doubling of distance
Screening	Normally 5 to 10, maximum of 15
Enclosure	Normally 15 to 25, maximum of 50

6.4.5.1.3 Control of noise at the receiver

Reasonable and feasible mitigation measures at the receivers for this project are limited to effective community consultation at this stage of the design. It is envisioned that design focused mitigation measures (i.e. control at the source) will help the project achieve compliance at all receivers during all time periods.

In the event that there are exceedances at sensitive receivers after all reasonable and feasible mitigation measures are implemented at the site, noise treatments at the receiver property may need to be considered.

6.4.5.2 Mitigation and management measures

The noise and vibration mitigation measures detailed in Table 6.28 are recommended where reasonable and feasible to reduce the impact on the surrounding receivers and sensitive land uses during construction.

Table 6.28 Mitigation measures for construction noise and vibration

ID	Impact	Mitigation Measure	Timing	Responsibility
	General controls			
NV1	Site inductions	All employees, contractors and subcontractors are to receive an environmental induction. The induction should include: – All relevant project specific and standard noise and vibration mitigation measures. – Relevant licence and approval conditions. – Permissible hours of work. – Location of nearest sensitive receivers. – Construction employee parking areas.	Construction and Operation	Orica and Contractor

ID	Impact	Mitigation Measure	Timing	Responsibility
		– Designated loading/unloading areas and procedures. – Site opening/closing times (including deliveries). – Environmental incident procedures.		
NV2	Behavioural practices	No swearing or unnecessary shouting or loud stereos/radios on site. No dropping of materials from height, throwing of metal items and slamming of doors.	Construction and Operation	Orica and Contractor
NV3	Implement community consultation measures	Contact will be established with the local residents and the construction program and progress communicated on a regular basis, particularly when noisy or vibration-generating activities are planned. Affected receivers will be notified of the intended work, its duration and times of occurrence. This may include a local community update letters for specific construction activities and a Project info line.	Construction and Operation	Orica and Contractor
NV4	Implement complaints management measures	Complaints will be managed in accordance with the procedure outlined below. Signage at each site will clearly and visibly provide a contact number and name to receive complaints and enquiries about construction. Potential complaints specific to these works could include: – Vibration impacts from works that significantly affect structures or dwellings. – A cluster of noise and/or vibration complaints. In this instance the response would be to: – Verbally respond to complainant. – Provide a written response within seven calendar days if the complaint cannot be resolved verbally. – Log the complaint, and any actions taken with regards to the complaint within a complaints register. – Undertake monitoring at the complainant's residence(s). – Investigate the nature and reasons of the impact. – Investigate and implement further mitigation measures to minimise the impact.	Construction and Operation	Orica and Contractor

ID	Impact	Mitigation Measure	Timing	Responsibility
NV5	Compliance vibration measurements	Vibration monitoring will be undertaken where construction equipment operate within the safe working distances of a building or when a complaint is received. Vibration monitoring should be conducted during these activities at the most susceptible buildings close to the construction sites. Where exceedances of the relevant vibration criteria outlined are recorded, the situation should be reviewed in order to identify the measures that can be taken to minimise the impacts to sensitive equipment and prevent structural damage. The review may result in a requirement to modify work practices or use alternative, low-vibration methods and equipment. Any vibration measurement will be undertaken by a qualified professional and with consideration to the ICNG guidelines.	Construction	Orica and Contractor
	Source controls			
NV6	Construction hours and scheduling	Comply with the recommended standard construction hours outlined in Section 6.4.3, unless out of hours work has been approved. No truck movements before 7:00 am or after 6:00 pm. For any work that would take place outside of normal construction hours: – Undertake an assessment of the potential noise and vibration impacts associated with the proposed activities and outline specific mitigation measures. – Residents potentially affected by such activities will be notified at least five days before hand. – Minimise consecutive night activities in the same locality and provide periods of quiet if activities occur for extended periods during the night. – Conduct activities in a manner that eliminates or minimises the need for audible warning alarms.	Construction	Orica and Contractor
NV7	Construction respite period	High noise and vibration generating activities may only be carried out in continuous blocks, not exceeding three hours each, with a minimum respite period of one hour between each block. High noise refers to construction noise impacts which exceed the highly affected noise management level of 75 dB(A) $L_{Aeq(15\text{-}min)}$ during standard construction hours.	Construction	Orica and Contractor

ID	Impact	Mitigation Measure	Timing	Responsibility
NV8	Equipment selection	Use quieter and less vibration emitting construction methods where reasonable and feasible.	Construction	Orica and Contractor
NV9	Use and siting of plant	Simultaneous operation of noisy plant within discernible range of a sensitive receiver is to be avoided. The offset distance between noisy plant and adjacent sensitive receivers is to be maximised. Plant used intermittently to be throttled down or shut down. Noise-emitting plant to be directed away from sensitive receivers.	Construction and Operation	Orica and Contractor
NV10	Plan worksites and activities to minimise noise and vibration	Plan traffic flow, parking and loading unloading areas to minimise reversing movements within the site.	Construction and Operation	Orica and Contractor
NV11	Minimise disturbance arising from delivery of goods to the Site	Loading and unloading of materials/deliveries is to occur during day time hours. Contractors are to avoid dropping materials from height where practicable, during loading and unloading. Delivery vehicles to be fitted with straps rather than chains for unloading, wherever possible.	Construction and Operation	Orica and Contractor
	Path controls			
NV12	Use of safe working/buffer distances	The safe working/buffer distances outlined in Table 6.26 will be observed when reasonable and feasible to minimise adverse vibration impacts.	Construction	Orica and Contractor

6.5 Waste management

This section provides an assessment of the potential waste impacts of constructing and operating the project.

6.5.1 Approach and method

6.5.1.1 Legislative and policy context to the assessment

The waste management assessment was undertaken in accordance with the SEARs and with reference to the requirements of relevant legislation, policies and/or assessment guidelines, including:

– *Environmental Planning and Assessment Act 1979* (EP&A Act).
– *Protection of the Environment Operations Act 1997* (POEO Act) and the Protection of the Environment Operations (General) Regulations 2009 (POEO (General) Regulations).
– Protection of the Environment Operations (Waste) Regulations 2014 (Waste Regulation).
– *Waste Avoidance and Resource Recovery Act 2001* (WARR Act).
– *NSW Waste and Sustainable Materials Strategy 2041* (NSW DPE, 2021).
– *NSW Waste Classification Guidelines: Part 1 Classifying Waste* (NSW EPA, 2014) and Addendum (NSW EPA, 2016).

This section addresses the above and the waste management SEARs.

6.5.1.2 Method

This waste management assessment has been prepared to quantify the waste generated by the project during construction and operation and address the potential environmental impacts associated with waste handling, storage and disposal.

The waste management assessment involved:

– Desktop review of project description and project design information.
– Review of the regulatory framework for waste management as it applies to the project.
– Review of Orica's policy/strategy documents relevant to waste management.
– Identification of key construction and demolition waste streams and management measures.
– Identification of the type, quantity and classification of waste to be received at the site in accordance with the NSW EPA (2014) *Waste Classification Guidelines*.
– Description of the proposed operational waste management and handling measures including transport and identification.
– Description of the mitigation measures proposed to be implemented to ensure that the construction and operation of the project is consistent with the aims, objectives and guidance in the *NSW Waste and Sustainable Materials Strategy 2041* (NSW DPE, 2021) – including waste minimisation and reuse.

6.5.2 Existing environment

The Tocumwal Explosives Reserve magazine complex consists of nine 1.1D magazines and one 1.1B magazine. The Reserve stores cast boosters and cord product and distributes these products across the country. Existing operations at the complex include:

– Storage and movement of explosives and accessories between trucks and magazines
– Storage and handling of diesel fuel for site vehicles
– Storage and disposal of pallets

6.5.3 Impact assessment

6.5.3.1 Construction and demolition

6.5.3.1.1 Waste generating activities, waste streams and classifications

Table 6.29 outlines the waste generating activities, key waste streams predicted to be generated during construction and demolition, and the likely classifications based on the *Waste Classification Guidelines*. Waste from demolition works is given indicatively in the event that existing magazines are not repurposed. Waste types and classifications would be confirmed during detailed design and construction planning. The classification of any demolition waste requiring off-site disposal or recycling would be confirmed prior to being transported to a suitable licensed waste facility.

Table 6.29 Indicative construction and demolition waste streams and likely waste classifications

Activity	Likely waste stream/s	Likely waste classification
Construction works		
Vegetation clearing: – Vegetation (trees and grasses) clearing and removal where required, including slashing, mulching and stockpiling within the project site for removal offsite	– Sand/soil – Green waste	General solid waste (non-putrescible)
Earthworks: – New magazine pad preparation – Drainage infrastructure	– Sand/soil – VENM/ENM	General solid waste (non-putrescible)
Concrete slabs: – Excess concrete from construction of level concrete foundation slabs for each magazine	– Concrete	General solid waste (non-putrescible)
Magazine construction: – Excess construction materials and packaging waste from construction of magazine construction including solar power system and security system and lights	– Soft plastics – Pallets – Concrete formwork offcuts – Welding rods butts – Used grinding disks – Used fasteners – screws, nails, tech screws, etc	General solid waste (non-putrescible)
Ancillary infrastructure: – Excess construction materials from construction of operational access roads – Excess construction materials from drainage infrastructure and fencing	– Sand/soil – VENM/ENM – Gravel – Pipework offcuts – Metals	General solid waste (non-putrescible)
Demolition works		
Removal of buildings – Building material (metal, concrete etc) – Electrical equipment	– Metal – Concrete – Electrical equipment (cables, lights, etc.)	General solid waste (non-putrescible)
Excess spoil	– Sand/soil – VENM/ENM	General solid waste (non-putrescible)

Activity	Likely waste stream/s	Likely waste classification
Construction / demolition personnel		
– Site office and amenities	– Food waste	General solid waste (putrescible)
	– Recyclable material: • Paper and cardboard • Beverage and other containers (plastics, aluminium cans, steel cans, glass bottles, liquid paperboard cartons, etc) • Printer/toner cartridges – General waste: • Soft plastics and plastic wraps • Gloves	General solid waste (non-putrescible)
	– Batteries	Hazardous waste
	– Sewage	Liquid waste
Maintenance and cleaning of site office and amenities	– Electrical/electronics – Light bulbs (LEDs) – Office furniture	General solid waste (non-putrescible)
	– Cleaning products (e.g. lubricants, oils)	Liquid waste

6.5.3.1.2 Construction and demolition waste estimates

VENM/ENM

The project site will require the construction of level hardstands to have the concrete foundation slabs constructed upon. Drainage will also be constructed. VENM/ENM generated from these activities is expected to be minimal.

Green waste

Trees and other vegetation are present in the proposed locations for the new magazines. These will need to be cleared for the new magazines and access roads. In addition, the area inside the fenced Asset Protection Zone (APZ) will need to be cleared. Green waste generated from vegetation clearance will be determined during detailed design, however the generation is expected to be low as some of the areas have been cleared previously.

Road materials

Excess material from gravel and bitumen placement is expected to be minimal. Exact volumes will be determined during detailed design.

Demolition building waste

Metal, concrete and electrical materials from demolished existing magazines will be recycled/disposed of. The end use of this material will be determined once quantities are confirmed.

Construction workers

Construction workers would generate wastes such as food waste and wrappings, gloves, packaging, etc. from lunchrooms and portable toilets supplied by the construction contractor.

The waste generated from construction and demolition personnel is expected to be minimal. Up to ten workers on site are expected to generate a maximum of four kilograms of general waste and three kilograms of recyclables each day.

6.5.3.1.3 Potential impacts

Potential impacts associated with aspects of waste generation during construction are summarised in Table 6.30.

Table 6.30 Potential impacts associated to waste management during construction

Aspect of waste management	Potential impacts
Generation of VENM/ENM during site preparation	– Generation and migration of dust during earthworks – Erosion and sedimentation due to runoff from disturbed areas – Uncontrolled sediment laden runoff from disturbed areas
Storage and segregation of waste	– Cross contamination of wastes due to improper segregation – Odour from waste storage area – Attract disease vectors
Waste transportation	– Dust generation from loading and unloading activities – Migration of wheel generated dust on haul roads – Litter and tracking waste on local roads
Non-compliant waste classification	– Regulatory non-compliance – Contamination of receiving facility

Potential impacts associated with water quality are assessed in Section 6.1. Soil and water measures proposed to be implemented during construction would manage potential environmental impacts to surface water and groundwater quality associated with earthworks and stockpiling. Waste management activities are not expected to have a significant impact on soil and water provided that the control measures identified in in Section 6.1 are implemented.

Section 6.3 provides an assessment of the potential impacts associated with air quality, odour and dust generation during construction of the project, including earthworks, stockpiling and transport. Management measures identified in the technical report for dust suppression and stockpile management would be implemented to manage environmental impacts to air quality during construction in line with air quality criteria.

Section 6.5.3.1 describes the proposed handling and management of waste, including waste classification, how waste would be segregate and stored to avoid cross-contamination, maximise re-use and resource recovery and to reduce the potential for odour and attraction of disease vectors.

Waste management activities are not expected to have a significant impact on the environment or human health provided that the controls measures identified in Section 6.1. and Section 6.3, the waste handling and management measures described in Section 6.5.3.1 and mitigation measures outlined in Section 6.5.4 are implemented.

6.5.3.1.4 Waste handling and management

6.5.3.1.4.1 Approach to waste minimisation and re-use

All waste generated during construction would be managed using the waste hierarchy approach of avoidance and re-use before consideration is given to disposal. Procurement of excess materials would be avoided in accordance with relevant guidelines and policies, including use of precast building materials.

All wastes would be managed in accordance with the waste provisions contained within the POEO Act and other relevant legislative and policy requirements, as outlined in Section 6.5.1.1.

Should waste be found to be unsuitable for re-use or recycling, disposal methods would be selected based on the classification of the waste material in accordance with the *Waste Classification Guidelines Part 1: Classifying waste* (NSW EPA, 2014).

The proposed approach to managing the different types of construction waste in accordance with the waste management hierarchy, including measures to facilitate segregation and prevent cross contamination, are provided in Table 6.31. Table 6.31 also identifies potential options for reuse, recycling and disposal of the key construction waste streams. The final destinations for all off-site recycling and disposal would be confirmed by the construction contractor and included in the construction waste management plan for the project prior to construction commencing.

Table 6.31 Construction waste management measures and potential re-use, recycling and disposal options

Waste	Hierarchy	Management measures	Reuse, recycling or disposal options
VENM/ENM	Dispose	VENM/ENM from earthworks for the project would be moved off site.	The current active tipping area located within the Berrigan Landfill.
Green waste	Avoid	The access road would be sited to minimise disturbance to existing vegetation and utilise already cleared land as far as practicable.	-
	Re-use	Cleared grass would be segregated and stockpiled for re-use on site for landscaping and finishing works.	On-site re-use for landscaping purposes.
	Recycle	Excess material, including cleared trees, would be disposed of in accordance with relevant guidelines and requirements.	The Finely Recycling Centre.
General waste	Dispose	Residual general solid waste would be properly stored on-site to avoid odour and vermin prior to disposal.	The current active tipping area located within the Berrigan Landfill.
Recyclable materials	Recycle	Labelled and colour coded receptacles would be provided at the construction site office for general waste from construction personnel to ensure source separation of recyclable materials and general waste.	The Tocumwal Transfer Station.
Food waste	Dispose	Putrescible waste would be properly stored on-site to avoid odour and vermin prior to disposal.	The current active tipping area located within the Berrigan Landfill.
Sewage	Dispose	Existing administration building has septic system. Construction sewage waste will be disposed of by the hire of portable toilets.	-
Excess construction materials	Avoid	Procurement of surplus construction materials would be avoided where practicable.	-
	Recycle	Any excess materials generated on-site would be segregated using separate bins for different waste and recyclable materials. The recyclable material would be removed from site for further processing or re-use at appropriately licensed facilities.	The Tocumwal Transfer Station.
	Dispose	Residual construction waste that cannot be recycled would be collected and disposed.	The current active tipping area located within the Berrigan Landfill.
Hazardous waste	Dispose	Minimal amounts of hazardous waste are expected to be generated during construction. Light globes and batteries would be collected and stored in designated collection containers.	The Tocumwal Transfer Station.

6.5.3.1.5 Waste storage locations

Construction waste would be temporarily stored on-site in bins prior to recycling/disposal off-site.

Stockpiles would be segregated according to classification and clearly signposted in order to maximise the stockpile fitness for use and reduce the risk of cross contamination.

Waste generated by construction staff would be stored in waste receptacles in the office before transferred to the skip bin near the office building.

6.5.3.2 Operation

6.5.3.2.1 Site operations

The complex receives, stores and dispatches packaged and palletised explosives and other products that are stored with the magazines. Minimal waste is expected to be generated from this site activity. Maintenance of the grass within the APZ area to a height below 100 mm would generate minimal green waste.

6.5.3.2.2 Waste quantities

There are currently a maximum of five operational staff at the Reserve at any one time. Based on five workers, about two kilograms of waste and 1.25 kilograms of recyclables is expected to be generated per day.

6.5.3.2.3 Potential impacts

Potential impacts associated with aspects of waste generation during operation are summarised in Table 6.32.

Table 6.32 Potential impacts associated with waste management during operation

Aspect of waste management	Potential impacts
Waste transportation	– Dust generation or litter from loading and unloading activities – Migration of wheel generated dust on roads

Potential impacts associated with water quality are assessed in Section 6.1. Waste management activities are not expected to have a significant impact on soil and water provided that the control measures identified in Section 6.1. are implemented.

Bushfire risks have been discussed in Section 6.8.

An assessment of the potential operational air quality and odour impacts of the project has been undertaken and a summary of the results of the assessment is provided in Section 6.3. It considered potential dust and odour during the construction, demolition and operational phase. As operations are not proposed to change, no further assessment was needed. Dust associated with construction and demolition works is identified as low or negligible risk as the distance between the receptors and the site is more than one kilometres away.

Section 6.5.3.2 describes the proposed approach to the management of waste during operation.

Operational waste management activities are not expected to have a significant impact on the environment or human health provided that the waste handling and management measures described in Section 6.5.4 and mitigation measures outlined in Section 6.5.4 are implemented.

6.5.3.2.4 Waste handling and management

All waste generated from operational workers would be stored in waste receptables in the office before transferred to the skip bin near the office building.

The management measures and facilities for operational waste are listed in Table 6.33. The final destinations for all off-site recycling and disposal would be confirmed prior to operations commencing and updated throughout the life of the facility based on the availability of suitably licensed facilities.

Table 6.33 Operational waste management measures and potential recycling and disposal options

Waste	Hierarchy	Management measures	Reuse, recycling or disposal options
General waste	Dispose	Residual general solid waste would be properly stored on-site to avoid odour and vermin prior to disposal.	The current active tipping area located within the Berrigan Landfill.
Sewage	Dispose	Existing administration building has septic system.	Disposal

6.5.4 Mitigation and management measures

Table 6.34 lists the proposed mitigation measures to be implemented to minimise the potential for waste management impacts.

Table 6.34 Waste management measures

ID	Impact	Environmental Safeguard	Timing	Responsibility
W1	Waste Minimisation	Construction planning would include measures to minimise quantities of waste requiring disposal, careful procurement of construction materials to minimise excess waste materials. Demolition methodology will include a plan for recycling or disposal of material.	Pre-construction and demolition	Orica and Contractor
W2	Waste Minimisation	All construction and demolition waste would be classified and recycled or disposal of in accordance with the *Waste Classification Guidelines Part 1: Classifying waste* (NSW EPA, 2014) and the waste provisions contained within the POEO Act and other relevant legislative and policy requirements.	Construction and demolition	Orica and Contractor
W3	Waste Minimisation	**Construction and demolition waste management plan** A construction and demolition waste management plan would be prepared and implemented once the construction contractor has been appointed. The plan would adopt the waste hierarchy principles contained in the *Waste Avoidance and Resource Recovery Act 2001* and detail processes, responsibilities and measures to manage waste and minimise the potential for impacts during construction. This would include waste separation, handling, storage, transport and off-site re-use, recycling and disposal locations.	Construction and demolition	Orica and Contractor
W4	Waste Minimisation	**Operational waste management plan** Prior to the commencement of operation, an operational waste management plan would be developed. The plan would aim to ensure waste management that conforms to the requirements of relevant guidance documents and adheres to the waste management hierarchy principles contained in the *Waste Avoidance and Resource Recovery Act 2001*.	Operation	Orica and Contractor

6.6 Traffic

The section provides a summary of the potential traffic impacts of constructing and operating the project. A full copy of the Traffic Impact Assessment (GHD, 2024) is provided in Appendix E.

6.6.1 Approach and method

6.6.1.1 Legislative and policy context to the assessment

The traffic assessment was undertaken in accordance with the SEARs and with reference to the requirements of relevant legislation, policies and/or assessment guidelines, including:

– Guide to Traffic Generating Developments (Roads and Traffic Authority, 2002)
– Guide to Traffic Management Part 3: Transport Studies and Analysis Methods (Austroads, 2020)
– Australian Standard (1998) AS 2187.1 – Explosives – Storage, transport and use – Storage
– New South Wales Consolidated Regulations (2014) – *Road Rules*
– *State Environmental Planning Policy (Transport and Infrastructure) 2021*

6.6.1.2 Method

The traffic assessment generally involved:

– Reviewing available information (including weighbridge data) and traffic and transport infrastructure in proximity to the project site.
– Determining the operational and construction vehicle activity associated with the project, based on information provided by Council.
– Undertaking a qualitative assessment of the potential vehicle impacts on the adjoining road network.
– Assessing operational and construction impacts on public transport, pedestrians and cyclists.
– Identifying if traffic management/mitigation measures are required and, if applicable, provide high-level recommendations.

6.6.2 Existing environment

6.6.2.1 Current operation

During construction, the operations at the Tocumwal Magazine Compound would continue as normal to avoid disruptions to service. After the four new 250 t HE magazines and one detonator magazine have been constructed, operations would continue as present with no changes to current operational procedures being proposed.

Currently, the site operates in line with a number of existing procedures, including:

– An operating manual
– EMP
– ERP
– SSMP
– SSP
– FRMP

These operational procedures would remain in place after the project has been constructed.

6.6.2.1.1 Hours of operation

Existing operational hours, which would remain unchanged, as follows:

– Facility operating hours 6:30 am to 15:30 pm Monday to Friday
– Traffic arrival 24 hours, seven (7) days a week

6.6.2.1.2 Operational workforce

There are currently two to five permanent staff operating the Tocumwal Explosives Reserve at any one time. The operation of the new facility would continue to require the same number of staff after construction has been completed. Currently, from Monday to Thursday, five (5) staff are present on the site (four (4) permanent staff and one (1) permanent part time), and on Fridays, four permanent staff are present on the site.

There is no proposed change to the overall operational workforce at the facility due to the project.

6.6.2.1.3 Existing road network

6.6.2.1.4 Road hierarchy

Functional road classification involves the relative balance of mobility and access functions. Transport for NSW (TfNSW) define four levels in a typical functional road hierarchy, ranking from high mobility and low accessibility to high accessibility and low mobility. These road classes are:

- **Arterial Roads** – generally controlled by TfNSW, typically no limit in flow and designed to carry vehicles long distance between regional centres.
- **Sub-Arterial Roads** – can be managed by either TfNSW or local council. Typically, their operating capacity ranges between 10,000 and 20,000 vehicles per day, and their aim is to carry through traffic between specific areas in a subregion or provide connectivity from arterial road routes (regional links).
- **Collector Roads** – provide connectivity between local roads and the arterial road network and typically carry between 2,000 and 10,000 vehicles per day.
- **Local Roads** – provide direct access to properties and the collector road system and typically carry between 500 and 4,000 vehicles per day.

Newell Highway

The Newell Highway is a national highway providing a major road link between Queensland and Victoria, passing through central New South Wales (Figure 6.9). The highway passes through several rural towns, including Dubbo, Parkes, Narrabri and Tocumwal.

The speed limit on most rural sections of the Newell Highway is 110 km/h. The majority of the highway provides a single lane of travel in each direction, with overtaking lanes provided in both directions of travel. Along the Newell Highway, there are several major and minor rest areas.



Figure 6.9 431 Newell Highway, looking south

The current access from Newell Highway is unsealed as displayed in Figure 6.10. The project provides an opportunity to upgrade the access driveway, as detailed in Section 6.6.3.2.1.



Figure 6.10 Development access road at Newell Highway

Chinamans Road

Chinamans Road is a local rural road, connecting Newell Highway and Tuppal Road (refer Figure 6.10), with a default rural speed limit of 100 km/h. There is no on-street parking provided on Chinamans Road.

Chinamans Road is only used for emergency access/egress (if required) for the existing magazine.



Figure 6.11 Chinamans Road, looking from Newell Highway

Source: Google Maps modified by GHD

6.6.2.1.5 Crash data review

A review of crash data from the TfNSW Road Centre for Road Safety has been undertaken based on the last five years of data (2017 – 2021) (Figure 6.12).

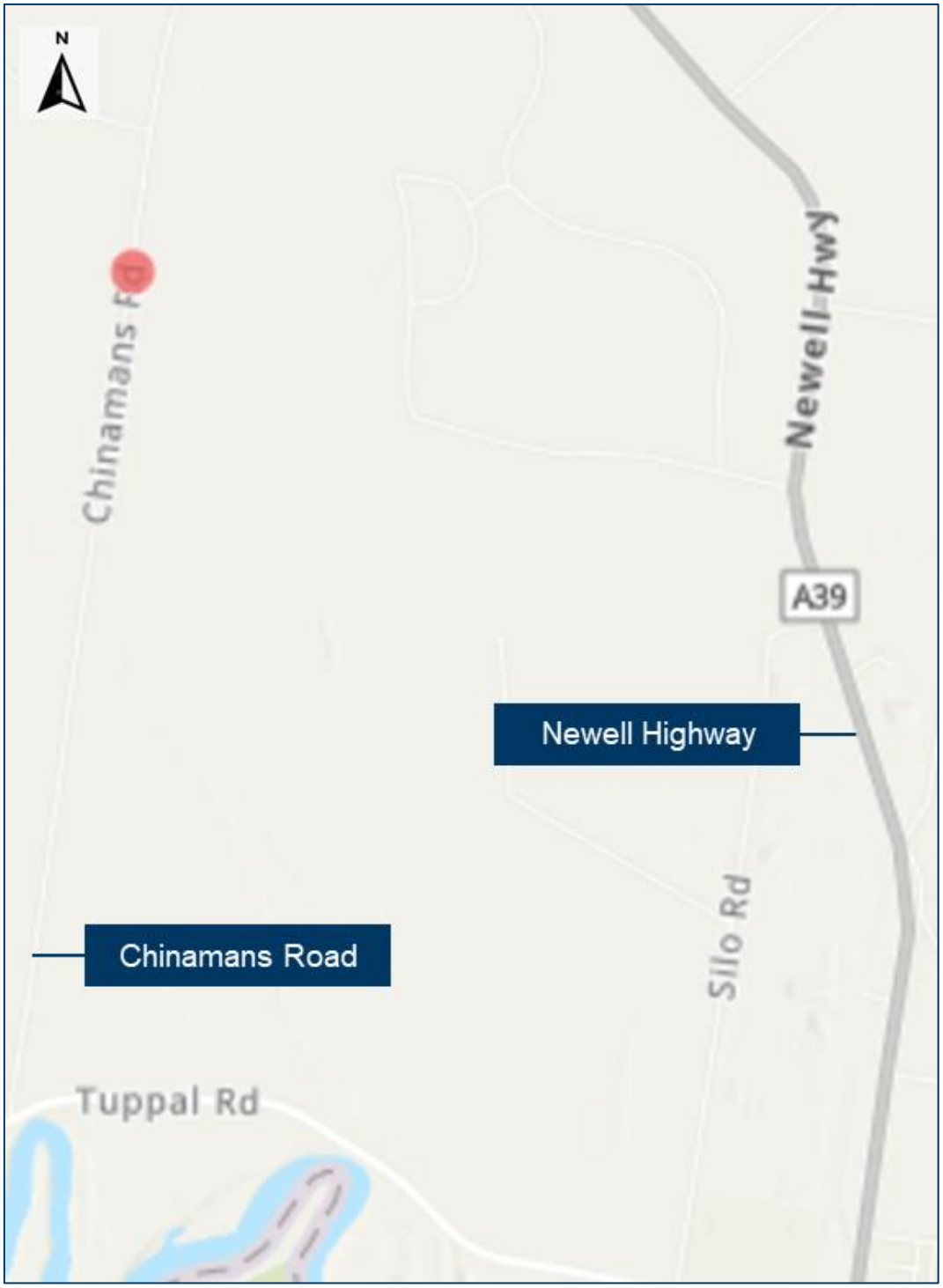


Figure 6.12 Crash data near the project site

Source: Transport for New South Wales modified by GHD

The data indicates that there was one crash recorded on Chinamans Road in proximity to the site in 2018. The crash occurred when a vehicle went off-road and struck an object and resulted in no injuries.

6.6.2.1.6 Freight routes

The TfNSW Restricted Access Vehicle (RAV) map indicates that the Newell Highway is authorised to accommodate vehicles up to the size of 26 metre B-doubles (Figure 6.13) and road-trains (including B-triple and AB-triple vehicles).

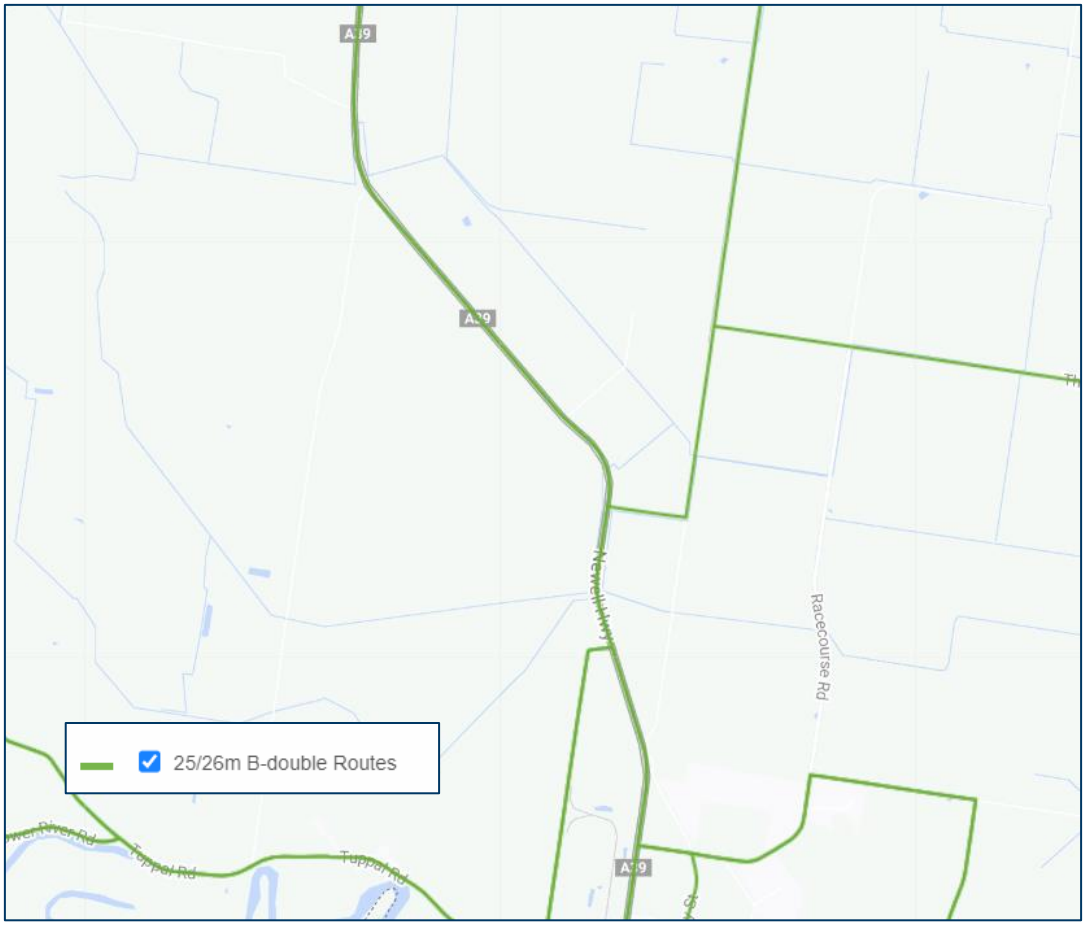


Figure 6.13 Restricted Access Heavy Vehicle Map near Tocumwal – B-doubles

Source: Transport for New South Wales, modified by GHD

6.6.2.1.7 Traffic data

TfNSW have provided traffic data for Newell Highway, approximately 57 km to the north of 431 Newell Highway, Tocumwal, which was collected between 01 January 2021 and 31 December 2022 (Figure 6.14).

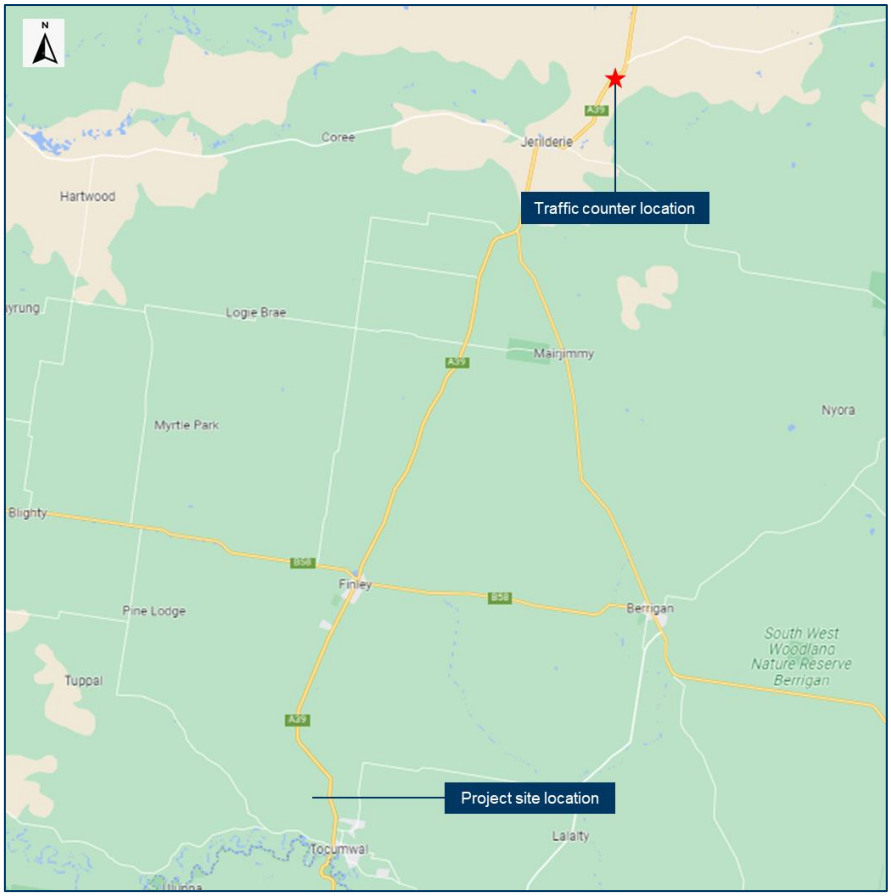


Figure 6.14 Location of Newell Highway traffic counter

Source: Google Maps modified by GHD

The average weekday traffic volumes for 2021 are displayed in Figure 6.15.

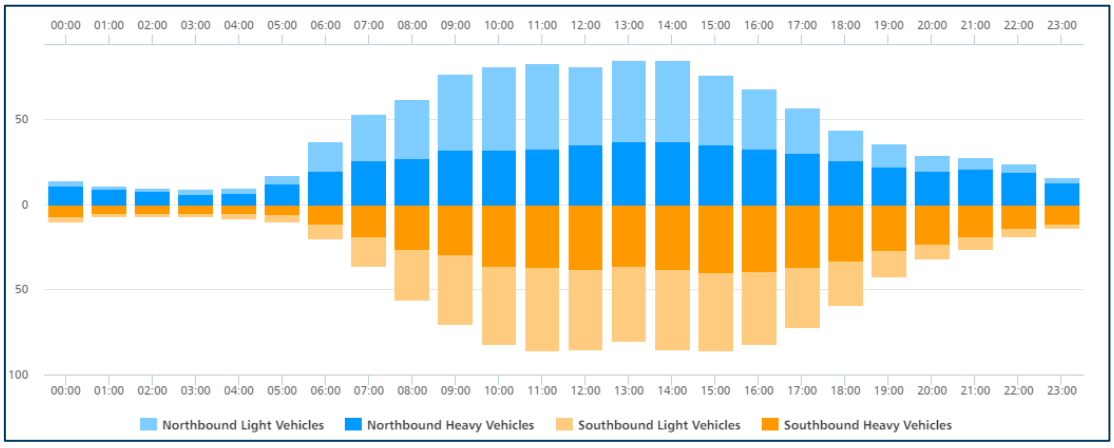


Figure 6.15 Daily traffic volumes on Newell Highway in 2022

Source: Transport for New South Wales modified by GHD

The data indicates that:

– The Newell Highway north of Tocumwal accommodates approximately 1,000 northbound vehicles and 1,000 southbound vehicles per day.
– Heavy vehicles constitute approximately 52 per cent of overall vehicle activity.
– Peak morning activity occurs between 11:00 am–12:00 pm, with 82 northbound vehicles and 85 southbound vehicles.
– Peak afternoon activity occurs between 2:00 pm–3:00 pm, with 84 northbound vehicles and 85 southbound vehicles.

Traffic data is not available for the local roads in proximity to the project site. However, in accordance with their rural location, it is expected that they accommodate negligible traffic volumes.

6.6.2.1.8 Road network performance

The *TfNSW Guide to Traffic Generating Developments* specifies that for rural roads with a speed limit of 100 kilometres per hour, a single travel lane in each direction, level terrain and 15 per cent heavy vehicles have a mid-block capacity (to a LOS D) of 1,410 vehicles per hour (bi-directional traffic).

Accounting for the higher traffic volumes and greater percentage of heavy vehicles at the TfNSW count station, the data in Figure 6.15 indicates that the Newell Highway is operating well within its mid-block capacity.

6.6.3 Impact assessment

6.6.3.1 Construction activities

The main construction activities of this project are planned to commence during early to mid–2024. A detailed design would be undertaken prior to the beginning of construction. Construction activities are expected to include:

– Earthworks: used to establish the concrete slabs under the four new 250 t HE magazines and one detonator magazine.
– Construction of earthen mounds: the project would include the construction of earthen mounds in front of three of the proposed 250 t HE magazines. These mounds would be strategically positioned to minimise risk of knock-on detonation. The construction of these mounds would be finalised in a detailed design and presented in the EIS.
– Construction of new access roads: new roads would be built running from the existing entrance to the sites of the new magazines. These roads would be gravel during the construction of the new magazines and would then be sealed prior to normal operations using the new magazines starting.
– Construction of four new two hundred and fifty tonne high explosive (250 t HE) magazines.
– Construction of a single 10,000,000 capacity detonator (IE) magazine.
– A hard stand would be constructed at each new magazine site upon which the concrete slab would be built.

The new magazines would be constructed on concrete slabs which would include an approximately nine-metre-wide apron across the front of the new building to allow parking of B-double trucks for loading and unloading.

6.6.3.1.1.1 Construction hours

The construction activities would be carried out during the following hours, consistent with the recommended standard hours of the *Draft Construction Noise Guideline* (NSW EPA, 2020):

– 7:00 am-6:00 pm Monday to Friday
– 8:00 am-1:00 pm Saturdays
– No work on Sundays or Public Holidays

6.6.3.2 Operation activities

During construction, operations at the Tocumwal Explosives Reserve would continue as normal to avoid disruptions to service. After the four new 250 t HE magazines and one detonator magazine have been constructed, operations would continue as present with no changes to current operational procedures being proposed.

As stated previously, there is no proposed change to the overall operational workforce at the facility due to the project.

6.6.3.2.1 Access arrangements

With respect to the access to the project site, it is proposed to spray seal the internal access road, including its intersection with the Newell Highway, in accordance with Austroads Guidelines. The proposed internal road upgrades are displayed in Figure 6.16 and the access intersection upgrade is displayed in Figure 6.17.

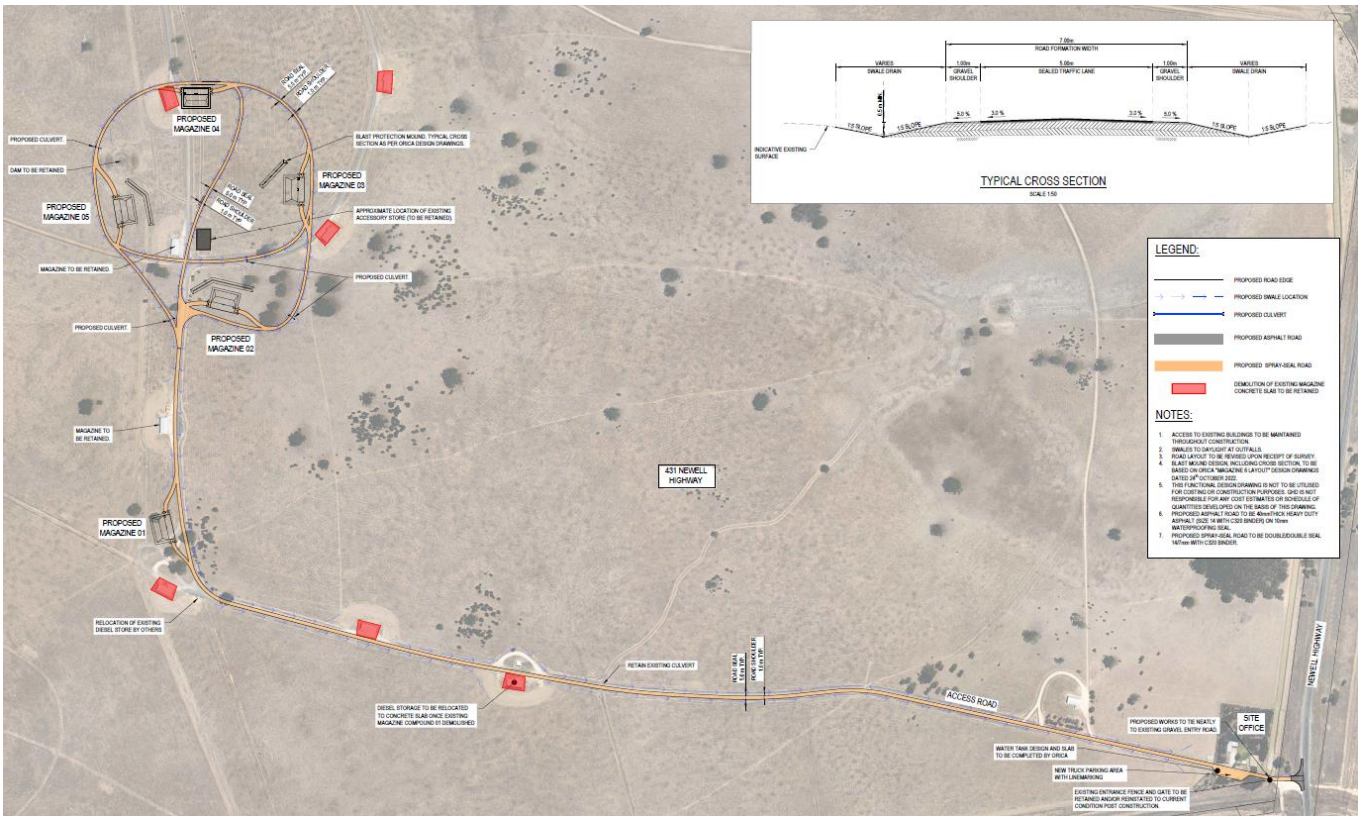


Figure 6.16 Proposed internal road upgrade



Figure 6.17 Proposed access intersection

Swept path analyses showing a 26 metre B-double truck entering and exiting the subject site via the upgraded access intersection are displayed in Figure 6.18.

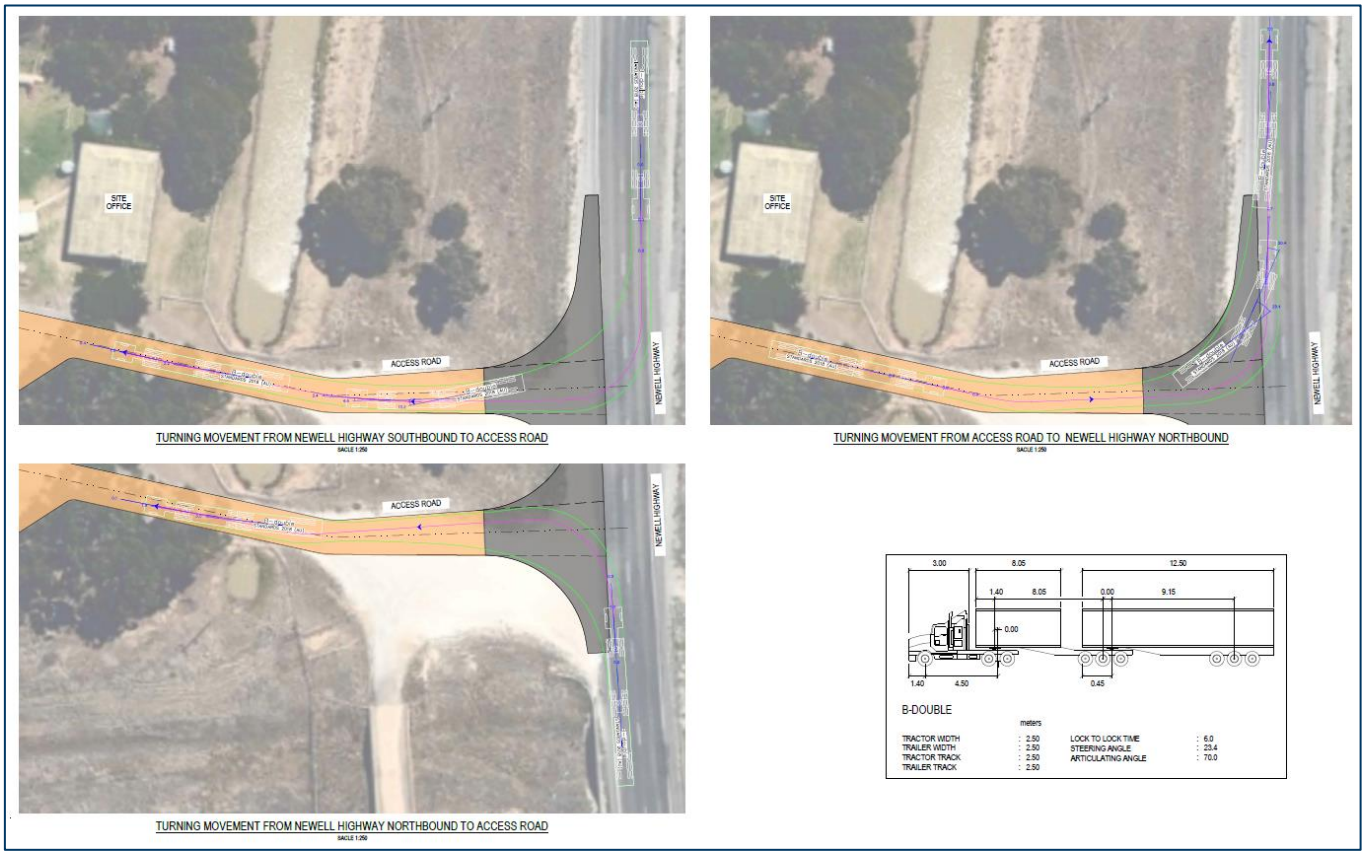


Figure 6.18 Swept path analysis

6.6.3.3 Traffic generation

As the number of workers at the site is not expected to change, the traffic generated from operation of the facility would remain the same and as such has not been considered further in this assessment.

The peak hour construction vehicle activity has been undertaken on a first principles basis in accordance with the expected volumes of workers and heavy vehicles as follows:

– Up to ten additional workers are expected at the site during the construction of the project.
– Workers will access the site in the morning and depart the site in the afternoon.
– To be conservative, it has been assumed that two heavy vehicles would access/egress the project site in a single hour during the peak hour.

For the purposes of this assessment, the highest hourly traffic generation for the project under the peak construction scenario is assumed to be up to 14 vehicle trips in total, which will consist of the following:

– AM peak hour:
  - Ten inbound light vehicles
  - Two inbound heavy vehicle movements
  - Two outbound heavy vehicle movements
– PM peak hour:
  - Ten outbound light vehicles
  - Two inbound heavy vehicle movements
  - Two outbound heavy vehicle movements

6.6.3.4 Traffic distribution

It is assumed all vehicles would access/egress the project site via the Newell Highway. For the purposes of analysis, it has been assumed that 50 per cent of vehicles will access/egress the site from the north and 50 per cent will access/egress the site from the south.

6.6.3.5 Site impacts

6.6.3.5.1 Impacts to traffic

With respect to the traffic impacts of the project, the following is noted:

– The available information indicates that the roads in proximity to the project site are operating with a good Level of Service during peak periods of road network activity.
– Operational vehicle activity is expected to be negligible.
– The vehicle activity associated with the construction of the project would be minor, up to 14 vehicles in a single hour, at an average of (approximately) one vehicle every four minutes.

Accordingly, the traffic impacts of the project are expected to be negligible and fall within the daily fluctuations of the adjoining arterial road network.

6.6.3.5.2 Impacts to public and active transport

As there are no active transport facilities in proximity to the project site, there will be no impact on such facilities.

There are some public transport routes on the Newell Highway, including the Albury to Echuca Regional Coach Service. However, given their infrequent nature as well as the small number of construction vehicles, the impact on public transport services is expected to be negligible.

6.6.3.5.3 Impacts to road safety

With respect to impacts on road safety:

– The crash review outlined in Appendix E shows there has been one recorded crash in proximity to the site in the last five years on Chinamans Road.
– Appropriate traffic control measures in the vicinity of the site should be adopted to ensure that the safety of all road users is not impacted by construction-related vehicles travelling to and from the site.
– The construction/operational volumes generated by the project are minor.

Accordingly, the impacts of project construction and operational vehicles on road safety are expected to be negligible.

6.6.3.5.4 Impacts to parking

With respect to impacts on parking, the following is noted:

– Due to on-street parking not being permitted on Newell Highway in proximity to the project site, there is not expected to be any impact to on street parking.
– Parking for workers would be provided within the project site.

Accordingly, the impacts on parking associated with the construction and operation of the project are expected to be negligible.

6.6.4 Mitigation and management measures

Mitigation measures proposed to avoid or minimise traffic and transport impacts during construction and operation, of the project are listed in Table 6.35.

Table 6.35 Mitigation measures – traffic and transport

ID	Impact	Environmental Safeguard	Timing	Responsibility
T1	Minimise environmental impacts associated with the movement of vehicles.	Rectify any road deposits caused by site vehicles, to maintain the safety of road users. Where possible, offset the construction vehicle activity from peak periods of road network activity.	Construction	Orica/ Contractor
T2	Minimise environmental impacts associated with the movement of vehicles.	Induct employees and contractors to raise awareness and understanding of traffic and transport mitigation measures to be implemented during construction.	Construction	Orica/ Contractor

6.7 Hazards and risk

The section provides a summary of the potential hazard and risk impacts of constructing and operating the project. A full copy of the Preliminary Hazard Analysis (GHD, 2024) is provided in Appendix J.

6.7.1 Approach and method

6.7.1.1 Legislative and policy context to the assessment

The assessment was undertaken in accordance with the SEARs and with reference to the requirements of relevant legislation, policies and/or assessment guidelines, including:

– The EP&A Act.
– *State Environmental Planning Policy (Resilience and Hazards) 2021.*
– NSW Department of Planning and Environment, Hazardous Industry Planning Advisory Paper No 4 – Risk criteria for Land Use Safety Planning (HIPAP No.4).
– NSW Department of Planning and Environment, Hazardous Industry Planning Advisory Paper No 6 – Guidelines for Hazard Analysis (HIPAP No.6).
– Australian Standard AS 2187 Explosives – Storage, transport and use.
– Australian Standard AS 4326 – The storage and handling of oxidising agents.

6.7.1.2 Method

6.7.1.2.1 Key tasks

In order to assess the potential impacts associated with hazards and risks, the following was undertaken:

– A preliminary risk screening in accordance with the Resilience and Hazards SEPP
– Identifying potential hazards and safeguards
– Identifying mitigation and management measures

Further information regarding these key tasks are detailed in the following sections.

6.7.1.2.2 Preliminary risk screening

The risk screening process involved the identification of classes and quantities of dangerous goods (DGs) to be used, stored, or produced on site with an indication of storage locations. The quantities of DGs were then assessed against the threshold quantities in the Resilience and Hazards SEPP. If any of the threshold quantities are exceeded, then a Preliminary Hazard Analysis (PHA) is required. In this instance, a PHA was required by the SEARs and is included in Appendix J. The overall risk screening process is illustrated below in Figure 6.19.

6.7.1.2.3 Hazard identification

Hazard identification involved a qualitative assessment documenting possible events that could lead to a possible off-site incident. The assessment then lists potential causes of the incident, as well as identification of operational and organisational safeguards to prevent the incidents from occurring or to mitigate their impact. The hazard identification was conducted for the whole life cycle of the project.

6.7.1.2.4 Hazard analysis

For hazards identified as having potentially off-site impacts, a detailed analysis was completed to determine the risk to people, property, and the environment at the proposed location and in the presence of controls. Criteria of acceptability are used in the analysed hazards to determine if the project is classified as a ‘hazardous industry’. The hazard analysis aims to demonstrate that the project would not impose an unacceptable level of risk to surrounding land uses.

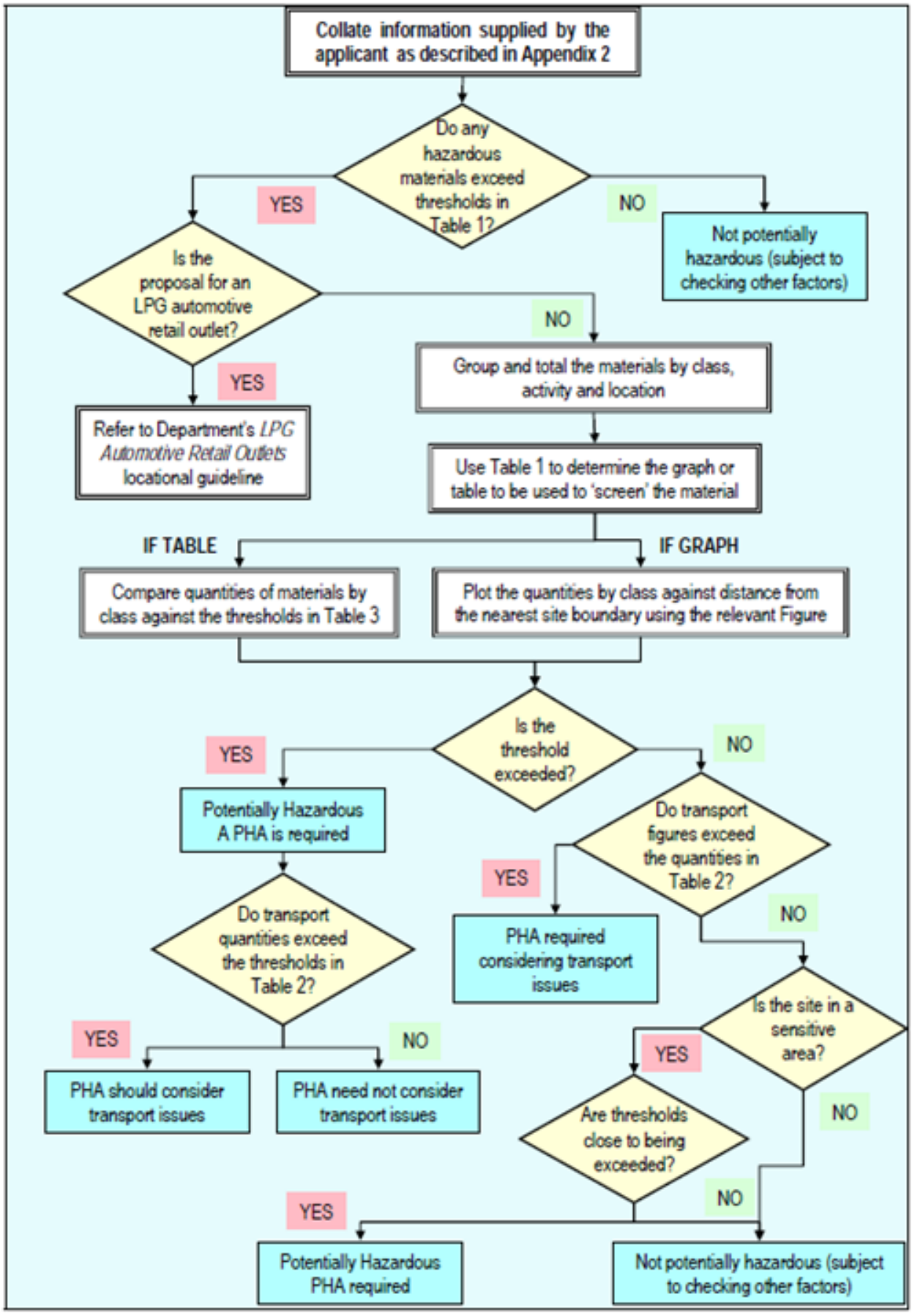


Figure 6.19 SEPP (Resilience and Hazards) risk screening process

6.7.2 Existing environment

The existing environment relevant to the assessment of potential hazardous impacts include any infrastructure and residential receptors in the vicinity of the project. These have been detailed in Section 2 and Section 6.4.

6.7.3 Impact assessment

6.7.3.1 Construction

Due to the nature of constructing the project, it is expected that chemicals used during the construction of the project will be present in small quantities. However, the Resilience and Hazards SEPP threshold for DGs has been analysed to not be exceeded during construction.

As low volumes of DGs would be stored in the construction compound, transportation volumes of chemicals during construction would be minimal. Based on this, the construction of the project has been assessed to not exceed transport screening thresholds.

The results of the DG screening and the transport screening indicate that the project does not exceed the thresholds within the Resilience and Hazards SEPP requirements. Therefore, this element of the project lifecycle is not considered potentially hazardous.

While the preliminary risk screening process confirmed that the project is not considered to be a potentially hazardous industry, a hazard identification exercise was undertaken to demonstrate that potential hazards have been identified and control measures would be in place. Mainly, the following potential personal injury impacts associated with the construction of the project were identified during hazard identification due to the following:

– Vehicle movements in vicinity of personnel.
– Natural hazards such as flooding, bushfire, lightning etc, also potentially leading to asset damage and/or plant shut down.
– Hot works within the project area, posing a fire risk.
– Contact with chemicals, including DGs, during general construction activities and/or vegetation management.

Relevant and recommended mitigation measures have been identified for potential impacts associated with the construction and are detailed in Section 6.7.4.

Potential bushfire hazards have been identified and assessed in detail in Section 6.8. Amenity impacts from the project e.g., from air quality and odour, noise and vibration and visual changes, are addressed in Section 6.3.3, Section 6.4.3, and Section 6.9.3 respectively.

The potential hazardous impacts associated with construction would be controlled through implementation of a safety management system and would not result in any significant off-site impacts.

The only potential impacts associated with construction that could lead to significant off-site impacts and required further analysis in the hazard analysis were:

– Natural hazards (e.g. flooding, earthquake, lightning, bushfire)
– Fire started within the project area (e.g. hot works)

As such, a consequence analysis was undertaken and is summarised in Section 6.7.3.3.

6.7.3.2 Operation

As the diesel to be delivered to the compound would be in a 12,000 L truck and the storage tank would be re-filled twice a week, the combined transport movements are calculated to a total of 104 movements annually, significantly under the Resilience and Hazards SEPP annual threshold pf >1000 annual movements.

Excluding the construction risk, diesel and explosive storage hazards have existed on-site since 1966. Since 1966, the site has actively managed explosive storage hazards, demonstrating over 50 years of effective risk control with no major incidents recorded. The proposal will not be increasing the storage quantities on site. Additionally, relocating the magazine storage away from site boundaries reduces the risk of off-site impact or fatality. Nonetheless, due to the nature of the class 1 explosives located on-site during operation, a hazard identification process was completed.

The potential impacts associated with the operation of the project are detailed below in Table 6.36.

Table 6.36 Potential hazards and risk operational impacts

Hazard scenario	Cause	Impact
– **Diesel storage**		
Loss of containment of diesel from the on-site storage tank.	– Large spill or leak – Human error – Damage to storage tank e.g., due to external impact or wear/ corrosion	– Fire – Explosion – Asset damage – Personnel injury/fatality
Loss of containment of diesel from delivery tank.	– Overfill of tank during tank filling – Tanker drive away whilst connected – Flexible hose failure (leak/rupture) – Operator error - incorrect connection of flexible hose (connection fails)	– Fire – Explosion – Asset damage – Personal injury/fatality
Magazine Storage		
Explosion due to: – Pentex Boosters – Cordtex Detonating Cords – Senatel Magnum	– Malicious intent (unauthorised access)	– Personnel injury/fatality
Explosion of: – Electric Detonators	– Ignition source – Asset damage – Personnel injury/fatality	– Explosion – Asset damage – Personnel injury/fatality

Although mitigation measures have been identified for the potential impacts (detailed in Section 6.7.4), the hazard identification process (HAZID) indicated that there are scenarios with the potential for off-site impact. In order to confirm off-site impact, the extent of impact, and applicable mitigation measures, a consequence analysis of these scenarios was completed and is summarised below in Section 6.7.4.

6.7.3.3 Consequence analysis

The following six scenarios were identified to potentially have an off-site impact in the HAZID phase of the study:

– Loss of containment of diesel from the on-site storage tank
– Loss of containment of diesel from the delivery tank
– Explosion due to pentex boosters, cordtex detonating cords or senatel magnum
– Explosion of detonators
– Natural hazards (e.g. flooding, earthquake, lightning, bushfire)
– Fire started within the project area (e.g. hot works)

Natural hazards like bushfire are covered in the other SEARs requirements of a bush fire assessment and is addressed in Section 6.8. Hazards associated with diesel containment loss and explosion were modelled for consequence results. These results and their potential impacts are detailed in the following sections.

6.7.3.3.1 Loss of containment (diesel)

The flammable range of a gas is the concentration range for which it will burn if an ignition source is present. This is described by the following:

- **Upper Flammable Limit (UFL)** – This is the upper air fuel mixture concentration at which the material will burn in air. Concentrations higher than the UFL are considered too rich to burn.
- **Lower Flammable Limit (LFL)** – This is the lower air fuel mixture concentration at which the material will burn in air.
- **Fraction Lower Flammable Limit (0.5 LFL)** – This is a concentration (50& LFL) providing a safety factor that gives an indication of the maximum distance at which a flammable could be ignited. This considers the effects of imperfect mixing that may lead to local concentrations higher than those predicted by the dispersion modelling.

The flammability limit values are defined for diesel in Table 6.37 below, value is in ppm (parts per million).

Table 6.37 Flammability Limit Values

Material	0.5 LFL	LFL	UFL
Diesel fuel	2,500 ppm	5,000 ppm	45,000 ppm

6.7.3.3.1.1 Scenario 1: diesel tank

Scenario 1 is the loss of containment of the on-site tank containing 2,000 L of diesel. The modelled dispersion results of scenario 1 indicate that this diesel will travel 2.7 m at 0.5 LFL (2,500 ppm) from the tank based on a downwind direction. This is minimal movement and will be effectively controlled by safeguards identified in Section 6.7.4.

6.7.3.3.1.2 Scenario 2: diesel tanker

Scenario 2 is the loss of containment of the tanker containing 12,000 L of diesel. The dispersion results of scenario 2 indicate that this diesel will travel 5.4 m at 0.5 LFL (2,500 ppm) from the tanker based on the downwind direction. This is minimal movement and will be effectively controlled by safeguards identified in Section 6.7.4.

Scenario 2 has a greater impact due to the truck holding more diesel than the tank. However, both loss of containment scenarios resulting in minor on-site impacts, which can be effectively managed through proper diesel storage and refilling procedures. Furthermore, the diesel is being relocated to have a larger separation distance from the magazines.

6.7.3.3.2 Potential explosions

6.7.3.3.2.1 Scenario 3: magazines

The project would have 4 magazines with 1.1D explosives, these magazines will have a maximum license quantity of 250 T each. This is a reduction from the original class 1.1D license limit of 1100 T down to 1000 T. Detailed results of scenario 3 can be found in Table 6.38, which presents the explosion results, including the coefficient Z (explosion catchment), its definition, and its range.

Table 6.38 Scenario 3: magazine explosion results

Coefficient Z ($m/kg^{1/3}$)	Definitions	Range (m)
8	Distances between ammunition process buildings (APB) within an explosive storage area (ESA).	504
14.8	Distances between an explosive storehouse (ESH) and a public traffic route with civilian access.	932
22.2	Distances between an explosive storehouse (ESH) and a building inhabited by civilians.	1396
44.4	Distances between an explosive storehouse (ESH) and a vulnerable building inhabited by civilians (e.g., a school).	2797

The above results indicate individual catchments of the explosion and their extent of impact. In this instance, coefficient 22.2 m/kg$^{1/3}$ and 44.4 m/kg$^{1/3}$ are of most concern when assessing impact as they are associated with civilian occupied areas.

Figure 6.20 illustrates the modelled results of scenario 3, which have been measured from the new HE magazine 05 as it is closest to the site boundary and has been used to identify the worst case scenario. The figure shows that coefficients 22.2 m/kg$^{1/3}$ and 44.4 m/kg$^{1/3}$ will have an off-site influence as they cross the site boundary (red line).

The orange area corresponding to the 22.2 m/ kg$^{1/3}$ does not encompass any buildings inhabited by civilians (green markers). The pink area associated with 44.4 m/kg$^{1/3}$ excludes vulnerable buildings such as schools or nursing homes. It is important to note that these areas in Figure 6.20 could shift slightly depending on whether the explosion occurred at one of the other three magazines However, HE Magazine 05 is closest to the site boundary therefore the worst-case scenario.

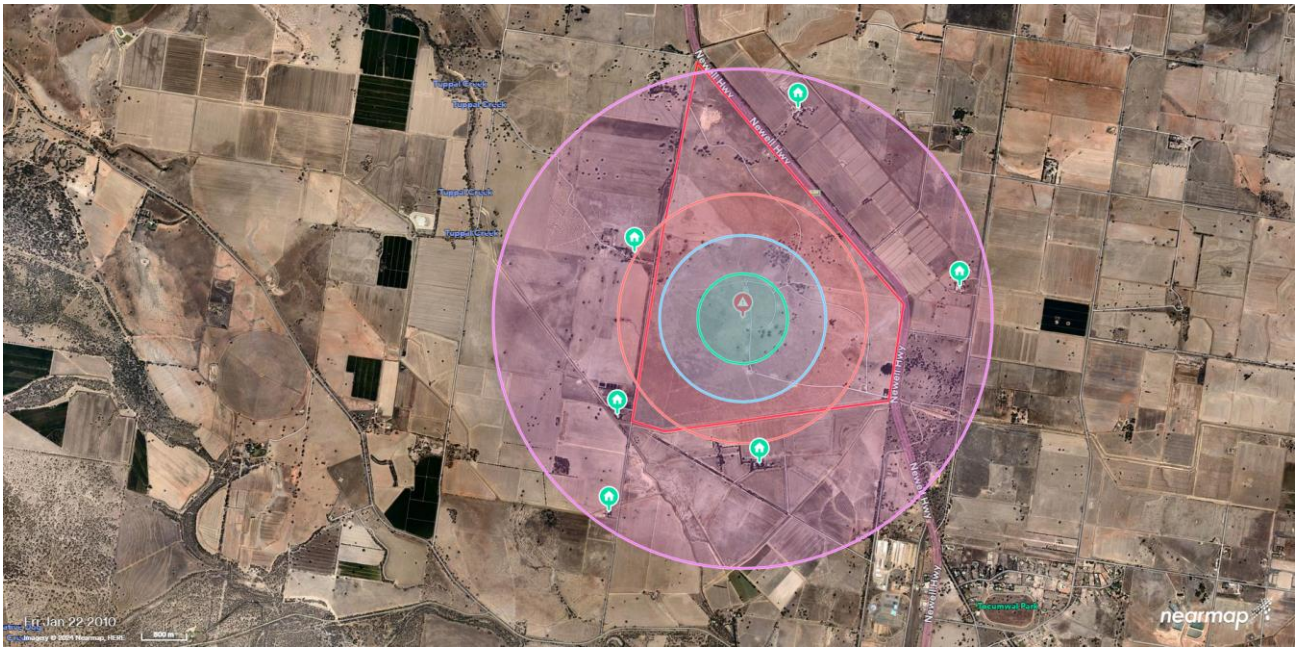


Figure 6.20 Scenario 3: magazine explosion results

While Scenario 3 could potentially have a significant impact and does affect off-site areas, it is unlikely to occur due to the safeguards in place and compliance with AS 2187.

6.7.3.3.2.2 Scenario 4: detonators

Scenario 4 models the explosion (hypothetical) based on the only IE Magazine. The results presented below in Table 6.39 are based on 6 T of electronic detonators, which are detailed further in Appendix J.

Table 6.39 Scenario 4: detonators explosion results

Coefficient Z (m/kg$^{1/3}$)	Definitions	Range (m)
8	Distances between ammunition process buildings (APB) within an explosive storage area (ESA).	145
14.8	Distances between an explosive storehouse (ESH) and a public traffic route with civilian access.	269
22.2	Distances between an explosive storehouse (ESH) and a building inhabited by civilians.	403
44.4	Distances between an explosive storehouse (ESH) and a vulnerable building inhabited by civilians (e.g., a school).	809

Figure 6.21 presents the results from the IE Magazine (red marker). The 44.4 m/kg$^{1/3}$ is 809 m from the magazine and is the only coefficient Z which is outside the site boundary (red line). However, that area only includes a public traffic route with civilian access and no vulnerable building inhabited by civilians.

Scenario 4 has a smaller impact compared to Scenario 3 due to the 6 T of explosives being stored, as opposed to the 250 T. Notably, the original site has no reported incidents in its over 50 years of operation that indicate an explosion has occurred. Furthermore, the magazines are currently undergoing upgrades to position them further away from the site boundary than the original layout. Previously, Magazine 1 was only 375 meters from the site boundary, but now the IE Magazine is the closest, situated at 640 meters from the boundary.

Therefore, although potential impacts are still present, the project is considered to act as a mitigating effort itself by minimising the existing potential for impact through increasing the distance of the current magazines from the site boundary, in combination with the proposed safeguards, which would ensure standards are adhered to and potential for an explosion to occur is minimised.

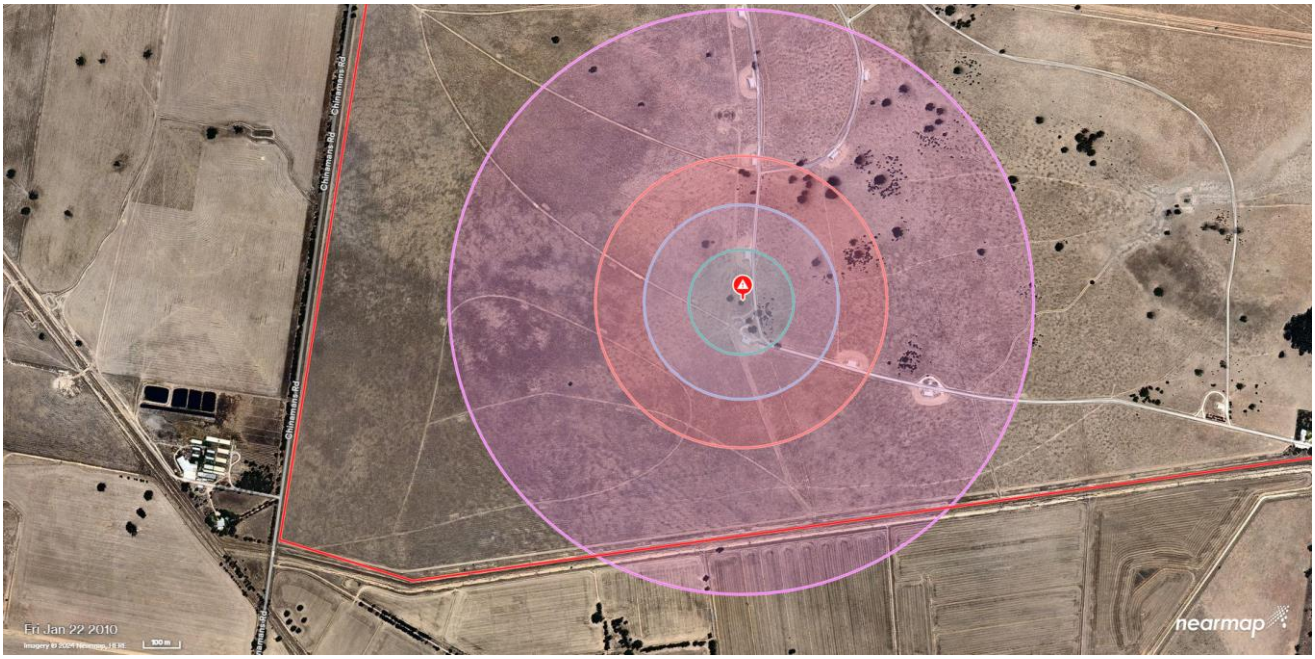


Figure 6.21 Scenario 4: detonator explosion results

6.7.4 Mitigation and management measures

The measures listed in Table 6.40 would be implemented to manage the risk of hazards and risks during operation of the project.

Table 6.40 Hazards and risks mitigation measures

ID	Impact	Environmental Safeguard	Timing	Responsibility
H1	General	All safeguards identified in the hazard identification process would be implemented through the development and implementation of a safety management system for the operation of the project.	Operation	Contractor
H2	Construction impacts	Prepare traffic management plans including standard traffic rules and signage for construction and operation & maintenance which address the following: – Site speed limits.	Construction	Contractor

ID	Impact	Environmental Safeguard	Timing	Responsibility
		– Site layout to minimise vehicle reversing. – Designated pedestrian areas for construction and operation. – Driver competency. – Safe Work Method Statements (SWMS). – Machine inductions/licensing.		
		Prepare a construction environmental management plan, including hot work permit process to be implemented.		
		Update existing Bushfire Management Plan.		
		Prepare an earthing and bonding strategy, including provision of lightning arrestors.		
		Update and implement housekeeping standards.		
		Ensure site drainage works are upgraded.		
		Manage fuel for vehicles and machinery on site to appropriate standards.		
		Implement site security (fencing and CCTV).		
		Implement and upkeep inspection and maintenance regime, including for chemical storage areas.		
		Prepare and implement fire management and emergency response procedures.		
		Store chemicals in line with appropriate standards, such as AS1940 for flammable and combustible liquids, and AS3780 for corrosives.		
		Prepare and implement a Safe Work Method Statement detailing safe methods & procedures for chemical handling and transfer.		
		Store spill kits on site, to be used in the event of an incident involving release of chemicals.		
		Issue PPE to all staff handling chemicals.		
H3	Diesel storage (operation) hazards	Prepare and implement comprehensive emergency plan and procedures for the site.	Construction	Contractor

ID	Impact	Environmental Safeguard	Timing	Responsibility
		Provide fire and evacuation training for staff.		
		Provide fire water supply and fire main.		
		Ensure tanks are regularly inspected for potential leaks and corrosion impact.		
H4	Magazine storage (operation) hazards	Ensure Storage to AS 2187 Australian Standards Explosives - Storage, Transport and Use is adhered to.	Construction	Contractor
		Implement maintenance of magazine storage to ensure integrity of storage facility.		
		Issue separation distance for site boundary.		
		Install earthen mounds to minimise risk of knock-on detonation.		
		Install earth grid and lightning protection masts and conductors.		
		Install entry alarms on both doors and vibration alarms on the internal structures of the magazine.		

6.8 Bushfire

The section provides a summary of the potential bushfire hazard and impacts of constructing and operating the project. A full copy of the Bushfire Hazard Assessment (GHD, 2024) is provided in Appendix F.

6.8.1 Approach and method

6.8.1.1 Legislative and policy context to the assessment

The assessment was undertaken in accordance with the SEARs and with reference to the requirements of relevant legislation, policies and/or assessment guidelines, including:

- The EP&A Act.
- *Rural Fires Act 1997* (the RF Act).
- Australian Standard (AS) AS3959:2018 – Construction of buildings in bushfire prone areas. Standards Australia.
- New South Wales Rural Fire Service (2005). Standards for Asset Protection Zones. NSW Government. **https://www.rfs.nsw.gov.au/__data/assets/pdf_file/0010/13321/Standards-for-Asset-Protection-Zones.pdf.**
- New South Wales Rural Fire Service (2019). Planning for Bushfire Protection – A guide for councils, planners, fire authorities and developers. NSW Government (PBP).
- New South Wales Rural Fire Service (2023). Check if you are in bush fire prone land. NSW Government. **https://www.rfs.nsw.gov.au/plan-and-prepare/building-in-a-bush-fire-area/planning-for-bush-fireprotection/bush-fire-prone-land/check-bfpl.**
- New South Wales Government (2023). ePlanning Spatial Viewer. NSW Government. **https://www.planningportal.nsw.gov.au/spatialviewer/#/find-a-property/address.**
- Orica Australia Pty Ltd (2024). Fire Fighting Aircraft Exclusion Zones Above Explosive Storage Magazines.
- Orica Australia Pty Ltd (2023) Orica Tocumwal Emergency Management Plan, Revision 16.
- OzArk Environment and Heritage (2023) Ecological Field Assessment Tocumwal Magazine.

6.8.1.2 Method

The bushfire assessment generally involved:

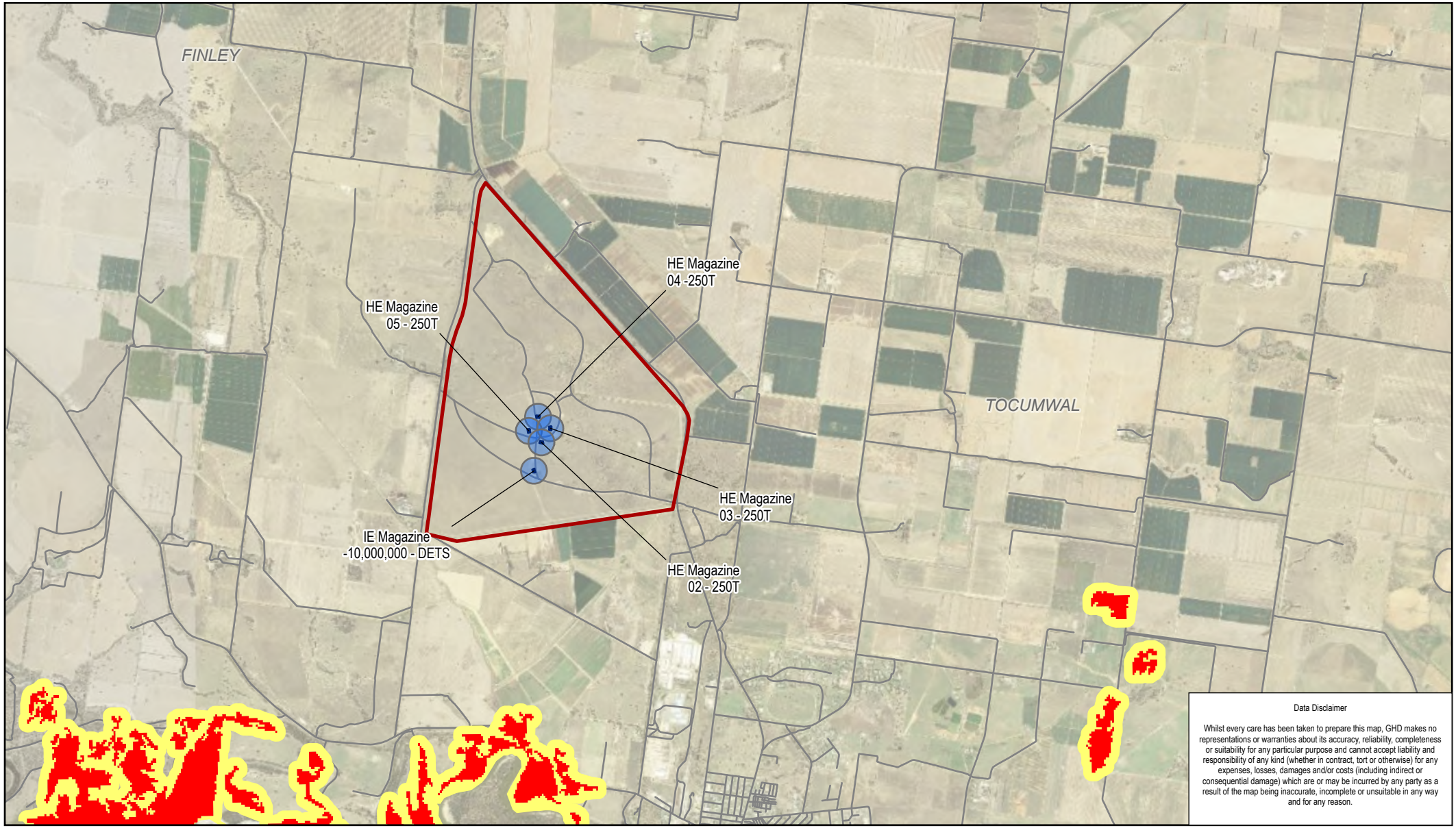
- Providing site assessment details in relation to bushfire hazard and bushfire attack levels for the project.
- Addressing the relevant requirements of PBP.
- Identifying if the development complies with the aims and objectives of PBP.
- Determining the APZ's and Bushfire Attack Level (BAL)in relation to the project.
- Consultation with the NSW RFS and NSW Fire and Rescue Service.

Refer to Appendix F.

6.8.2 Existing environment

6.8.2.1 Bushfire prone land classification

The site is not designated as BPL (as per Berrigan Council and RFS mapping – see Figure 6.22). The closest mapped BPL is located approximately two km to the south and is associated with the riparian vegetation adjacent the Murray River. Site inspections have confirmed the majority of the site is actively grazed by livestock, however seasonal conditions may affect the level of grass growth and accumulation. On site vegetation may be considered a potential bushfire hazard.



Data Disclaimer

Whilst every care has been taken to prepare this map, GHD makes no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and cannot accept liability and responsibility of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and/or costs (including indirect or consequential damage) which are or may be incurred by any party as a result of the map being inaccurate, incomplete or unsuitable in any way and for any reason.

Legend

- Road
- 150m Assessment Buffer
- Site boundary
- Bushfire Prone Land
- Vegetation Category 1
- Vegetation Buffer

Paper Size ISO A4

0 500 1,000 1,500 2,000

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

GHD

Orica Australia Pty Ltd
Orica Tocumwal Magazine Compound Upgrade

Project No. **12597123**
Revision No. **0**
Date **24/04/2024**

Bushfire Prone Land

FIGURE 6-22

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\ghdnet\ghd\AU\Newcastle\Projects\22\12597123\GIS\Maps\Deliverables\12597123_OricaTocumwa
Print date: 24 Apr 2024 - 13:02

Data source: NSW_Imagery: © Department of Customer Service 2020. Phase 1 layout, Blast mound - Orica, 2023, Bushfire Prone Land - NSW Government - 2023, Site Boundary , Buffer Zone - GHD - 2023.
Created by: pfernandes

6.8.2.2 Fire weather

The site falls within the Berrigan LGA within the greater Southern Riverina area for which Fire Danger Index (FDI) of 80 is applicable for bushfire assessment (NSW RFS, 2019).

6.8.2.3 Vegetation

A desktop review of the State Vegetation Type Map (DPE 2023) indicates the site is dominated by:

– Grasslands Plant Community Type (PCT) 44
– Grassy woodlands)

The BDAR (Appendix K) indicates that the site is dominated by PCT 45 Plains Grass grasslands.

The site is generally maintained to a low fuel condition by livestock grazing, ploughing, and slashing adjacent roadways, magazines, and key fence lines.

The site visit confirmed there is substantial adjoining grassland vegetation (associated with agricultural cropping and grazing activities) in the surrounding landscape. Much of the adjoining land is subject to flood irrigation, with water supplied by a series of open irrigation channels.

6.8.2.4 Effective slope

The site can broadly be characterised as flat, with the main geographic feature surrounding the site being irrigation channels.

6.8.3 Impact assessment

6.8.3.1 Bushfire protection measures

A suitable package of Bushfire Protection Measures (BPM) is proposed in Appendix F, commensurate with the assessed level of risk associated with hazardous industry, and commercial and industrial development as outlined in 8.3.9 and 8.3.10 of PBP.

Asset protection zones

Built assets requiring separation from bushfire prone vegetation have APZ requirements. To achieve deemed-to-satisfy acceptable solutions for APZs) and building construction BALs for hazardous industry development, structures are to be positioned, and vegetation managed such that the building can achieve a radiant heat exposure not exceeding 10 kW/m2 (calculated on a flame temperature of 1200 Kelvin). The required APZ for each vegetation type is shown in Figure 6.23 with the Section specifications for management detailed in Table 6.41.

Table 6.41 Asset Protection Zones

Magazine	Direction	Nearest BF prone vegetation	Effective slope class	Required APZ (10 kW/m^2)	Comments
HE 2	North	Woodland	Flat	42 m	
	East	Woodland	Flat	42 m	The internal access road will form part of the required APZ
	South	Grassland	Flat	42 m	The internal access road will form part of the required APZ
	West	Grassland	Flat	36 m	The internal access road will form part of the required APZ

Magazine	Direction	Nearest BF prone vegetation	Effective slope class	Required APZ (10 kW/m^2)	Comments
HE 3	North	Grassland	Flat	36 m	The internal access road will form part of the required APZ
	East	Grassland	Flat	36 m	The internal access road will form part of the required APZ
	South	Grassland	Flat	36 m	The internal access road will form part of the required APZ
	West	Grassland	Flat	36 m	
HE 4	North	Grassland	Flat	36 m	The internal access road will form part of the required APZ
	East	Grassland	Flat	36 m	The internal access road will form part of the required APZ
	South	Grassland	Flat	36 m	
	West	Grassland	Flat	36 m	The internal access road will form part of the required APZ
HE 5	North	Grassland	Flat	36 m	
	East	Grassland	Flat	36 m	
	South	Grassland	Flat	36 m	
	West	Grassland	Flat	36 m	The internal access road will form part of the required APZ
IE (1)	North	Woodland	Flat	42 m	The internal access road will form part of the required APZ
	East	Woodland	Flat	42 m	The internal access road will form part of the required APZ
	South	Woodland	Flat	42 m	The internal access road will form part of the required APZ
	West	Woodland	Flat	42 m	

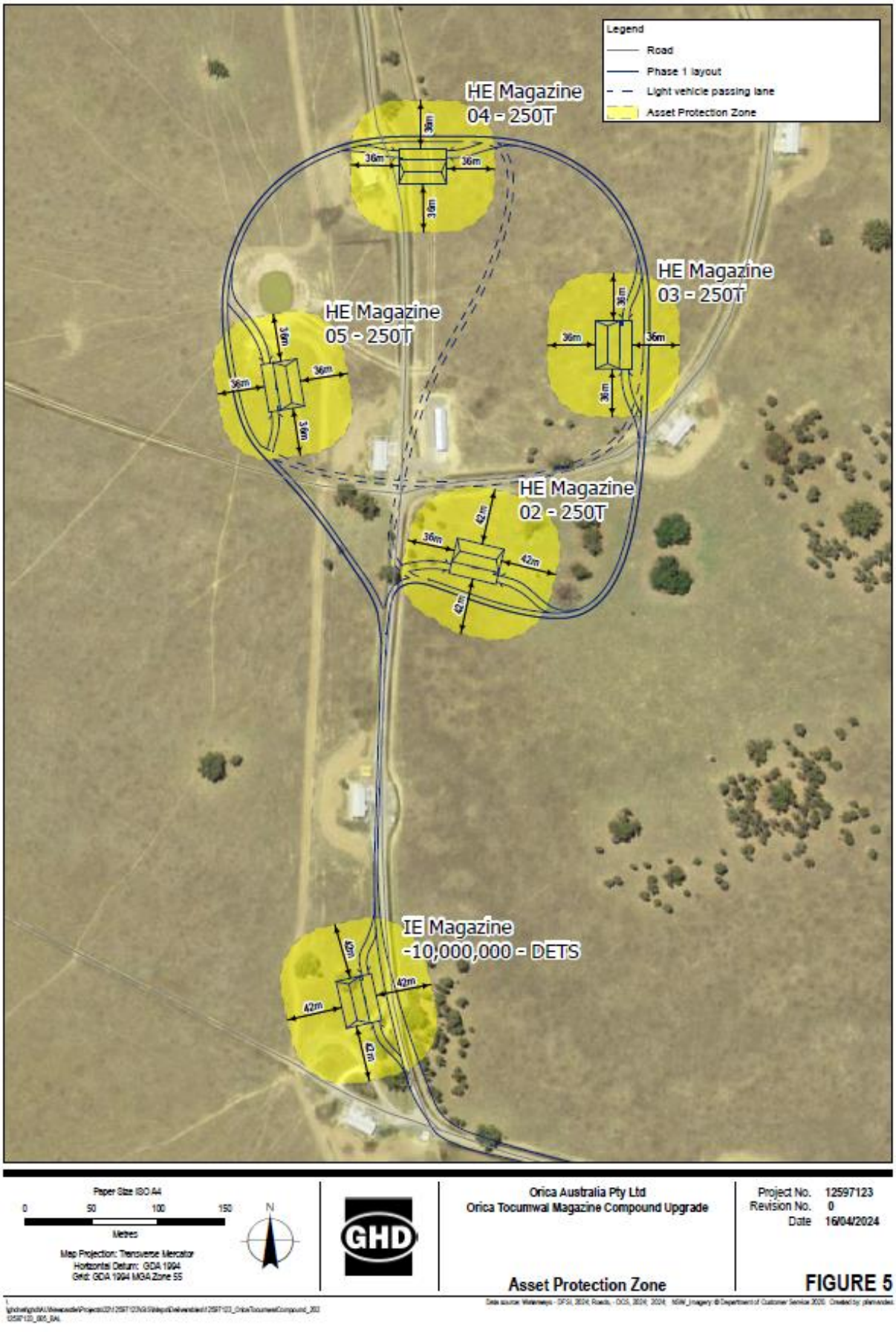


Figure 6.23 Asset protection zone

Water supply

No reticulated water is present on site. Water is supplied to the site via bore water. Channel water for example from the adjoining Tocumwal No. 6 Channel or the Lalalty Canal may also be used for fire suppression purposes. Orica proposes to install a single large 50,000 litre tank, immediately south west of the existing administration building (at the main entrance to the site) as water supply for firefighting purposes.

Three farm dams are located within and adjoining the site and may provide water for fire suppression purposes Dam 1, west of proposed magazines has a capacity of approximately 1,446 m^3; Dam 2 within close proximity to HE Magazine 05, is approximately 2,556 m^3 in capacity, and Dam 3 on the northeastern boundary of the site is approximately 2,900 m^3 in capacity (Source: Orica Tocumwal Emergency Management Plan, 2023, Revision 16).

Fire extinguishers are located in each magazine building, amenities and vehicles.

Access and egress

Internal access roads are proposed to link the existing site entrance to each of the new magazines. These roads will be gravel during the construction of the new magazines and would then be sealed prior to commissioning of the new magazines.

There is a single main access point to the site via the Newell Highway (existing dual lane, sealed public road). There is an alternative gated access to the west of the site via Chinamans Road, a sealed single lane road. The existing internal road network and onsite roadways are trafficable year-round and are sufficient for emergency vehicle access and site personnel egress.

There are currently between two to five permanent staff operating the Tocumwal Explosives Reserve during standard working hours. The operation of the new facility would continue to require the same number of staff after construction has been completed. As the proposed development will not result in additional personnel onsite the proposed upgrades to the internal road network will be sufficient to achieve the access/egress objectives of PBP.

Utilities

The existing security system and emergency system are hard wired back to the office.

It is recommended the installation and location of electrical services limits the possibility of ignition of surrounding bush land or the fabric of the buildings. Where practicable, electrical transmission lines are underground; where overhead, electrical transmission lines are proposed as follow:

– Lines are installed with short pole spacing (30 m), unless crossing gullies, gorges or riparian areas.
– No part of a tree is closer to a power line than the distance set out in accordance with the specifications in ISSC3 Guideline for Managing Vegetation Near Power Lines.

The site is not serviced by reticulated gas.

Emergency management, evacuation and bushfire plans

Emergency management arrangements are described in the site EMP which would be updated to cater for the site redevelopment. The EMP notes that Fire and Rescue NSW is the primary party for incident response and control. NSW RFS may also respond.

The project can comply with all PBP requirements if the mitigation and management measures identified in Section 6.8.4 are incorporated.

6.8.4 Mitigation and management measures

The measures listed in Table 6.42 would be implemented to manage the risk of bushfire during operation of the project.

Table 6.42 Bushfire mitigation measures

ID	Impact	Environmental Safeguard	Timing	Responsibility
BHA1	Bushfire Risk Reduction	APZ would be provided in accordance with Table 6.41 as shown in Figure 6.23.	Construction and Operation	Orica and Contractor
		A 50,000 L water tanks is installed immediately southwest of the existing administration building (at the main entrance to the site) as water supply for firefighting purposes.	Construction and Operation	
		Electrical transmission lines are underground; where overhead, electrical transmission lines are proposed as follow: – Lines are installed with short pole spacing (30 m), unless crossing gullies, gorges or riparian areas; and – No part of a tree is closer to a power line than the distance set out in accordance with the specifications in ISSC3 Guideline for Managing Vegetation Near Power Lines.	Construction and Operation	
		Internal access roads re upgraded as proposed.	Construction	
		The existing emergency management and evacuation plans would be updated and amended prior to occupancy and operation.	Construction and Operation	

6.9 Landscape character and visual amenity

This section provides an assessment of the potential landscape character and visual impacts of constructing and operating the project.

6.9.1 Approach and method

A summary of the approach to the assessment is provided in this section, including the legislation, guidelines and/or policies driving the approach and the methodology used to undertake the assessment.

6.9.1.1 Legislative and policy context to the assessment

The landscape character and visual amenity impact assessment was undertaken in accordance with the SEARs and with reference to the requirements of relevant legislation, policies and/or assessment guidelines, including:

– Environmental Impact Assessment Practice Note – Guideline for landscape character and visual impact assessment (Transport for NSW, 2023).

6.9.1.2 Methodology

Key components of the Landscape character and visual amenity (LCVIA) methodology include:

– **Site analysis and identification of landscape character zones** - Based on desktop and field analysis, the natural environment is identified and described as well as the human intervention and shaping of that environment, including settlements and the interaction between place and community.
– **Assessment of landscape character impacts** - The impact of the development and associated infrastructure on each zone is identified and assessed. Impacts are based on the sensitivity of the landscape character zone to change and the magnitude of the development within that landscape.
– **Assessment of the visibility of the proposal** - Based on desktop and site analysis, the extent of the development that is visible is defined.
– **Identification of key viewpoints** - Based on desktop and field analysis, a schedule of key viewpoints is developed. The final list of receptors does not represent the entire number of receptors likely to be visually impacted by the proposal, but rather gives an indication of the typical range of views that receptors will have.
– **Assessment of visual impacts** - The unmitigated impact of the development on each representative viewpoint is assessed. Impacts are based on a composite of the sensitivity of the view and magnitude of the development in that view, before any mitigation strategy has been put in place.
– **Development of mitigation strategy** - Principles and strategies are developed to mitigate landscape character and visual impacts in the ongoing development of the design.

Site inspections and photography were conducted on 28 May and 28 November 2023.

6.9.1.3 Assessment criteria

6.9.1.3.1 Landscape character value

For this assessment, it is GHD's interpretation of the landscape character values and attributes that determine the rankings for the landscape character impact assessment, not an interpretation of the values or perceptions of individuals or the community.

6.9.1.3.2 Landscape character sensitivity and magnitude of landscape character effects

The sensitivity for landscape character (refer Table 6.43) is assessed based on how sensitive the character of the setting is to the proposed change and its capacity to absorb the change, and magnitude (refer Table 6.44) is assessed based on the scale, form, and character of a project.

Table 6.43 Sensitivity ranking Sensitivity ranking

Ranking	Description
High	Pristine landscape with regionally important landscape heritage or biodiversity features. Predominantly intact and very good condition landscape with distinctive character and strong sense of place.
Moderate	Locally important but undesignated landscape heritage or biodiversity features. Land use retains some of the original/intrinsic character but also reflects modern changes. Moderate condition landscape but could have some erosion or loss. Moderate level of scenic beauty.
Low	Undesignated landscape heritage or biodiversity features. Land use retains little original or intrinsic value with strong modern trends. Moderately settled with medium level of built form. Limited representation of landscape character type. Low scenic beauty.
Negligible	Undesignated landscape heritage or biodiversity features. Densely settled with some noticeable erosion/loss. Few/poor/negative perceptual and aesthetic qualities and poor representation of landscape character type.
None	No defining features or contribution to local character. Land use retains no original/intrinsic character and modern trends are widespread. Very densely settled with landscapes of very low quality and in degraded condition/derelict. Widespread erosion or loss. No sense of remoteness.

Table 6.44 Magnitude ranking Magnitude ranking

Ranking	Description
High	Substantial or total loss of key elements/features/characteristics of the landscape character and/or introduction of elements that are considered to be totally uncharacteristic.
Moderate	Partial loss of/or alteration to one or more key elements/features/characteristics of the landscape character and/or introduction of elements that may be prominent but not considered to be substantially uncharacteristic.
Low	Minor loss of/or alteration to one or more key elements/features/characteristics of the landscape character (with recovery expected in the short term 0-4 years) and/or introduction of elements that are consistent with the existing character.
Negligible	Very minor loss or alteration to one or more key elements/features/characteristics of the landscape character and/or introduction of elements that are consistent with the existing character.
None	No part of the project is discernible.

6.9.1.3.3 Visual impact assessment

The levels of potential visual impact have been assessed through consideration of the combination of viewpoint sensitivity and the magnitude of change within a viewshed.

Viewpoint sensitivity (refer Table 6.45) refers to the qualities of the view, the number and type of receivers, viewer distance and typical duration the view is able to be perceived. The magnitude of visual change (refer Table 6.43) is influenced by the level of visibility of the project resulting from the combination of the physical scale of the project, how distant it is and the contrast it presents to the existing condition.

Table 6.45 Viewpoint sensitivity ranking

Ranking	Description				
	View Duration	Viewer Numbers	Viewer Type	Viewer Distance	View Sensitivity
High	Long	High	Resident	Short <150 m	Pristine
Moderate	Moderate	Moderate	Pedestrian	Medium 150 m to 600 m	Minimally Modified
Low	Short	Low	Cyclist	Long 600 m to 1 km	Moderately Modified
Negligible	Glimpse	Negligible	Motorist	Distant >1 km	Significantly Modified

Table 6.46 Magnitude of change ranking

Ranking	Description
High	Substantial to total loss of key elements/features/characteristics of the existing visual character and/or introduction of elements considered to be totally uncharacteristic of the existing character.
Moderate	Partial loss of/or alteration to one or more key elements/features/characteristics of the existing visual character and/or introduction of elements that may be prominent but not considered to be substantially uncharacteristic of the existing landscape character.
Low	Minor loss of/or alteration to one or more key elements/features/characteristics of the existing visual character and/or introduction of elements that are consistent with the existing landscape character.
Negligible	Very minor loss or alteration to one of more key elements/features/characteristics of the existing visual character and/or introduction of elements that are consistent with the visual character to the existing landscape character.

6.9.1.3.4 Evaluating impact

The combination of sensitivity and magnitude provides the rating of the landscape character and visual impacts of the project, as set out in the Environmental Impact Assessment Practice Note – Guideline for landscape character and visual impact assessment (NSW RMS, 2018) (refer Table 6.46).

Table 6.47 Impact rating matrix Impact rating matrix

		Magnitude			
		High	Moderate	Low	Negligible
Sensitivity	High	High	Moderate - High	Moderate	Negligible
	Moderate	Moderate - High	Moderate	Moderate - Low	Negligible
	Low	Moderate	Moderate - Low	Low	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible

6.9.2 Existing environment

6.9.2.1 Project Site and Surrounding land uses

The Tocumwal Explosives Reserve is located at 431 Newell Highway, approximately four kilometres north of the township of Tocumwal. The project site is situated on approximately 750 ha of fenced open grazing land in an area that currently contains the existing Tocumwal Explosives Reserve.

The site is surrounded by agricultural land and parts of the site are currently used as grazing land for sheep and cattle via leasing agreements. These leasing agreements would remain in place after the project has been completed. The project site also contains several small farm dams and drainage lines, which support the partial agricultural use of the site.

The site has three distinct visual boundaries, including:

– North and East - Newell Highway
– West - Chinamans Road
– South - Lalalty Channel

Land use activities further beyond the site boundaries are mainly agricultural, including:

– North – Crop farming and associated rural residence
– South – Crop farming and associated rural residence
– East – Crown Land, forming a buffer between the Newell Highway and agricultural land further to the east
– West – Intensive animal production and cropping and associated rural residences

6.9.2.2 Topography, landform and vegetation

The topography of the land at the Tocumwal Explosives Reserve is flat, with local relief being <9 metres and elevation generally between 90-180 metres. The project site is approximately 110 metres AHD.

The vegetation on the project site consists mainly of open cleared, modified grassland with scattered patches of remnant woodland. The project site boundaries along Chinamans Road and the Newell Highway are vegetated with patches and sporadic rows of both endemic and exotic trees.

Vegetation surrounding the project site varies from areas of cleared, modified grassland with patches of remnant woodland, to areas of open intensive cropping. Surrounding rural residences and access roads are generally lined with a combination of endemic and exotic trees.

Several waterways are located near the project site including Lalalty Channel which forms the southern boundary. Primarily these are manmade channels that form the drainage network of surrounding agricultural land.

The built form within the study area is sparse and reflective of the rural and agricultural land uses, comprising of rural residences, agricultural sheds, produce storage and silos.

Built form on the project site is reflective of the current Tocumwal Explosives Reserve facility, including:

– Office and amenities to accommodate five personnel.
– Ten explosives magazines, some with adjacent earthen mounds.
– Storage sheds and shipping containers.
– Maintenance and general storage shed.

The magazine buildings and storage sheds are low scale and set well back from Newell Highway and Chinamans Road and are often obscured or screened from view by vegetation.

6.9.2.3 Key visual characteristics of the project

The key characteristics of the project are summarised below and described as either visual or non-visual elements.

Due to the flat topography of the site and surrounds and a lack of elevated vantage points, the visual elements are those above ground that would be discernible within the landscape following construction of the project. The visible project elements include:

– Four (4) new 250 t HE magazines and one detonator magazine including earth grid and lightning protection masts and security fencing.
– Three (3) new earthen segregation mounds.
– Some vegetation clearing.

The five proposed single story magazine buildings and earthen segregation mounds are of a scale and materiality consistent with the existing built form on the projects site. The magazine buildings would be arranged around a ring road and would be centrally located on the project site, which again is consistent with the current facility.

The non-visual elements include those which would be below ground or at ground level following construction and would generally include site works. These elements may be visible during construction of the project, due to specific construction plant and equipment requirements, these include:

– Earthworks to establish the concrete slabs and hardstand areas for the five new magazines.
– Construction of new access roads. These roads would be gravel during the construction of the new magazines and would then be sealed prior to normal operations.

Following construction of the four new 250 t HE magazines and one detonator magazine, operations would continue as present with no proposed change to the overall operational workforce at the facility due to the project.

6.9.2.4 Landscape character analysis

Landscape character zones

Landscape character results from the combination of topography, built form, vegetation, and land use. The landscape character for this assessment has been based on a study area within 1.5 km surrounding the project site.

Whilst specific land use activities within this area are varied, only one overall landscape character zone has been identified and defined as rural / agricultural.

The Tocumwal Explosives Reserve occupies the majority of the study area and has been in operation by Orica since 1966 however, large parts of the project site are currently used as grazing land for sheep and cattle via leasing agreements. These leasing agreements would remain in place after the project has been completed. The project site also contains several small farm dams and drainage lines, which supports the agricultural use of the site and contribute to the rural / agricultural character.

6.9.3 Impact assessment

6.9.3.1 Landscape character impacts

LCZ – Rural /agricultural

The existing landscape character zone is illustrated in Table 6.48 and described in Table 6.49.

The measurement of impact is provided in Table 6.50.

Table 6.48 Landscape character photographs



View south along Newell Highway with project site on the right



View towards project site entry from Newell Highway



Project site internal access road with remnant woodland



Existing magazine building and earthen mound



Existing magazine building and earthen mound



View west toward project site from Newell Highway



Rural residence off Chinamans Road



View along Chinamans Road with tree screening to the project site

Table 6.49 Landscape character

Summary	This landscape is characterised by flat, vast, open areas of cleared, modified grassland and intensive cropping with scattered patches of remnant woodland and treelined roads. The built form is sparse and reflective of the rural and agricultural land uses, comprising rural residences, agricultural sheds, produce storage and silos and small-scale buildings associated with the Tocumwal Explosives Reserve.
Landform	– Flat
Vegetation	– Cleared, modified grassland with patches of remnant woodland and areas of open intensive cropping.
Landscape features	– Several small farm dams and drainage lines
Infrastructure	– Newell Highway – Chinamans Road – Lalalty Channel
Land use/built environment	– Tocumwal Explosives Reserve and associated buildings, earthen mounds and access roads. – Intensive animal production and cropping and associated rural residences, sheds and access roads.
Spatial quality/amenity	– Vast open landscape with distant treelined visual boundaries. – Land use retains some of the original/intrinsic character but also reflects modern changes. Moderate condition landscape with moderate level of scenic beauty.

Table 6.50 Measure of impact

Sensitivity	Low
Magnitude	Negligible
Impact	Negligible
Comments	Locally important but undesignated landscape heritage or biodiversity features. Land use retains some of the original/intrinsic character but also reflects a high level of modification associated with agriculture. The Tocumwal Explosives Reserve has been in operation since 1966. During construction the project is not anticipated to have a negative impact. The project site is already cleared and used for the purposes of the Tocumwal Explosives Reserve magazines. Construction equipment onsite may represent a small change to the visual outlook of the site, but this impact would be short term and temporary. During operation, the project would not operate differently from its current functions and represents a continuation of the current land use activities. Impact would be negligible with very minor loss associated with the clearing of trees. The introduction of additional magazines on the project site would constitute a small intensification of built form however this is set well back from site boundaries, located adjacent to existing buildings.

6.9.3.2 Visual impacts

Key viewpoints

The location of the project's key visual elements is identified on the following key viewpoint images by a solid red pin. Where distance makes them indiscernible, or trees screen the elements, open red pins are used to signify their location.

Viewpoint 1 – Newell Highway South

The current view of the project site from the viewpoint is shown in Figure 6.24. The impact on this viewpoint would be negligible**.** The viewpoint sensitivity and impact ratings are provided in Table 6.51 and measured in Table 6.52.



Figure 6.24 Viewpoint 1 – Newell Highway South

Table 6.51 Viewpoint 1 Sensitivity

Criteria	Description	Ranking
View duration	Glimpse	Negligible
Viewer numbers	Moderate	Moderate
Viewer type	Motorist	Negligible
Viewer distance	Distant	Negligible
View sensitivity	Moderately Modified	Low

Table 6.52 Viewpoint 1 Impact

Sensitivity	Negligible
Magnitude	Negligible
Impact	Negligible
Comments	The Newell Highway corridor is the main public viewing location of the facility. The existing magazine buildings are set back from the Newell Highway with views of the magazines greater than one kilometre which make the proposed buildings appear small and almost indiscernible. Existing remnant woodland clumps would further obscure views of the buildings. Operationally the project would have a negligible magnitude within the landscape and would introduce elements that are consistent with the visual character of the existing landscape. During construction the impact of having construction plant / equipment onsite is expected to be negligible and would be for a short duration.

Viewpoint 2 – Newell Highway North

The current view of the project site from the viewpoint is shown in Figure 6.25. The impact on this viewpoint would be negligible. The viewpoint sensitivity and impact ratings are provided in Table 6.53 and measured in Table 6.54.



Figure 6.25 Viewpoint 2 – Newell Highway North

Table 6.53 Viewpoint 2 Sensitivity

Criteria	Description	Ranking
View duration	Glimpse	Negligible
Viewer numbers	Moderate	Moderate
Viewer type	Motorist	Negligible
Viewer distance	Distant	Negligible
View sensitivity	Moderately Modified	Low

Table 6.54 Viewpoint 2 Impact

Sensitivity	Negligible
Magnitude	Negligible
Impact	Negligible
Comments	The Newell Highway corridor is the main public viewing location of the facility. The existing magazine buildings are set back from the Newell Highway with views of the magazines greater than one kilometre which make the proposed buildings appear small and almost indiscernible. Existing remnant woodland clumps would further obscure views of the buildings. Operationally the project would have a negligible magnitude within the landscape and would introduce elements that are consistent with the visual character to the existing landscape. During construction the impact of having construction plant / equipment onsite is expected to be negligible and would be for a short duration.

Viewpoint 3 – Chinamans Road North

The current view of the project site from the viewpoint is shown in Figure 6.26. The impact on this viewpoint would be negligible. The viewpoint sensitivity and impact ratings are provided in Table 6.55 and Table 6.56.



Figure 6.26 Viewpoint 3 – Chinamans Road North

Table 6.55 Viewpoint 3 Sensitivity

Criteria	Description	Ranking
View duration	Glimpse	Negligible
Viewer numbers	Low	Low
Viewer type	Motorist	Negligible
Viewer distance	Distant	Negligible
View sensitivity	Moderately Modified	Low

Table 6.56 Viewpoint 3 Impact

Sensitivity	Negligible
Magnitude	Negligible
Impact	Negligible
Comments	The existing magazine buildings are set back from Chinamans Road with views of the magazines greater than one kilometre which make the proposed buildings appear small and almost indiscernible. Existing remnant woodland clumps would further obscure views of the buildings. Operationally the project would have a negligible magnitude within the landscape and would introduce elements that are consistent with the visual character of the existing landscape. During construction, the impact of having construction plant / equipment onsite is expected to be negligible and would be for a short duration.

Viewpoint 4 – Chinamans Road South

The current view of the project site from the viewpoint is shown in Figure 6.27. The impact on this viewpoint would be negligible**.** The viewpoint sensitivity and impact ratings are provided in Table 6.57 and Table 6.58.



Figure 6.27 Viewpoint 4 – Chinamans Road South

Table 6.57 Viewpoint 4 Sensitivity

Criteria	Description	Ranking
View duration	Glimpse	Negligible
Viewer numbers	Low	Low
Viewer type	Motorist	Negligible
Viewer distance	Distant	Negligible
View sensitivity	Moderately Modified	Low

Table 6.58 Viewpoint 4 Impact

Sensitivity	Negligible
Magnitude	Negligible
Impact	Negligible
Comments	The existing magazine buildings are set back from Chinamans Road with views of the magazines greater than one kilometre which make the proposed buildings appear small and almost indiscernible. Existing remnant woodland clumps would further obscure views of the buildings. Operationally the project would have a negligible magnitude within the landscape and would introduce elements that are consistent with the visual character to the existing landscape. During construction the impact of having construction plant / equipment onsite is expected to be negligible and would be for a short duration.

6.9.4 Mitigation and management measures

The measures listed in Table 6.59 would be implemented to manage the risk of landscape character and visual impacts during operation of the project.

Table 6.59 Landscape character and visual mitigation measures

ID	Impact	Environmental Safeguard	Timing	Responsibility
CVIA1	Visual impacts from lighting	Any outdoor lighting required during construction would only be used as described within the Section *2.1 Key characteristics of the project*, which would include: – 7:00 am to 6:00 pm Monday to Friday – 8:00 am to 1:00 pm Saturdays – No work on Sundays or Public Holidays Operational outdoor lighting would only be used as per the existing operational hours / curfew, which include: – 6:30 am to 15:30 pm Monday to Friday	Construction & Operation	Orica/ Contractor

6.10 Aboriginal heritage

The section provides a summary of the potential Aboriginal cultural heritage impacts of the project. A full copy of the Aboriginal Cultural Heritage Assessment Report prepared by OzArk Environment & Heritage (2024) is provided in Appendix G. Non-Aboriginal heritage is discussed in Section 6.12.1.

6.10.1 Approach and method

6.10.1.1 Legislative and policy context to the assessment

The assessment was undertaken in accordance with the SEARs and with reference to the requirements of relevant legislation, policies and/or assessment guidelines, including:

– EPBC Act

– *Aboriginal and Torres Strait Islander Heritage Protection Act 1984*
– EP&A Act
– *National Parks and Wildlife Act 1974 (*NPW Act)
– Guidelines relevant to the assessment of impacts:
    - The Burra Charter: The Australia ICOMOS Charter for Places of Cultural Significance (the Burra Charter) (International Council on Monuments and Sites, 2013).
    - Code of Practice for the Investigation of Aboriginal Objects in New South Wales (Code of Practice) (DECCW, 2010).
    - Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW (the Guide) (OEH, 2011).

6.10.1.2 Method

6.10.1.2.1 Study area

The study area for the archaeological survey was the project site.

6.10.1.2.2 Key tasks

The Aboriginal cultural heritage assessment generally involved:

– Undertaking background research on the study area and surrounding region.
– Developing a predictive model in accordance with the Code of Practice (DECCW, 2010).
– Identifying and recording Aboriginal objects or sites within the study area as well as any landforms likely to contain further archaeological deposits including completing an archaeological survey of the study area.
– Undertaking an Aboriginal cultural values assessment in consultation with Registered Aboriginal Parties (RAPs) of tangible and intangible cultural heritage values that have potential to be impacted by the project.
– Assessing the significance of any recorded Aboriginal sites, objects, or places likely to be impacted by the project, in consultation with RAPs.
– Assessing the likely impacts of the proposed works to any recorded Aboriginal sites, objects, places, or intangible values and to develop management recommendations, in consultation with RAPs.

6.10.1.2.2.1 Aboriginal community consultation

Consultation with Aboriginal community stakeholders was undertaken in accordance with the Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010 (the ACHCRs) (DECCW, 2010). This included:

– Identifying key Aboriginal stakeholders including individuals and groups.
– Placing a public notice in the *Southern Riverina* inviting expressions of interest to be consulted about the project and contacting relevant organisations and agencies requesting details of individuals or groups who may be interested in being consulted about the project.
– Notification of the project and registration of interest (a total of three (3) Aboriginal parties registered interest in the project).
– Presentation of information about the project and assessment methodology.
– Issue of the draft Aboriginal Cultural Heritage Assessment Report to all RAPs for their consideration.

Further information on the consultation process is provided in Section 3 of Appendix G.

6.10.1.2.2.2 Archaeological survey

An archaeological survey was carried out on 10 October 2023 to assess and understand the landforms and determine whether any archaeological material from Aboriginal occupation or land use exists within the study area.

The archaeological survey was conducted with a field team of one member. Recording during the survey followed the archaeological survey requirements of the Code of Practice (DECCW, 2010).

6.10.2 Existing environment

6.10.2.1 Aboriginal historical context

There are several broad scale regional archaeological studies which either cover the Study Area itself or are in general proximity to it. The most relevant studies have been summarised below.

– Buchan 1974:

  This assessment covered approximately 41,000 square kilometres (km^2) and nearly 200 sites were identified. Approximately half were oven/hearth and mound sites ranging from over 1 m diameter and 0.1 m high to 1.2 m in diameter and two m high. Of exception was an oven deposit at Mellool which extended 150 m (Buchan 1974: 38). Scarred trees were the next most common site type. Sixteen sites containing burials were identified. Of these, ten were associated with other cultural material including surface artefacts, middens and ovens. Seven shell middens were identified with freshwater mussel being the dominant species. Middens ranged in length from 15 m to 650 m and ranged in width from two m to 60 m. The average depth/thickness of deposit was 0.2 – 0.3 m.

– Hamm 1995:

  In 1995, Hamm completed an extensive survey in this region for the proposed construction of an optic fibre cable. The areas from Finley (19 km north from current Study Area) to Jerilderie and Darlington Point to Coleambally were subject to field survey. Areas of archaeological sensitivity were identified for the Finley to Jerilderie route at a small lake depression just south of Jerilderie and to the west of a small sand dune (Hamm 1995: 5). Generally, sites were considered most likely in proximity to water sources (lake, creek or dry swamp), such as Berrigan Creek, or in elevated flat land such as sand dune crests, lunette or hummocky dune. Locations near water sources were predicted to contain artefact scatters or open camp sites and sand dune or lunettes to contain burials. Scarred trees were predicted in areas of road reserves, where old growth native trees remain. Due to extensive historic disturbance seen in this region from grazing and farming it was deemed unlikely that surface sites would be identified.

  The surveys resulted in three scarred trees located between Darlington Point and Coleambally. A further 17 scarred trees were identified along the Newell Highway between Finley and Jerilderie. These trees lined the travelling stock reserve next to the highway between Finley Canal and Berrigan Creek (Hamm 1995: 7).

– Archaeological Consulting Services 1996:

  In 1996, Archaeological Consulting Services undertook a pedestrian and vehicular survey for a proposed drainage channel through the Pinelea Drainage Basin between Finley and Tocumwal. Six scarred trees were recorded during the survey on Grey Box trees associated with swamps, depressions, and floodplains. The survey predominantly was alluvial plain, of which only a small portion was adjacent to Tuppal Creek. Due to the lack of water supply throughout much of the survey area Aboriginal campsites were not expected, nor identified during the survey (Edmonds 1996).

– OzArk 2008:

  In 2008, OzArk completed an assessment of the proposed route for the Mulwala to Finley 132 kilovolt (KV) electricity transmission line, stretching for 68 km and running approximately 15 km from the current Study Area. No Aboriginal sites were identified, and it was determined that there was low potential for intact, subsurface archaeological material in the assessment area due to the area comprising predominately plains with clay soils which experience periodic inundation during flooding events, making them unsuitable for long term occupation. Further to this, no permanent water or rock sources were present in the assessment area, which has undergone extensive disturbance through clearing of native vegetation and agricultural cropping.

6.10.2.2 AHIMS database search

A search of the Aboriginal Heritage Information Management System (AHIMS) database on 9 August 2023 returned 65 results for Aboriginal sites within a 20 km radius of the Study Area (GDA 2020 Zone 55 Eastings: 348314-388189; Northings: 6020594– 6060588). None of the recorded sites are located within the Study Area.

The most frequently recorded site types are modified trees (carved or scarred) which contribute 75.38% of the site types in the vicinity of the Study Area. The closest recorded site to the Study Area is a modified tree (55-4-0206), located 1 km to the east. Other frequent site types are open camp sites (n=5, 7.69%) and earth mounds (oven) with hearths (n=4, 6.15%). Isolated finds (n=2, 3.07%), as well as less represented site types which only have single recording in the vicinity of the Study Area are also present.

Modified trees, earth mounds (ovens) with hearths, and open camp sites tend to be near watercourses. The Aboriginal resource and gathering; Aboriginal ceremony and dreaming; artefact; modified tree (carved and scarred); and water hole site refers to Tocumwal Rocks which is situated in a granite outcrop. It is an important cultural site for the Ulupna and Bangarang Aboriginal people who believe that the Tocumwal Rocks Blow Hole was connected by an underground stream to the Murray River near Tocumwal It is situated approximately six km south of the Study Area.

6.10.2.3 Archaeological survey results

No Aboriginal sites were identified within the study area.

6.10.3 Impact assessment

6.10.3.1 Significance

Social or Cultural Value

No specific cultural values were identified by the RAPs regarding the Study Area, however, the strong cultural values of Aboriginal communities towards landscapes and cultural heritage sites are acknowledged.

Archaeological/Scientific Value

During the survey, no Aboriginal sites were recorded and therefore there are no known places with archaeological significance within the Study Area.

Aesthetic Value

There are no known places with identified aesthetic values identified in the Study Area.

Historic Value

There are no known places with identified historic values identified in the Study Area.

6.10.3.2 Impacts to Aboriginal heritage

As no Aboriginal sites or specific cultural values were recorded during the current assessment, there are no known impacts to Aboriginal cultural heritage from the project.

6.10.4 Mitigation and management measures

There is no specific management to be applied to the project as no Aboriginal sites or values have been identified. The measures listed in Table 6.60 would be implemented to manage the risk of Aboriginal heritage impacts from construction and operation of the project.

Table 6.60 Aboriginal cultural heritage mitigation measures

ID	Impact	Environmental Safeguard	Timing	Responsibility
AH1	Disturbance of Aboriginal sites	Although no specific Aboriginal heritage will be harmed, it is noted that following approval of the Project, Aboriginal cultural heritage will be managed by the policies within an ACHMP. The ACHMP must be approved by the DPE prior to works commencing. The ACHMP will include an unanticipated finds protocol, unanticipated skeletal remains protocol and heritage inductions.	Construction and Operation	Orica and Contractor

ID	Impact	Environmental Safeguard	Timing	Responsibility
		It is assessed that ground disturbing works associated with the Project will not harm Aboriginal archaeological deposits and no further archaeological investigation is required.	Construction and Operation	Orica and Contractor
		All land disturbing activities must be confined to within the assessed Study Area. Should the parameters of the proposed work extend beyond the assessment area, then further archaeological assessment may be required by a suitably qualified archaeologist.	Construction	Orica and Contractor

6.11 Biodiversity

The section provides a summary of the potential biodiversity impacts of the project. A full copy of the Biodiversity Development Assessment Report prepared by OzArk Environment & Heritage (2024) is provided in Appendix K.

6.11.1 Approach and method

Biodiversity constraints assessment

During the scoping stage of the project development, a biodiversity constraints assessment was prepared by Ozark (2023) to describe the conservation value of the area being considered for development of the project, with particular emphasis on threatened ecological communities, populations and species listed under the *Biodiversity Conservation Act 2016* (BC Act), Fisheries *Management Act 1994 (*FM Act), and Matters of National Environmental Significance (MNES) listed under the Commonwealth EPBC Act.

The biodiversity constraints assessment involved:

– Review of existing information relating to the study area to identify terrestrial biodiversity values that may be affected by the project including register searches and review of threatened species profiles.
– A field assessment carried out by a BAM-accredited Assessor on 19 July 2023 and an additional field assessment that included targeted surveys for certain species credit species, conducted on the 10 of October 2023.
– Identification of the existing environment and terrestrial biodiversity values of the study area.
– Mapping of biodiversity values and constraints, including vegetation, threatened ecological communities, threatened species observations and habitat resources such as hollow-bearing trees.
– Identification of threatened biota as listed under the BC Act and the EPBC Act that could potentially be impacted by the proposed works.
– Identification and mapping of biodiversity constraints across the study area.

Ozark then completed a complete BDAR (Appendix K).

6.11.2 Existing environment

The proposal would occupy up to 7.05 ha, of which 4.50 ha possesses remnant native vegetation. The native vegetation present in the disturbance footprint consists of three PCTS summarised below and illustrated in Figure 6.28:

– PCT 9 – River Red Gum - wallaby grass tall woodland wetland on the outer River Red Gum zone mainly in the Riverina Bioregion.
– PCT 45 – Plains Grass grassland on alluvial mainly clay soils in the Riverina Bioregion and NSW South Western Slopes Bioregion.
– PCT 74 – Yellow Box - River Red Gum tall grassy riverine woodland of NSW South Western Slopes Bioregion and Riverina Bioregion.

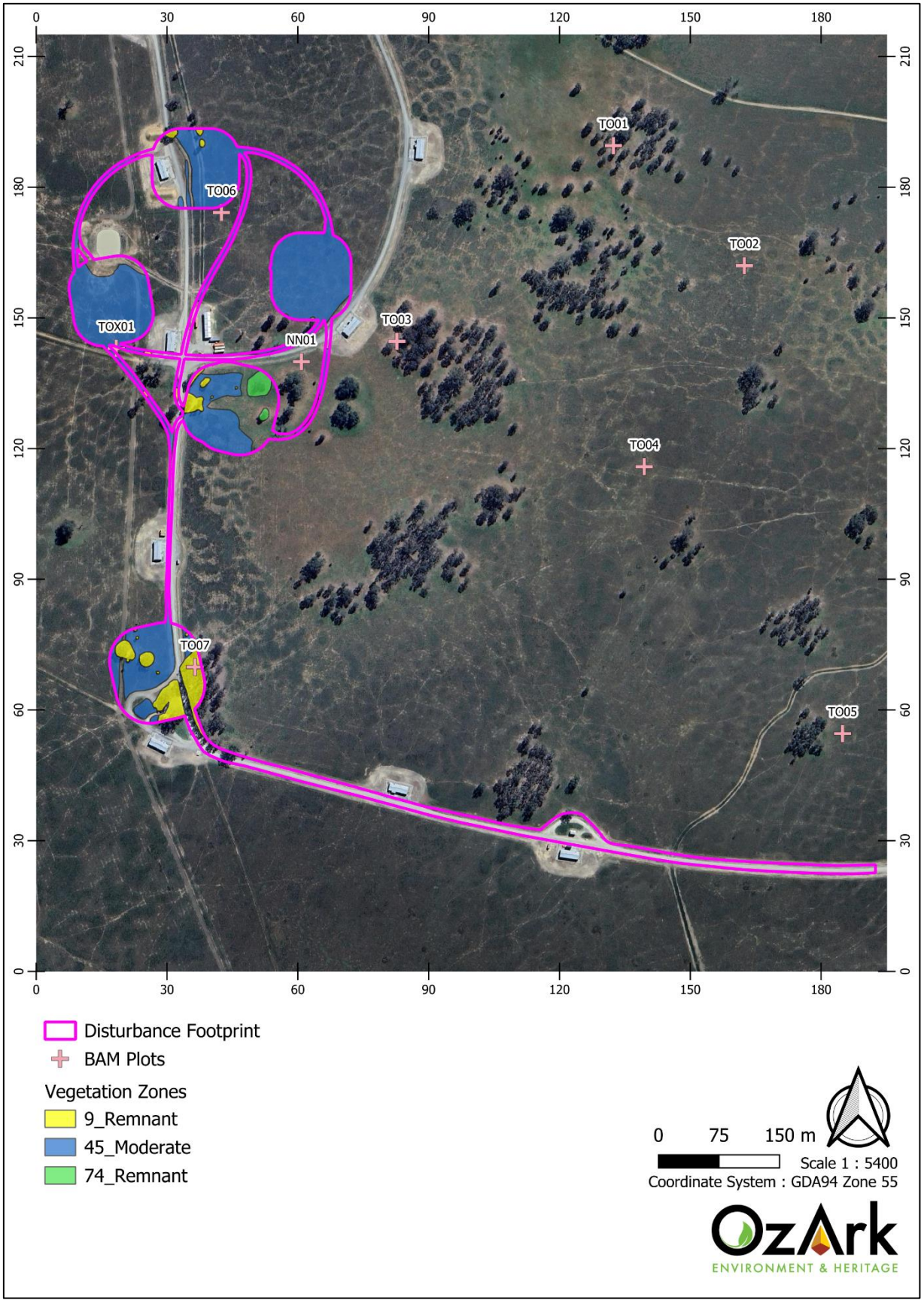


Figure 6.28 Vegetation mapping

6.11.3 Impact assessment

There are three PCTs (PCT 9, PCT 45, and PCT 74) within the disturbance footprint, with up to 4.54 ha of native vegetation to be removed, comprising a small number of mature trees, a small amount of woody regrowth, and an area of native grassland.

Up to 0.10 ha of the BC Act-listed CEEC *White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions* will be impacted by this proposal.

Up to 3.94 ha of the EPBC Act-listed CEEC *Natural Grasslands of the Murray Valley Plains* would be impacted by the proposal. A test of significance conducted under the EPBC Act concluded that this impact is unlikely to be significant or warrant referral.

PCT 74 was found to belong to the BC Act-listed CEEC *White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions*. Up to 0.10 ha of this community would be impacted by the proposal. PCT 45 was found to belong to the EPBC Act-listed CEEC *Natural Grasslands of the Murray Valley Plains*. Up to 3.9 ha of this community would be impacted by the proposal.

In total, 34 ecosystem credit species were generated by the Biodiversity Assessment Method Calculator (BAM-C) *Heritage Act 1977.*

The habitat suitability of the subject land for these species was assessed. Three (3) species was removed from the list due to habitat constraints; consequently, 31 species were assumed present as ecosystem credit species, generating a total of 183 Ecosystem Credits.

In total, 25 species credit species were generated by the BAM-C. After consideration of geographical and habitat constraints, six species could be discounted due either to distribution or to the absence of features necessary for breeding and one (Sloane's Froglet, *Crinia sloanei*) due to the lack of suitable plant communities within the specified buffer distance of a waterbody. A further 14 species were eliminated by targeted survey. Four species could not be ruled out by constraints or surveys and have been assumed present, generating a total of 84 species credits.

The proponent intends to satisfy their offset obligations by buying and retiring the necessary credits from the open market or, if appropriate credits are not available, by paying directly into the Biodiversity Conservation Fund.

The significance of the proposed impact to EPBC Act-listed threatened, migratory, wetland and marine species, populations and communities predicted to occur within a 10 km search area was assessed. No significant impact to any threatened entity likely to result in the extinction of a local population was identified. The residual ecological impacts of the proposal would be adequately mitigated and offset using the management actions recommended and the offset requirements detailed within the BDAR. Therefore, a referral of the proposal to DCCEEW for these matters is not required.

6.11.4 Mitigation and management measures

The measure described in Table 6.61 would be implemented to manage the potential for biodiversity impacts during the construction of the project.

Table 6.61 Biodiversity mitigation measures

ID	Impact	Environmental Safeguard	Timing	Responsibility
BD1	Impacts to native vegetation	Satisfaction of the offset obligations by buying and retiring the necessary credits from the open market or, if appropriate credits are not available, by paying directly into the Biodiversity Conservation Fund.	Construction	Orica

6.12 Other issues

6.12.1 Historic heritage

This section describes the non-Aboriginal heritage values of the site and surrounds and outlines potential impacts the project may have on non-Aboriginal heritage. It summarises the key findings of the historical heritage desktop assessment.

6.12.1.1 Approach and method

6.12.1.1.1 Legislative and policy context to the assessment

The assessment was undertaken in accordance with the SEARs and with reference to the requirements of relevant legislation, policies and/or assessment guidelines, including:

– EP&A Act
– *Heritage Act 1977 (the '*Heritage Act')
– Berrigan LEP

6.12.1.1.2 Method

6.12.1.1.2.1 Study area

The study area for the historic heritage assessment was the project site.

6.12.1.1.3 Key tasks

The historic heritage assessment generally involved:

– Identifying whether historical heritage items or areas are, or are likely to be, present within the area
– Determining whether the project is likely to cause harm to recorded historical heritage items or areas
– Providing management recommendations and options for mitigating impacts

6.12.1.1.3.1 Heritage lists and databases

The following heritage lists and databases were searched in May 2023:

– National and Commonwealth Heritage Listings
– State Heritage Listings
– Berrigan LEP

6.12.1.2 Existing environment - Heritage-listed items and sites

A search of the State Heritage Inventory administered heritage databases and the LEP did not return any records for historical heritage sites near the study area.

6.12.1.3 Impact assessment

No historic heritage sites or historic archaeological deposits were recorded in the study area. As such, it is unlikely that there would be any significant impact to historic heritage from the project during construction or operation.

6.12.1.4 Mitigation and management measures

The measures listed in Table 6.62 would be implemented to manage the risk of non-Aboriginal heritage impacts during the construction and operation of the project.

Table 6.62 Historical heritage mitigation measures

ID	Impact	Environmental Safeguard	Timing	Responsibility
HH1	Disturbance to historic heritage sites	In the unlikely event that items of historic heritage significance are noted during construction or operation of the project, the site manager and contractor should contact Heritage NSW.	Construction & Operation	Orica and Contractor
		All land and ground disturbance activities would be confined to within the project site. Should the parameters of the project extend beyond the assessed areas, then further assessment may be required.	Construction	
		All staff and contractors involved in the proposed work would be made aware of the legislative protection requirements for all historic items.	Construction & Operation	

6.12.2 Cumulative impacts

This section describes the potential cumulative impacts of the project and other existing or proposed major projects. The cumulative impact assessment draws on the findings of other specialist assessments of the project contained throughout the EIS and publicly available assessment documentation on other existing or proposed major projects in the LGA. The cumulative impact assessment has found that there is limited potential for cumulative impacts to occur.

6.12.2.1 Approach and method

The approach undertaken for the cumulative impact assessment is:

– A desktop review of concurrent projects has been conducted by reviewing the following:
  - DPHI's online major projects database.
– Review project environmental aspects to determine those with the potential to result in cumulative impacts:
  - Undertake a desktop cumulative impact assessment for environmental aspects with the potential for cumulative impacts to occur.
– Recommend additional management measures to address identified cumulative impacts where they have not been suitably addressed elsewhere as part of the assessment of the project.

A search of the DPHI Major Projects database was undertaken on 19 July 2024, but no SSD and SSI projects were identified within the LGA of the project site. Berrigan Shire Council does not have an online DA tracking portal. It is noted that Development Application No 92-24-DA-DM for an electricity generating works (solar farm) and battery energy storage system at 118 Silo Road, Tocumwal was approved by Berrigan Shire Council on 19 June 2024. The site of the approved solar farm is directly to the south of the site.

Cumulative impacts have the potential to occur for hazards (Section 6.7), traffic (Section 6.6) and biodiversity Section (6.11). As such, the specialist assessment for each of these impacts were reviewed to understand the cumulative impacts the project would have.

6.12.2.2 Existing Environment

As above, a search of the DPHI Major Projects database was undertaken on 19 July 2024, but no SSD and SSI projects were identified within the LGA of the project site. Berrigan Shire Council does not have an online DA tracking portal.

6.12.2.3 Impact Assessment

Table 6.63 summarises relevant environmental aspects assessed for the project and their associated cumulative impacts.

Table 6.63 Review of environmental aspects for potential cumulative impacts

Environmental Aspect	Cumulative impact summary	Cumulative assessment approach
Soils & Water	Negligible. A CEMP and SWMP, would reduce the likelihood of erosion and sedimentation during construction. Stormwater design will address stormwater management. The results show that the proposed magazine pad levels are marginally above or at the flood planning level. Groundwater is not assessed as being impacted.	N/A
Contamination	Negligible. The implementation of the CEMP and SWMP will ensure that the operation of the project is not anticipated to result in soil or groundwater contamination.	N/A
Air Quality & Odour	Minor Due to the distance between the receptors and the project site, dust impacts are not expected to be significant regardless of the estimated dust magnitude. Mitigation measures would reduce risk even further (refer Section 6.3.4). As there are no proposed changes to the overall operational workforce or activities at the magazine facility an operational assessment is not required for this project.	N/A
Noise & Vibration	Negligible. Predictive modelling indicates that at all receivers in the study area, noise levels for all assessed scenarios are predicted to be below NML during adverse meteorological conditions with all equipment operating simultaneously. No adverse vibration impacts to human comfort or structural damage are anticipated as a result of the project.	N/A
Waste Management	Negligible. Waste management activities during construction and operation are not expected to have a significant impact on the environment or human health provided that the mitigation measures are implemented.	N/A
Traffic	Negligible. the traffic impacts of the project are expected to be negligible and fall within the daily fluctuations of the adjoining arterial road network.	N/A
Hazards & Risk	Minor. As outlined in Section 6.7, The results from the modelling of the explosives and diesel stored on-site showed that there is appropriate separation distance between the storages and the site boundary. Additionally, the consequence analysis results validate that the site upgrades specifically the relocation of the magazines further from the site boundary are an improvement. Furthermore, the new placement of the diesel tank ensures a safer distance between the diesel, which is a possible fuel source, and the magazines. It was determined that the hazards with potential off-site impact would be suitably controlled with the control measures listed in Table 7 to Appendix L.	Cumulative Assessment undertaken in Section 6.7.
Bushfire	Minor – Some vegetation management is required to facilitate APZs. The project can comply with all PBP requirements if the mitigation and management measures identified in Section 6.8.4 are incorporated.	N/A
Landscape Character & Visual Amenity	Negligible. The project would be visually consistent with the pre-existing visual landscape.	N/A
Aboriginal Heritage	Negligible. Unlikely to have direct impacts on known sites.	N/A
Biodiversity	The BDAR identified that there are three PCTs (PCT 9, PCT 45, and PCT 74) within the disturbance footprint, with up to 4.54 ha of native vegetation to be removed, comprising a small number of mature trees, a small amount of woody regrowth, and an area of native grassland. Orica can offset any potential loss to biodiversity to the site by the buying and retiring the necessary credits. The residual ecological impacts of the proposal would be adequately mitigated and offset using the management actions recommended and the offset requirements detailed within the BDAR.	N/A
Historic Heritage	Negligible. No impacts identified.	N/A

6.12.2.4 Mitigation Measures

The measures listed in Table 6.64 would be implemented to manage the risk of cumulative impacts during the construction and operation of the project.

Table 6.64 Historical heritage mitigation measures

ID	Impact	Environmental Safeguard	Timing	Responsibility
CL1	General Impact Reduction	The mitigation measures presented in Section 7.2 will be implemented effectively to reduce the project's impact on the environment.	Pre-Construction Construction & Operation	Orica and Contractor

7. Environmental management

This chapter summarises proposed environmental management framework that will be implemented during delivery of the project. Environmental management measures and plans have been recommended based on the projects potential environmental impacts as identified in Section 6.

7.1 Approach to environmental management

The approach to environmental mitigation and management for the project involves:

– Project design – as described in Section 3.3.6 the project incorporates measures to avoid and minimise impacts.
– Mitigation measures – mitigation measures provided in Section 6 are identified as an outcome of the environmental impact assessment and are consolidated in Section 7.2.
– Project-specific construction environmental management plan (CEMP)– prepared to guide the approach to environmental management during construction and operation, as described in Section 7.1.1.

7.1.1 Construction environmental management plan

The CEMP will be prepared by the construction contractor(s), and include the following:

– Outline requirements and guidelines for management in accordance with:
  - The conditions of approval for the project.
  - The mitigation measures specified in this EIS.
  - Relevant construction management guidelines.
  - Requirements in relation to incorporating environmental protection measures and instructions in all relevant standard operating procedures and emergency response procedures.
  - Roles and responsibilities of all personnel and contractors to be employed on-site.
  - Incident and contingency management procedures.
  - Processes for demonstrating compliance with the commitments made in this EIS, the submissions report (to be prepared), and relevant approval conditions.
  - Procedures for complaints handling and ongoing communication with the community.
  - A monitoring and auditing program, as defined by any conditions of the approval.

7.2 Mitigation and management measures

Table 7.1 provides a compilation of the measures proposed to mitigate and manage the potential impacts of the project, as detailed in Section 6.

The measures listed may be revised in response to submissions raised during public exhibition of the EIS and/or any design changes made following exhibition. The final list of mitigation measures would be provided in the submissions report. If the project is approved, the conditions of approval, which would include reference to the finalised mitigation measures, would guide subsequent phases of the project. The works would be undertaken in accordance with the conditions of approval and the final list of mitigation measures.

Table 7.1 Mitigation Measures

ID	Impact	Environmental Safeguard	Timing	Responsibility
Soil & Water				
SW1	Surface water	Incoming clean surface water flowing from surrounding terrain would be diverted around the project site via diversion drains/banks.	Design Construction Operation	Consultant Contractor Orica
SW2		A detailed Soil and Water Management Plan is to be developed prior to construction of the project to manage the risk of erosion and sedimentation during the construction and operation of the project, as well as manage the handling of any high-risk materials. It is noted that sediment basins are not required, and, on this basis, focus would be placed on controlling pollutants at the source and collection of onsite runoff in surface water drains.	Design Construction Operation	Consultant Contractor Orica
SW3		A detailed Operation Environment Management Plan (OEMP) is to be developed and applied during the operational phase of the project. The OEMP will address operational activities that may pose a risk to water quality, the bunding and storage of all fuel and explosives on site, maintenance of plants and equipment, measures to manage accidental spills, water quality monitoring at the site, and inspection and maintenance requirements.	Operation	Contractor
SW4		Any stormwater drainage design is to include the principles of Water Sensitive Urban Design in accordance with the general principles outlined in the following references: – *Water Sensitive Urban Design Guidelines* (Melbourne Water, 2005). – *Urban Stormwater – Best Practice Environmental Management Guidelines* (Victorian Stormwater Committee, 1999). – *Australian Runoff Quality: A guide to water sensitive urban design* (Engineers Australia, 2006).	Design Construction Operation	Consultant Contractor Orica
SW6		A Flood Response Plan should be compiled for the site. This plan should, amongst others, describe flood response responsibilities, monitoring of impending flood, flood preparation and flood evacuation.	Design	Consultant
SW7	Groundwater	Groundwater dewatering is not anticipated but may be required if groundwater inflow occurs, to minimise impacts to groundwater. A procedure for emergency dewatering, and the associated triggers, shall be established by the contractor in the SWMP to prepare for the case where groundwater inflow could occur unexpectedly.	Construction	Contractor
Contamination				
C1	Contamination	The soil in the vicinity of the diesel above ground storage tank be further assessed if it is to be disturbed.	Construction	Contractor

ID	Impact	Environmental Safeguard	Timing	Responsibility
C2		The CEMP for the project would include an 'unexpected finds protocol', to manage any potential impacts associated with the disturbance of potentially contaminated soils (if encountered) during works of the project. It would include actions to cease work on discovery, test suspected contaminated material, and safely store, treat, and dispose of the material as relevant. The procedure would also address any legislative requirements for reporting and/or approval.		
Air quality & Odour				
AQ1	Dust emissions are minimised during construction.	Prepare a construction dust control protocol that details management measures, a method for recording dust complaints, and monitoring requirements.	Pre-construction	Consultant
AQ2	Dust emissions are minimised during construction and demolition.	On days with forecast and actual high winds (i.e., over 10 m/s), reduce work effort accordingly if wind-blown dust is observed to be leaving the site boundary.	Construction and demolition	Contractor
AQ3	Dust emissions are minimised during construction and demolition.	Undertake dust suppression, as required, using water sprays, water extension agents, soil stabilising polymers or other media on: – Unpaved work areas subject to traffic or wind. – Spoil and aggregate stockpiles. – During the loading and unloading of dust generating materials. Unpaved access tracks.	Construction and demolition	Contractor
AQ4	Ignition risk, spills, and air emissions are minimised during construction and operation.	Maintain plant and equipment in good condition to minimise ignition risk of fuel or chemicals, spills, and air emissions that may cause nuisance.	Construction and operation	Contractor
Noise & Vibration				
General controls				
NV1	Site inductions	All employees, contractors and subcontractors are to receive an environmental induction. The induction should include: – All relevant project specific and standard noise and vibration mitigation measures. – Relevant licence and approval conditions. – Permissible hours of work. – Location of nearest sensitive receivers. – Construction employee parking areas. – Designated loading/unloading areas and procedures. – Site opening/closing times (including deliveries). – Environmental incident procedures.	Construction and Operation	Orica and Contractor
NV2	Behavioural practices	No swearing or unnecessary shouting or loud stereos/radios on site. No dropping of materials from height, throwing of metal items and slamming of doors.	Construction and Operation	Orica and Contractor
NV3	Implement community consultation measures	Contact will be established with the local residents and the construction program and progress communicated on a regular basis, particularly when noisy or vibration-generating activities are planned.	Construction and Operation	Orica and Contractor

ID	Impact	Environmental Safeguard	Timing	Responsibility
		Affected receivers will be notified of the intended work, its duration and times of occurrence. This may include a local community update letters for specific construction activities and a Project info line.		
NV4	Implement complaints management measures	Complaints will be managed in accordance with the procedure outlined below. Signage at each site will clearly and visibly provide a contact number and name to receive complaints and enquiries about construction. Potential complaints specific to these works could include: – Vibration impacts from works that significantly affect structures or dwellings. – A cluster of noise and/or vibration complaints. In this instance the response would be to: – Verbally respond to complainant. – Provide a written response within seven calendar days if the complaint cannot be resolved verbally. – Log the complaint, and any actions taken with regards to the complaint within a complaints register. – Undertake monitoring at the complainant's residence(s). – Investigate the nature and reasons of the impact. – Investigate and implement further mitigation measures to minimise the impact.	Construction and Operation	Orica and Contractor
NV5	Compliance vibration measurements	Vibration monitoring will be undertaken where construction equipment operate within the safe working distances of a building or when a complaint is received. Vibration monitoring should be conducted during these activities at the most susceptible buildings close to the construction sites. Where exceedances of the relevant vibration criteria outlined are recorded, the situation should be reviewed in order to identify the measures that can be taken to minimise the impacts to sensitive equipment and prevent structural damage. The review may result in a requirement to modify work practices or use alternative, low-vibration methods and equipment. Any vibration measurement will be undertaken by a qualified professional and with consideration to the ICNG guidelines.	Construction and Operation	Orica and Contractor
Source controls				
NV6	Construction hours and scheduling	Comply with the recommended standard construction hours unless out of hours work has been approved. No truck movements before 7:00 am or after 6:00 pm. For any work that would take place outside of normal construction hours: – Undertake an assessment of the potential noise and vibration impacts associated with the proposed activities and outline specific mitigation measures. – Residents potentially affected by such activities will be notified at least five days before hand. – Minimise consecutive night activities in the same locality and provide periods of quiet if activities occur for extended periods during the night.	Construction and Operation	Orica and Contractor

ID	Impact	Environmental Safeguard	Timing	Responsibility
		– Conduct activities in a manner that eliminates or minimises the need for audible warning alarms.		
NV7	Construction respite period	High noise and vibration generating activities may only be carried out in continuous blocks, not exceeding three hours each, with a minimum respite period of one hour between each block. High noise refers to construction noise impacts which exceed the highly affected noise management level of 75 dB(A) $L_{Aeq(15\text{-}min)}$ during standard construction hours.	Construction and Operation	Orica and Contractor
NV8	Equipment selection	Use quieter and less vibration emitting construction methods where reasonable and feasible.	Construction and Operation	Orica and Contractor
NV9	Use and siting of plant	Simultaneous operation of noisy plant within discernible range of a sensitive receiver is to be avoided. The offset distance between noisy plant and adjacent sensitive receivers is to be maximised. Plant used intermittently to be throttled down or shut down. Noise-emitting plant to be directed away from sensitive receivers.	Construction and Operation	Orica and Contractor
NV10	Plan worksites and activities to minimise noise and vibration	Plan traffic flow, parking and loading unloading areas to minimise reversing movements within the site.	Construction and Operation	Orica and Contractor
NV11	Minimise disturbance arising from delivery of goods to construction sites	Loading and unloading of materials/deliveries is to occur during standard construction hours. Contractors are to avoid dropping materials from height where practicable, during loading and unloading. Delivery vehicles to be fitted with straps rather than chains for unloading, wherever possible.	Construction and Operation	Orica and Contractor
Path controls				
NV12	Use of safe working/buffer distances	The safe working/buffer distances outlined will be observed when reasonable and feasible to minimise adverse vibration impacts.	Construction and Operation	Orica and Contractor
Waste				
W1	Waste Minimisation	Construction planning would include measures to minimise quantities of waste requiring disposal, careful procurement of construction materials to minimise excess waste materials. Demolition methodology will include a plan for recycling or disposal of material.	Pre-construction and demolition	
W2	Waste Minimisation	All construction and demolition waste would be classified and recycled or disposal of in accordance with the *Waste Classification Guidelines Part 1: Classifying waste* (NSW EPA, 2014) and the waste provisions contained within the POEO Act and other relevant legislative and policy requirements.	Construction and demolition	

ID	Impact	Environmental Safeguard	Timing	Responsibility
W3	Waste Minimisation	**Construction and demolition waste management plan** A construction and demolition waste management plan would be prepared and implemented once the construction contractor has been appointed. The plan would adopt the waste hierarchy principles contained in the *Waste Avoidance and Resource Recovery Act 2001* and detail processes, responsibilities and measures to manage waste and minimise the potential for impacts during construction. This would include waste separation, handling, storage, transport and off-site re-use, recycling and disposal locations.	Construction and demolition	Orica and Contractor
W4	Waste Minimisation	**Operational waste management plan** Prior to the commencement of operation, an operational waste management plan would be developed. The plan would aim to ensure waste management that conforms to the requirements of relevant guidance documents and adheres to the waste management hierarchy principles contained in the *Waste Avoidance and Resource Recovery Act 2001*.	Operation	Orica and Contractor
Traffic				
T1	Minimise environmental impacts associated with the movement of vehicles.	Rectify any road deposits caused by site vehicles, to maintain the safety of road users. Where possible, offset the construction vehicle activity from peak periods of road network activity.	Construction	Orica and Contractor
T2	Minimise environmental impacts associated with the movement of vehicles.	Induct employees and contractors to raise awareness and understanding of traffic and transport mitigation measures to be implemented during construction.	Construction	Orica and Contractor
Hazards and Risk				
H1	General	All safeguards identified in the hazard identification process would be implemented through the development and implementation of a safety management system for the operation of the project.	Operation	Orica
H2	Construction impacts	Prepare traffic management plans including standard traffic rules and signage for construction and operation and maintenance which address the following: – Site speed limits. – Site layout to minimise vehicle reversing. – Designated pedestrian areas for construction and operation. – Driver competency. – Safe Work Method Statements (SWMS). – Machine inductions/licensing.	Construction	Contractor
		Prepare a construction environmental management plan, including hot work permit process to be implemented.		
		Update existing Bushfire Management Plan.		
		Prepare an earthing and bonding strategy, including provision of lightning arrestors.		

ID	Impact	Environmental Safeguard	Timing	Responsibility
		Update and implement housekeeping standards.		
		Ensure site drainage works are upgraded.		
		Manage fuel for vehicles and machinery on site to appropriate standards.		
		Implement site security (fencing and CCTV).		
		Implement and upkeep inspection and maintenance regime, including for chemical storage areas.		
		Prepare and implement fire management and emergency response procedures.		
		Store chemicals in line with appropriate standards, such as AS1940 for flammable and combustible liquids, and AS3780 for corrosives.		
		Prepare and implement a Safe Work Method Statement detailing safe methods & procedures for chemical handling and transfer.		
		Store spill kits on site, to be used in the event of an incident involving release of chemicals.		
		Issue PPE to all staff handling chemicals.		
H3	Diesel storage (operation) hazards	Prepare and implement comprehensive emergency plan and procedures for the site.	Construction and Operation	Orica
		Provide fire and evacuation training for staff.		
		Provide fire water supply and fire main.		
		Ensure tanks are regularly inspected for potential leaks and corrosion impact.		
H4	Magazine storage (operation) hazards	Ensure Storage to AS 2187 Australian Standards Explosives - Storage, Transport and Use is adhered to.	Construction and Operation	Orica
		Implement maintenance of magazine storage to ensure integrity of storage facility.		
		Issue separation distance for site boundary.		
		Install earthen mounds to minimise risk of knock-on detonation.		
		Install earth grid and lightning protection masts and conductors.		
		Install entry alarms on both doors and vibration alarms on the internal structures of the magazine.		
Bushfire				
BHA1	Bushfire Risk Reduction	APZ would be provided in accordance with Table 6.41 as shown in Figure 6.23.	Construction and Operation	Orica/ Contractor
		A50,000 L water tanks is installed immediately south west of the existing administration building (at the main entrance to the site) as water supply for firefighting purposes.	Construction and Operation	
		Electrical transmission lines are underground; where overhead, electrical transmission lines are proposed as follows: – Lines are installed with short pole spacing (30 m), unless crossing gullies, gorges or riparian areas.	Construction and Operation	

ID	Impact	Environmental Safeguard	Timing	Responsibility
		– No part of a tree is closer to a power line than the distance set out in accordance with the specifications in ISSC3 Guideline for Managing Vegetation Near Power Lines.		
		Internal access roads re upgraded as proposed.	Construction	
		The existing emergency management and evacuation plans would be updated and amended prior to occupancy and operation.	Construction and Operation	
Landscape Character and Visual Amenity				
LCVIA1	Visual impacts from lighting	Any outdoor lighting required during construction would only be used as described within the Section *2.1 Key characteristics of the project*, which would include: – 7:00 am to 6:00 pm Monday to Friday. – 8:00 am to 1:00 pm Saturdays. – No work on Sundays or Public Holidays. Operational outdoor lighting would only be used as per the existing operational hours / curfew, which include: – 6:30 am to 15:30 pm Monday to Friday.	Construction & Operation	Orica/ Contractor
Aboriginal Heritage				
AH1	Disturbance of Aboriginal sites	Although no specific Aboriginal heritage will be harmed, it is noted that following approval of the Project, Aboriginal cultural heritage will be managed by the policies within an ACHMP. The ACHMP must be approved by the DPE prior to works commencing. The ACHMP will include an unanticipated finds protocol, unanticipated skeletal remains protocol and heritage inductions.	Construction and Operation	Orica/ Contractor
		It is assessed that ground disturbing works associated with the Project will not harm Aboriginal archaeological deposits and no further archaeological investigation is required.	Construction and Operation	Orica/ Contractor
		All land disturbing activities must be confined to within the assessed Study Area. Should the parameters of the proposed work extend beyond the assessment area, then further archaeological assessment may be required by a suitably qualified archaeologist.	Construction	Orica/ Contractor
Biodiversity				
BD1	Impacts to native vegetation (	Satisfaction of the offset obligations by buying and retiring the necessary credits from the open market or, if appropriate credits are not available, by paying directly into the Biodiversity Conservation Fund.	Construction	Orica
Historic Heritage				
HH1	Disturbance to historic heritage sites	In the unlikely event that items of historic heritage significance are noted during construction or operation of the project, the site manager and contractor should contact Heritage NSW.	Construction & Operation	Orica/ Contractor

8. Justification of the project

8.1 Justification for undertaking the project

This chapter provides the justification for the project with consideration to the objectives of the EP&A Act. A strategic justification has been provided to demonstrate the project's alignment with national, state and local strategic plans. The project's ecological sustainability and biophysical, economic and social merits have also been considered. A conclusion has been provided to fully evaluate the project's expected impact and assess whether the potential benefits of the project are considered to significantly outweigh any potential negative impacts.

8.2 Environmental considerations

8.2.1 Approach

In order to understand the existing environment of the site and surrounds, inform development of the design and preliminary construction planning, and undertake the environmental impact assessment, detailed environmental investigations have been carried out as described in Section 6.

All investigations were undertaken by technical specialists experienced in impact assessment using best practice methodologies in accordance with relevant requirement statutory requirements and guidelines. A summary of the investigations undertaken, methodologies applied, and results achieved, are described in Section 6. Further detailed information is provided in the technical reports.

The first step of the impact assessment process involved identifying key potential environmental issues, impacts and risks that would be subject to detailed assessment as part of the EIS. Investigations were informed by the impact scoping exercise and risk assessment, as described in Section 6 and were undertaken in accordance with the SEARs. The results of environmental investigations and consideration of the environmental risk assessment were used to ensure that potential impacts are avoided as far as possible.

Ways to further reduce and minimise unavoidable potential impacts on the environment were considered. Mitigation and management measures to minimise any outstanding impacts are identified in this document. These measures, and the proposed approach to environmental management during construction and operation, are provided in Section 7.

8.2.2 Avoiding and minimising impacts

The key strategy to avoid or minimise potential impacts principally included selecting an already heavily disturbed site within the existing facility. Being within the existing facility and having relatively good separation distances from surrounding development, the project site offers advantages in terms of avoiding a number of amenity and social impacts such as visual intrusion, noise, risk etc.

Various detailed investigations and assessments have been undertaken, including site visits and modelling. These investigations identified key constraints early in the design process to assist with avoiding and minimising impacts as far as reasonably practicable.

The overall approach to the design development included the following key steps:

– Social, environmental and economic constraints assessment to identify and assess site layout options
– Preliminary concept design and layout selection
– Investigations and assessments

8.3 Social and economic considerations

During construction there is potential for actual or perceived amenity impacts associated with dust generated during construction activities and noise from construction equipment. Predictive noise modelling demonstrated that activities associated with the project would comply with the NMLs in accordance with the ICNG, and operational noise levels are not expected to change.

During operation there is also potential for actual or perceived amenity impacts associated with dust emissions, noise. Due to the distance between the receptors and the project site, dust impacts are not expected to be significant regardless of the estimated dust magnitude.

Ways to reduce and minimise potential amenity and socio-economic impacts have been considered during design development to date and as a result of the environmental investigations. The project also has a number of benefits which must also be considered when determining if the project is in the public and community's interest overall. The benefits of the project are summarised below.

8.3.1 Public interest and community benefits

The project has the following key community benefits:

– **Jobs:** the project is expected to create new up to ten jobs at the peak of construction and retain the 5 operational staff currently employed.
– **Stimulate the local economy:** during construction the project would temporarily increase economic activity in the area with potential increases in trade at local businesses and increased demand for construction related goods and services.
– **Efficient and effective use of a key asset**: the project would optimise the project site and make efficient and effective use of a key industry asset.

The project site layout has also been developed with due consideration of the possibility of risk.

Therefore, the project is considered to be in the public and community's interest.

8.4 Suitability of the site

The project site is considered suitable for the project for the following reasons:

– The project site is located within the existing Tocumwal Facility.
– The project site is located in an area that has been extensively cleared with surface layers removed and reworked and contains existing assets and facilities suitable to maintain the use of the site for its current purpose.
– The use is permissible with consent in the RU1 Zone.
– The location is remote from sensitive receivers with the nearest residential receiver about 170 metres away.
– The EIS technical studies have demonstrated that its intended use would not result in any significant impacts to nearby sensitive receivers and with the implementation of the proposed mitigation and management measures outlined in this EIS, the potential environmental impacts of the project would be adequately managed.

8.5 Ecologically sustainable development

The EP&A Act adopts the definition of ecologically sustainable development contained in the POEA Act. The following sections provide reasons justifying the project having regard to the principles of ecologically sustainable development defined by clause 7(4) of Schedule 2 of the EP&A Regulation.

8.5.1 Precautionary principle

The precautionary principle is defined as "…*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"*.

A range of environmental investigations have been undertaken during the development of the project and the environmental assessment process, to ensure that potential impacts are understood with a high degree of certainty. The assessment of the potential impacts of the project is consistent with the precautionary principle. The assessments undertaken are consistent with accepted scientific and assessment methodologies and have considered relevant statutory and agency requirements. The assessments have applied a conservative approach regarding construction and operational arrangements, and the modelling used. The project design has evolved to avoid impacts where possible and to reflect the findings of the studies undertaken. For example, the existing access road for the project has been selected to minimise the potential environmental impacts, and an upgrade to the intersection is an ancillary component of the project. The design has also been developed with due consideration of the sensitivity of the surrounding environment in relation to risk. Mitigation and management measures have been proposed to minimise potential impacts, which would be implemented during construction and operation.

8.5.2 Principle of inter-generational equity

The principle of inter-generational equity is defined as "…*the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations.'*

The project would deliver inter-generational equity by ensuring the existing facility is compliant with the AS2187 standard, and makes efficient use of an existing facility, in a location that minimise environmental impacts, and provides adequate safety and separation from other land uses. Any potential impacts to the eco-system can be offset by the purchase of credits. The implementation of applicable standards and relevant design codes and guidelines and the identified mitigation and control measures would help reduce the likelihood of significant impacts that would diminish the health, diversity, or production of the environment for present or future generations.

Conservation of biological diversity and ecological integrity

The principle of conservation of biological diversity and ecological integrity is defined as "…*conservation of biological diversity and ecological integrity should be a fundamental consideration."*

The project is located on an established magazine storage facility and requires minimal vegetation management. Through the application of the mitigation measures (refer to Section 6.11), these impacts would be appropriately avoided, mitigated or managed. Importantly these measures include an established environmental management system which would be employed following approval of the project. These measures would be subject to ongoing review and improvement where required. With these measures in place the project is unlikely to have an impact on biological diversity or ecological integrity.

8.5.3 Improved valuation and pricing of environmental resources

The principle of improved valuation and pricing of environmental resources is defined as "…*costs to the environment should be factored into the economic costs of a project",*

A BDAR was prepared in accordance with the *Biodiversity Assessment Method* (OEH 2017) to identify potential adverse impacts on biodiversity. Mitigation measures are proposed to minimise and manage the significance of the impact on native vegetation and flora and fauna. The environmental impact assessment has identified the potential environmental, social, and economic impacts of the project and identified mitigation and management measures, where appropriate, to manage potential impacts. If approved, the project would be undertaken in accordance with these mitigation and management measures. These requirements would result in an economic cost to the proponent, indicating that environmental resources have been given appropriate valuation in the development of the project. The project has been designed with an objective of minimising potential impacts on the surrounding environment and community. This indicates that the project has been developed with consideration of environmental outcomes.

8.5.4 Biophysical, economic and social merits of the project

The biophysical, economic and social costs and benefits of the project have been assessed in detail throughout the EIS. The biophysical impacts of the project would be generally limited due to the already disturbed nature of the site. The potential impacts of the project relate to hazards and risks, noise, dust and traffic. These environmental aspects have been assessed in detail in Section 6 of this EIS. The project is not expected to have a significant impact on the environment. Overall, the potential impacts of the project on the environment are considered limited and would be readily managed with the implementation of the mitigation and control measures discussed through this report that would be collated in environmental management plans. Construction of the project is expected to generate employment during the construction phase.

8.6 Objects of the EP&A Act

The project's consistency or otherwise with the objects of the EP&A Act is summarised in Table 8.1.

Table 8.1 Objects of the EP& A Act

Object	Comment
(a) to promote the social and economic welfare of the community and a better environment by the proper management, development and conservation of the State's natural and other resources.	The project would result in a capital spend of approximately $ 14,935,553.41 million (ex GST) into the NSW economy. Additional benefits would include flow-on jobs and services.
(b) to facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment,	The project is consistent with the principles of the ESD, as outlined in Section 8.5.
(c) to promote the orderly and economic use and development of land,	The project would be located on an existing facility and is permissible with consent in the zone. The land is heavily disturbed from past land use and access to existing infrastructure. On this basis, the project constitutes an orderly and economic use and development of the land.
(d) to promote the delivery and maintenance of affordable housing	Not relevant to the project.
(e) to protect the environment, including the conservation of threatened and other species of native animals and plants, ecological communities and their habitats,	A BDAR has been prepared to identify potential adverse impacts on biodiversity. The BDAR demonstrates that the project would not have a significant impact on any local populations of native biota, including threatened and endangered species, populations, or ecological communities listed under the BC Act or the EPBC Act.
(f) to promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage),	The ACHAR indicated that the project area contains no identified Aboriginal heritage items. No non-Aboriginal Heritage items are located proximate to the site.
(g) to promote good design and amenity of the built environment,	Early consideration was given to the configuration of the site and placement of the main project components with a view to optimising the site layout in conjunction with minimising the potential for social and environmental impact.
(h) to promote the proper construction and maintenance of buildings, including the protection of the health and safety of their occupants,	The PHA identified initial risks and mitigation measures to be implemented. The design, construction and maintenance of the project would be undertaken in accordance with manufacturer requirements and other applicable standards and relevant design codes and guidelines.
(i) to promote the sharing of the responsibility for environmental planning and assessment between the different levels of government in the State,	Not relevant to the project.
(j) to provide increased opportunity for community participation in environmental planning and assessment.	As outlined in Section 5, consultation with the key government and industry stakeholders was undertaken prior to the exhibition of the EIS. Exhibition of the EIS would provide additional opportunities for community participation in the approvals process.

8.7 Conclusion

The project responds to a strong need to maintain the distribution of explosives for the mining and quarrying sectors, and to remove the reliance on the exemption and become fully compliant with the AS2187 Standard and codes of practice.

The project is consistent with the LEP and in particular, the objectives of clause 6.11.

As described in Sections 6 and 7, the project would incorporate environmental management and design features to ensure that potential impacts are managed and mitigated as far as practicable.

To manage the potential impacts identified by the EIS, and in some cases remove them completely, the assessment sections outline a range of mitigation measures that would be implemented during construction and operation of the project. Section 7.2 summarises the mitigation measures that would be implemented. The environmental performance of the project would be managed by the implementation of the construction environmental management and operational environmental management framework. The plans and framework would also ensure compliance with relevant legislation and any conditions of approval.

With the implementation of the proposed mitigation and management measures the potential environmental impacts of the project would be adequately managed.

Development consent should be granted for the project because it:

- Is permissible with consent and consistent with the objects of the RU1 zone.
- Is located within the existing facility.
- Is consistent with the strategic planning directions of State and local planning policies.
- Would generate social and economic benefits including the provision of five (5) to ten (10) construction jobs and retention of five (5) operational jobs for the local area and a direct capital investment value of $ 14,935,553.41 million (ex GST)
- The impacts of the project can be mitigated and managed to ensure an acceptable level of environmental performance.
- Is in accordance with the Objects of the EP&A Act and is consistent with the Ecologically Sustainable Development Principles, because it would achieve an appropriate balance between the relevant environmental, economic and social considerations.
- As demonstrated by this EIS the project would have a long-term positive social, environmental, and economic impact for the LGA and the wider community. The project would generate increased government revenue through tax, increase employment.

The project is a suitable development for the project site, sited within an existing facility, and would deliver local and regional economic benefits. As such, it is in the public interest.

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Appendices

Appendix A

SEARs Table

Table A.1 SEARS

Requirement	Section addressed in EIS
General	
The Environmental Impact Statement (EIS) for the development must: – Comply with these assessment requirements. – Meet the form and content requirements in sections 190 and 192 of the Environmental Planning and Assessment Regulation 2021 (the Regulation). – Have regard to the Department's State Significant Development Guidelines (2021).	The EIS complies with the requirements as set out in this statement, and in the sections identified in this table. The EIS meets the requirements of S 190 and 192 of the Regulation (C-1-2). The EIS has regard to the SSDG 2021.
In addition, the EIS must include: – A clear comprehensive description of the proposal for the site, including details of all activities and processes proposed to be carried out as part of the development. – Consideration of issues discussed in the public authority responses to request for key issues (see **Attachment 2**). – A detailed assessment of the key issues specified below, including: • A description of the existing environment, using sufficient baseline data. • An assessment of the potential impacts of all stages and activities that form part of the development, including any cumulative impacts, taking into consideration relevant guidelines, policies, plans and statutes. • A description of the measures that would be implemented to avoid, minimise, mitigate and if necessary, offset the potential impacts of the development, including proposals for adaptive management and/or contingency plans to manage significant risks to the environment. The EIS must also be accompanied by: – High quality files of maps and figures of the subject site and proposal. – A report providing a detailed calculation of the capital investment value (CIV) (as defined in Schedule 7 of the Regulation) of the proposal. The CIV report must: • Be prepared by an AIQS Certified Quantity Surveyor or RICS Chartered Quantity Surveyor. • Include details of all assumptions and components from which the CIV calculation is derived. • Include certification from the Quantity Surveyor that the report has been prepared having regard to the Department's Planning Circular PS 21-020 'Calculation of capital investment value' and all components costed are consistent with the project description and all proposed works for which consent is being sought as described in the EIS.	Refer Section 3. Refer Section 5 Refer Section 1.5 Refer Section 6. Refer Sections 6 and 7.2. Throughout EIS, see Table of Contents. Separate attachment

Requirement	Section addressed in EIS
• An estimate of the retained and new jobs that would be created during the construction and operational phases of the development, including details of the methodology to determine the figures provided. – Certification that the information provided is accurate at the date of EIS submission and include details of all components and assumptions from which it is derived. – A declaration from a Registered Environmental Assessment Practitioner that your EIS includes the information specified in the Department's Registered Environmental Assessment Practitioner Guidelines.	Refer Section 2.1.1. Refer to Certification. Refer to Certification.
Key Issues	
Statutory and Strategic Context – including: – Detailed justification that the proposed land use is permissible with consent. – A detailed description of the history of the site, including the relationship between the proposed development and all development consents and approved plans previously and/or currently applicable to the site. – Demonstration that the proposal is consistent with all relevant planning strategies, environmental planning instruments, adopted precinct plans, draft district plan(s) and adopted management plans and justification for any inconsistencies. This includes, but is not limited to: • *State Environmental Planning Policy (Biodiversity and Conservation) 2021.* • *State Environmental Planning Policy (Industry and Employment) 2021.* • *State Environmental Planning Policy (Planning Systems) 2021.* • *State Environmental Planning Policy (Resilience and Hazards) 2021.* • *State Environmental Planning Policy (Sustainable Buildings) 2022.* • *State Environmental Planning Policy (Transport and Infrastructure) 2021.* • *Berrigan Local Environmental Plan 2013.* • *Riverina Murray Regional Plan 2041.* • *Future Transport Strategy 2056.*	Refer to Appendix C. Refer to Section 1.6. Refer to Section 2.2 to Appendix C.
Suitability of the Site – including detailed justification the proposed development can be integrated into the site by having regard to the scope of the operations of the existing facility. This EIS should also include a staging plan detailing the transitional and decommissioning phases of the development and existing equipment.	Refer to Section 3, and Section 8.4

Requirement	Section addressed in EIS
Community and Stakeholder Engagement – a community and stakeholder engagement strategy consistent with the Department's Undertaking Engagement Guidelines for State Significant Projects for all stages of the development, including (but not limited to): – Details of how issues raised, and feedback provided during engagement activities have been considered and responded to in the development. – Details of the proposed approach to future community and stakeholder engagement based on the results of consultation.	Refer to Section 5.
Hazards and Risk – a Preliminary Hazard Analysis (PHA) prepared in accordance with Hazardous Industry Planning Advisory Paper No. 6 – Guidelines for Hazard Analysis (DoP, 2011) and Multi-Level Risk Assessment (DoP, 2011) that includes: – Verification that the overall site complies with the requirements under Australian Standard AS 2187 Explosives – Storage, transport and use. – Verification that the overall site complies with the requirements for ammonium nitrate (security sensitive or otherwise) under Australian Standard AS 4326 – The storage and handling of oxidising agents, if relevant. – Outcomes and all necessary actions arising from the consultation with SafeWork NSW regarding compliance with the Explosives Act 2003 and Chapter 9 of the Work Health and Safety Regulation 2017.	Refer to Section 6.7.
Biodiversity – an assessment of the proposal's biodiversity impacts in accordance with the Biodiversity Conservation Act 2016, including the preparation of a Biodiversity Development Assessment Report (BDAR) where required under the Act, except where a waiver for preparation of a BDAR has been granted.	Refer to Section 6.11.
Traffic and Transport – a quantitative traffic impact assessment prepared in accordance with relevant Roads and Maritime Services and Austroads guidelines, that includes an assessment of the impact of traffic generation on the public road and rail network and measures employed to ensure traffic efficiency and road safety during construction, operation and decommissioning of the project (if applicable).	Refer to Section 6.6.
Soils – an assessment of potential impacts on soil resources and riparian land on and near the site, including: – Impacts on soil erosion, salinity and acid sulfate soils. – Details of earthworks, including cut and fill volumes. – Description of the proposed erosion and sediment controls during construction.	Refer to Section 6.1.

Requirement	Section addressed in EIS
Water Management – an integrated water management strategy, including: – A description of the water-related servicing infrastructure required by the development (informed by the anticipated annual and ultimate increase in servicing demand) and an evaluation of opportunities to reduce water demand (such as recycled water provision). – Demonstration that compliance with the Berrigan Shire Council or other drainage or water authority requirements can be achieved and avoids adverse downstream impacts. – Details of stormwater management and how any new infrastructure would integrate with existing on-site systems. **Flooding** – a flood risk assessment, that includes a detailed flooding assessment that satisfies the objectives and any relevant provisions of the NSW Floodplain Development Manual (2023).	Refer to Section 6.1.
Contamination – a site contamination assessment in accordance with the Managing Land Contamination Planning Guidelines: SEPP 55 – Remediation of Land (DUAP, 1998), including: – Characterisation of the nature and extent of any contamination on the site and surrounding area. – A Remedial Action Plan, if required.	Refer to Section 6.2
Air Quality and Odour – a quantitative assessment of the potential air quality, dust and odour impacts of the development (construction and operation) on surrounding landowners, businesses and sensitive receptors, in accordance with relevant Environment Protection Authority guidelines, including details of proposed mitigation, management and monitoring measures.	Refer to Section 6.3. A quantitative construction assessment not needed based on Air Quality guidelines/findings.
Noise and Vibration – a quantitative noise and vibration impact assessment undertaken by a suitably qualified acoustic consultant in accordance with the relevant Environment Protection Authority guidelines and Australian Standards, including details of proposed mitigation, management and monitoring measures.	Refer to Section 6.4.
Visual, including: – A visual impact assessment (including photomontages and perspectives) of the development layout and design (buildings and storage areas) on nearby public and private receivers and significant vantage points in the broader public domain. – Detailed plans showing suitable landscaping which incorporates endemic species.	Refer to Section 6.9.
Waste – including: – Details of the quantities and classification of all waste streams to be generated on site during the development. – Details of waste storage, handling and disposal during the development.	Refer to Section 6.5

Requirement	Section addressed in EIS
Infrastructure Requirements – an infrastructure delivery, management and staging plan that includes: – An assessment of impacts of the development on existing utility infrastructure and service provider assets surrounding the site. – Identification of any infrastructure required on-site and off-site to facilitate the development and any arrangements to ensure that the upgrades will be implemented on time and be maintained. – A description of how any upgrades will be co-ordinated, funded and delivered on time and be maintained to facilitate the development.	The only infrastructure connected to the site is the electricity that only goes to the main site office. The connection will not be getting upgraded or altered so any infrastructure management plan could take the form of a written statement that there will be no infrastructure impacts at all for this project. Refer to Appendix C.
Bush Fire – a bush fire assessment report that addresses the aims and objectives of Planning for Bushfire Protection 2019, and includes: – Details of proposed operational access for emergency services personnel. – Details of emergency and evacuation arrangements for occupants/visitors. – A Bush Fire Emergency Management and Evacuation Plan prepared in accordance with relevant RFS guidance.	Refer to Section 6.8.
Aboriginal Cultural Heritage – an Aboriginal Cultural Heritage Assessment Report (ACHAR) prepared in accordance with the Code of Practice for Archaeological Investigation in NSW (DECCW 2010a), and guided by the Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in New South Wales (OEH 2011). The ACHAR must: – Identify, describe and assess impacts on the Aboriginal cultural heritage values that exist across the development site. – Provide evidence and details of consultation with Aboriginal people in accordance with the Aboriginal Cultural Heritage Consultation Requirements for Proponents (DECCW 2010a). – Include results of a surface survey and any test excavations and an unexpected finds protocol.	Refer to Section 6.10.
Non-Aboriginal Cultural Heritage – a non-Aboriginal cultural heritage assessment (including both cultural and archaeological significance) which must detail potential impacts on heritage assets and any proposed management and mitigation measures.	Refer to Section 6.12.
Ecologically Sustainable Development – including: – A description of how the proposal will incorporate the principles of ecologically sustainable development in the design, construction and ongoing operation of the development. – Demonstration of how the development will meet or exceed the relevant industry recognised building sustainability and environmental performance standards.	Refer to Section 8.5.

Requirement	Section addressed in EIS
– Demonstration of how the development minimises greenhouse gas emissions (reflecting the Government's goal of net zero emissions by 2050) and consumption of energy, water (including water sensitive urban design) and material resources.	
Planning Agreement/Development Contributions – demonstration that satisfactory arrangements have been or would be made to provide, or contribute to the provision of, necessary local or State and/or regional infrastructure required to support the development.	Refer to Appendix C.
Consultation During the preparation of the EIS, you must consult with the relevant local, State or Commonwealth Government authorities, service providers, community groups and affected landowners. In particular you must consult with: – Berrigan Shire Council – SafeWork NSW – Fire & Rescue NSW – Department of Planning and Environment • Environment and Heritage Group • Heritage NSW – Department of Regional NSW, specifically the Department of Primary Industries – Agriculture – Transport for NSW – NSW Rural Fire Service – WaterNSW – Surrounding local landowners, businesses and stakeholders – Local and regional community and environmental groups – Cummeragunja Local Aboriginal Land Council – Any other utilities or community service providers	Refer to Section 5.25.
SEARs Expiry SEARs will expire two years after the date of issue (or the date they were last modified).	Noted.
References The assessment of the key issues listed above must take into account relevant guidelines, policies, and plans as identified. While not exhaustive, Attachment 1 contains a list of some of the guidelines, policies, and plans that may be relevant to the environmental assessment of this proposal.	Refer to Section 9.

Appendix B

Detailed maps and plans

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Issue 7

Project
S2223404 - Orica Tocumwal Magazines

PLEASE ACKNOWLEDGE RECEIPT OF DRAWINGS

Reasons: A - For Approval, AC - As Constructed, C - For Construction,
I - For Information, P - Preliminary, T - For Tender
MU - Multiple

ISSUE NO.	2	3	4	5	6	7
ISSUED BY	BB	BF	BB	BB	BB	BB
DAY	19	13	27	28	14	22
MONTH	9	10	10	11	12	12
YEAR	23	23	23	23	23	23
ISSUE REASON	P	P	P	A	P	C

DRG NO.	DRAWING/DOCUMENT TITLE	SIZE	SCALE						
S2223404-B01	SITE PLAN	NTS	-		P1	P2	P2		A
S2223404-B02	FLOOR PLAN	NTS	-	P2	P3	P4	P5		A
S2223404-B03	ELEVATIONS	NTS	-	P2	P3	P4	P5		A
S2223404-B04	SECTIONS	NTS	-	P1	P2	P3	P4		A
S2223404-B05	DETAILS	NTS	-	P2	P3	P4	P5	P6	A
S2223404-B06	WALL AND FLOOR FINISHES LAYOUT	NTS	-	P1	P2	P3	P4		A
S2223404-B07	MAGAZINE DOOR D1 DETAILS	NTS	-	P1	P2	P3	P4		A
S2223404-B08	MAGAZINE DOOR D2 DETAILS	NTS	-	P1	P2	P3	P4		A
S2223404-B09	WALL VENT DETAILS	NTS	-	P1	P2	P3	P4		A
S2223404-B10	REFLECTED CEILING PLAN	NTS	-	P1	P2	P3	P4		A
S2223404-B11	ROOF PLAN	NTS	-	P1	P2	P3	P4		A
S2223404-B12	FIRE SERVICES PLAN	NTS	-		P1	P2	P3		A
S2223404-GE00	COVER SHEET	NTS	-						A
S2223404-S01	NOTES	NTS	-						A
S2223404-S02	FOOTING AND FLOOR SLAB LAYOUT	NTS	-		P1	P2	P3		A
S2223404-S03	PRECAST CONCRETE WALL PANEL LAYOUT AND DETAILS	NTS	-		P1	P2	P3		A
S2223404-S04	PRECAST CONCRETE WALL PANEL ELEVATIONS	NTS	-		P1	P2	P3		A
S2223404-S05	ROOF FRAMING LAYOUT	NTS	-		P1	P2	P3		A
S2223404-S06	SECTION	NTS	-		P1	P2	P3		A
S2223404-S07	ROOF FRAMING SECTIONS AND DETAILS	NTS	-		P1	P2	P3		A
DISTRIBUTION				CD - Electronic Media, D - By Download, DH - Download and Hardcopy, E - Email, EH - Email and Hardcopy, EX - Extranet Issue, H - Hardcopy, MU - Multiple					
Ashburner Francis Consulting Engineers									
	John Kereczko				E	E			
Orica Australia Pty Ltd									
	Peter Fuller			E		E	E	E	E
	Sharon Richards			E					
ELECTRONIC FORMATS									
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DOCUMENT AND DRAWING ISSUE REGISTER

RP DESCRIPTION

LOT 2 ON DP225459



SITE LOCATION PLAN
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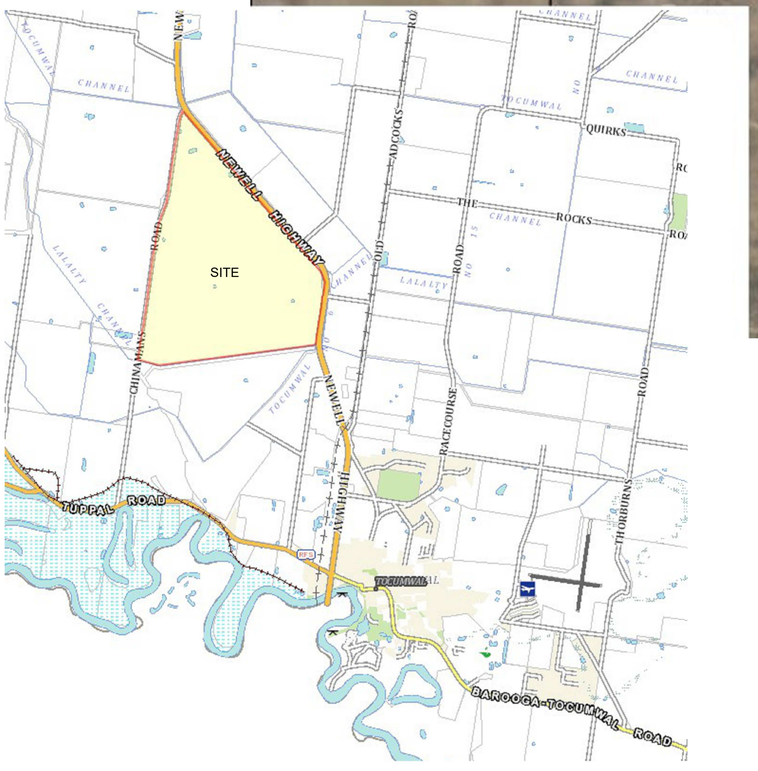


DETAIL "B"
SCALE 1:3,000



PART SITE PLAN

SCALE : NTS



LOCALITY PLAN

SCALE : NTS

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DATUM

DRAWING ISSUE

ISSUE	DATE	DETAILS	INITIALS
P1	13.10.23	PRELIMINARY	
P2	27.10.23	CLIENT REVIEW	
A	20.12.23	ISSUED FOR CONSTRUCTION	

0 1m 2m 3m 4m 5m

SCALE 1:100 @ A1
SCALE 1:200 @ A3

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CLIENT

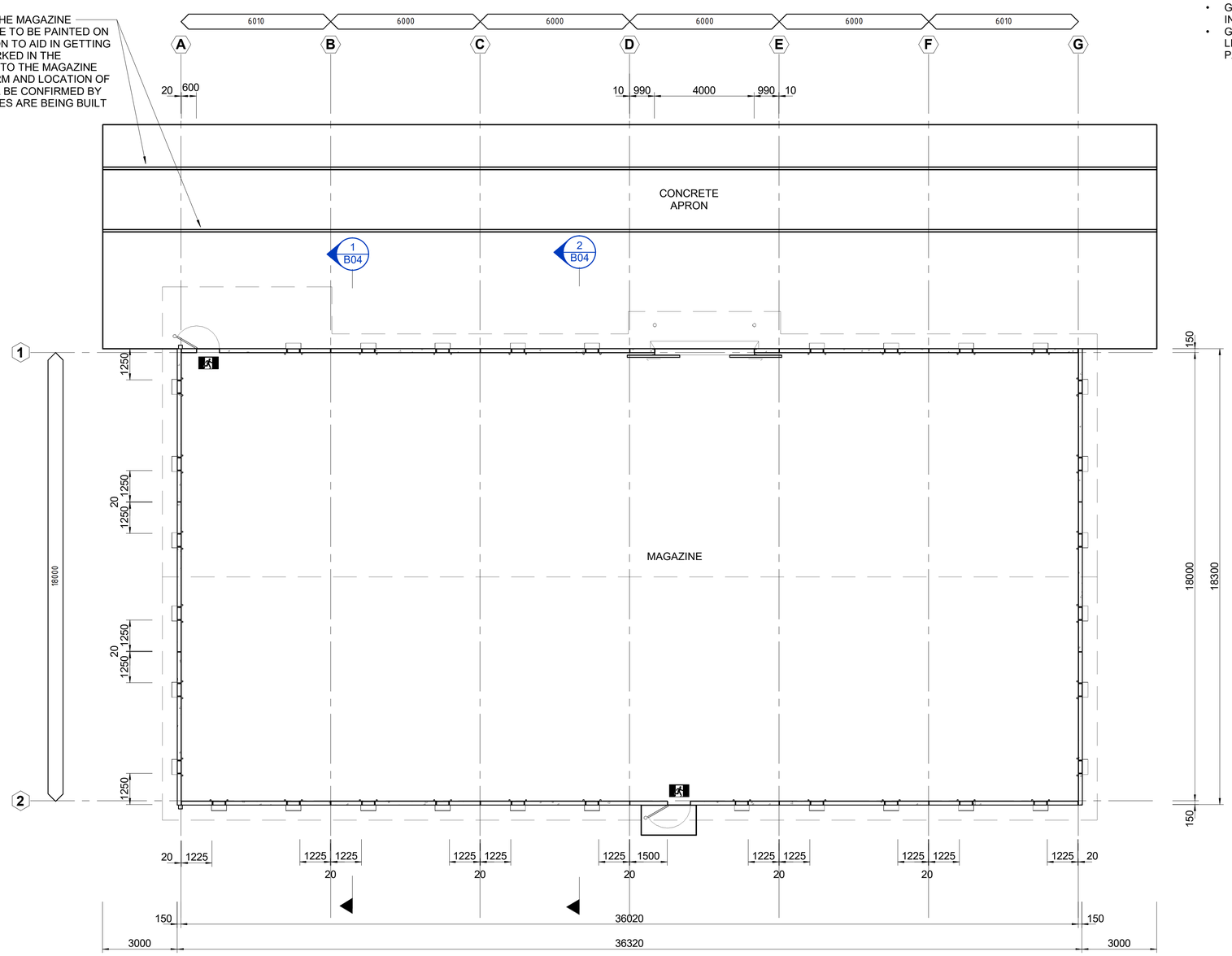
ORICA

PROJECT
TOCUMWAL MAGAZINES

DRAWING TITLE
SITE PLAN

DESIGN		ORIGINAL SIZE	A1
DRAWN	BJF	PROJECT NUMBER	S2223404
CHECKED	JP		
APPROVED		DRAWING NUMBER	B01
DATE		ISSUE	A

POST CONSTRUCTION OF THE MAGAZINE PAINTED YELLOW LINES ARE TO BE PAINTED ON THE CONCRETE SLAB APRON TO AID IN GETTING THE DELIVERY TRUCKS PARKED IN THE CORRECT SPOT ADJACENT TO THE MAGAZINE FORKLIFT DOOR. FINAL FORM AND LOCATION OF THESE PAINTED LINES WILL BE CONFIRMED BY ORICA WHEN THE MAGAZINES ARE BEING BUILT



GENERAL NOTES

- THESE DRAWINGS ARE TO BE READ IN CONJUNCTION WITH ALL OTHER CONSULTANT'S DRAWINGS AND SPECIFICATIONS
- ALL MATERIALS AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH CURRENT AND RELEVANT SAA CODES, NCC, THE BUILDING ACT AND LOCAL AUTHORITIES BY-LAWS
- THE CONTRACTOR TO VERIFY ALL DIMENSIONS, LEVELS, SETBACKS AND SPECIFICATIONS PRIOR TO COMMENCING ANY WORKS OR ORDERING MATERIALS AND SHALL BE RESPONSIBLE FOR ENSURING THAT ALL BUILDING WORKS COMPLIES WITH THE NCC, AUSTRALIAN STANDARDS (CURRENT EDITIONS), BUILDING REGULATIONS, LOCAL BY-LAWS AND TOWN PLANNING REQUIREMENTS. REPORT ANY DISCREPANCIES FOR CLARIFICATION.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE STRUCTURE DURING ERECTION AND PROVIDE ADEQUATE PROPPING AND SUPPORT
- ALL EXIT DOORS, DOORS IN PATH OF TRAVEL TO EXITS ARE TO COMPLY WITH THE NCC AND RELEVANT AUSTRALIAN STANDARDS, AT ALL TIMES
- EXIT SIGNS, DIRECTION SIGNS AND EMERGENCY LIGHTS TO COMPLY WITH AS/NZS2293.1 AND NCC. FOR ANY DEPARTURES FROM THE 'DEEMED TO SATISFY' SOLUTION TO THE REQUIREMENTS THE BUILDING CERTIFIER AND FIRE ENGINEER IS TO BE CONSULTED FOR AN ALTERATIVE SOLUTION OF THESE REQUIREMENTS TO SUIT THE OPERATIONAL REQUIREMENTS OF THE BUILDING
- BUILDING CONSTRUCTION TO BE IN ACCORDANCE WITH AS2181 'EXPLOSIVES - STORAGE, TRANSPORT AND USE PART 1 : STORAGE'
- BUILDING CONSTRUCTION TO BE IN ACCORDANCE WITH AS3959 'CONSTRUCTION OF BUILDINGS IN BUSHFIRE-PRONE AREAS' TO ACHIEVE A MINIMUM BAL 12.5

FLOOR PLAN

SCALE 1 : 100 @ A1

GRID LINE SETOUT

- GRID LINE A, G, 1 AND 2 ALIGN WITH INSIDE FACE OF PRECAST WALL PANELS
- GRID LINES B - F ALIGN WITH CENTER LINE OF RAFTERS AND PRECAST WALL PANEL JOINTS

DEVELOPMENT DETAILS

DISTRIBUTION MAGAZINE

PROPOSED USE	-	WAREHOUSE
BUILDING CLASSIFICATION	-	CLASS 7b
TYPE OF CONSTRUCTION	-	TYPE C
FLOOR AREA	-	664.7m^2
OCCUPANCY	-	

NOTE:
- PRIMARY BUILDING ELEMENTS ARE NOT SUSCEPTIBLE TO TERMITE ATTACK
- THE BUILDING IS TO BE USED FOR STORAGE ONLY AND NO HEATING OR COOLING EQUIPMENT TO BE INSTALLED. HENCE BUILDING FABRIC ASPECTS OF SECTION J DO NOT APPLY. REFER TO ELECTRICAL CONSULT FOR COMPLIANCE OF LIGHTING WITH SECTION J6

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DATUM

DRAWING ISSUE

ISSUE	DATE	DETAILS	INITIALS
P1	07.07.23	PRELIMINARY	
P2	15.09.23	PRELIMINARY	
P3	13.10.23	PRELIMINARY	
P4	27.10.23	CLIENT REVIEW	
P5	28.11.23	CLIENT REVIEW	
A	20.12.23	ISSUED FOR CONSTRUCTION	

0 1m 2m 3m 4m 5m

SCALE 1:100 @ A1
SCALE 1:200 @ A3

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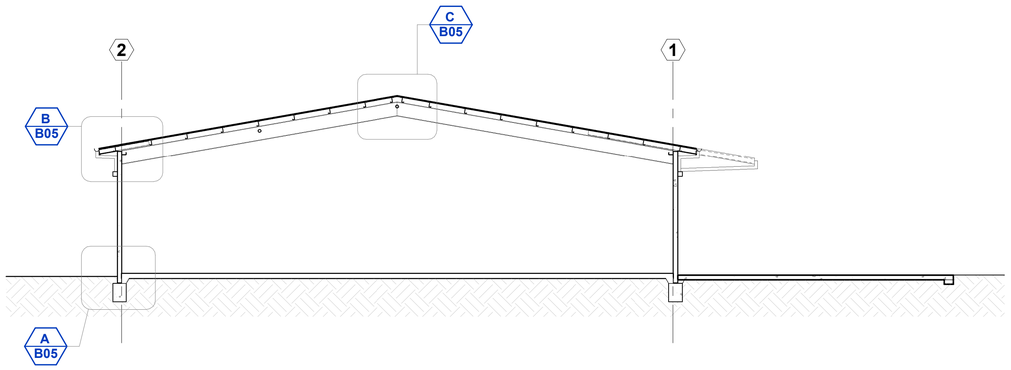
CLIENT

ORICA

PROJECT
TOCUMWAL MAGAZINES

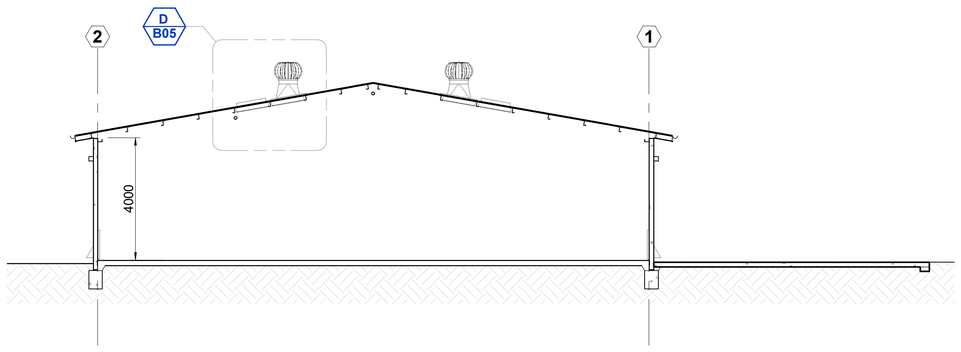
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FLOOR PLAN

DESIGN		ORIGINAL SIZE	A1
DRAWN	BJF	PROJECT NUMBER	S2223404
CHECKED	JP		
APPROVED		DRAWING NUMBER	B02
DATE		ISSUE	A



SECTION 1 / B02

SCALE 1 : 100 @ A1



SECTION 2 / B02

SCALE 1 : 100 @ A1

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P3	27.10.23	CLIENT REVIEW	
P4	28.11.23	CLIENT REVIEW	
A	20.12.23	ISSUED FOR CONSTRUCTION	

0 1m 2m 3m 4m 5m

SCALE 1:100 @ A1
SCALE 1:200 @ A3

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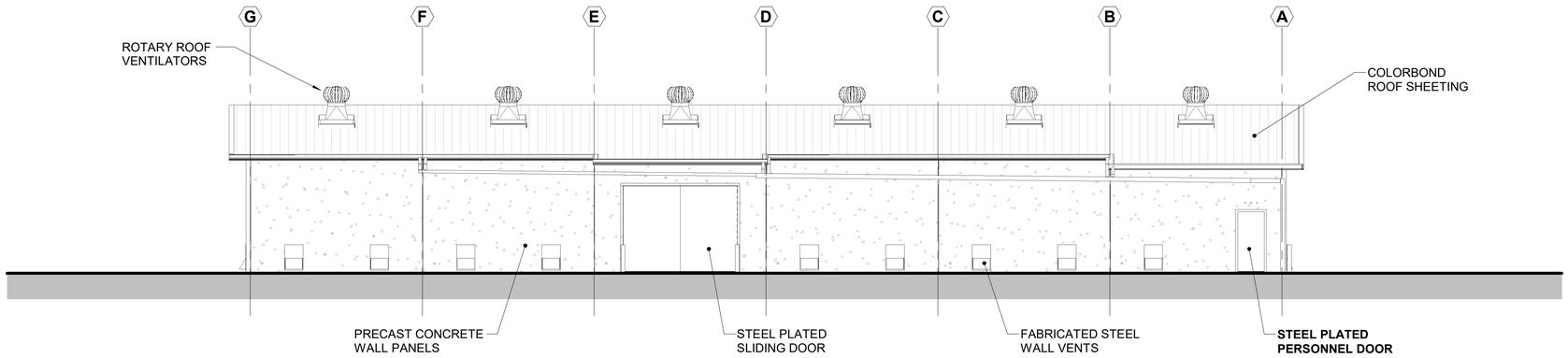
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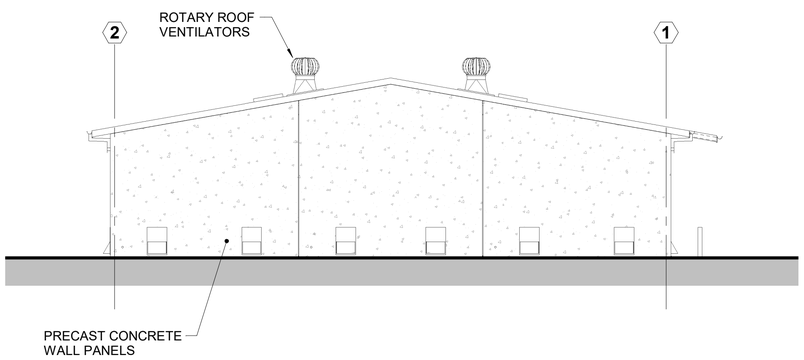
PROJECT
TOCUMWAL MAGAZINES

DRAWING TITLE
SECTIONS

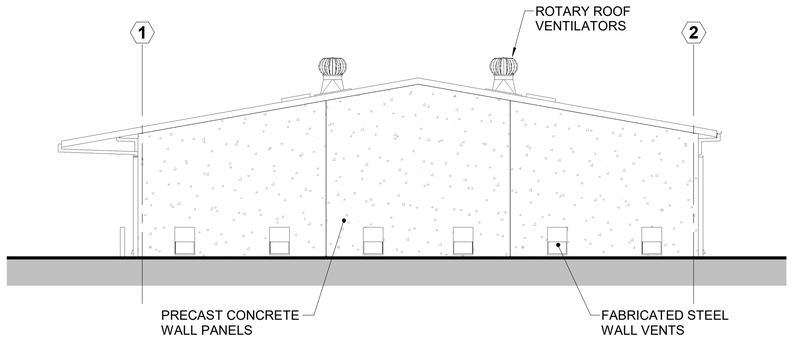
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CHECKED	JP		
APPROVED		DRAWING NUMBER	B04
DATE		ISSUE	A



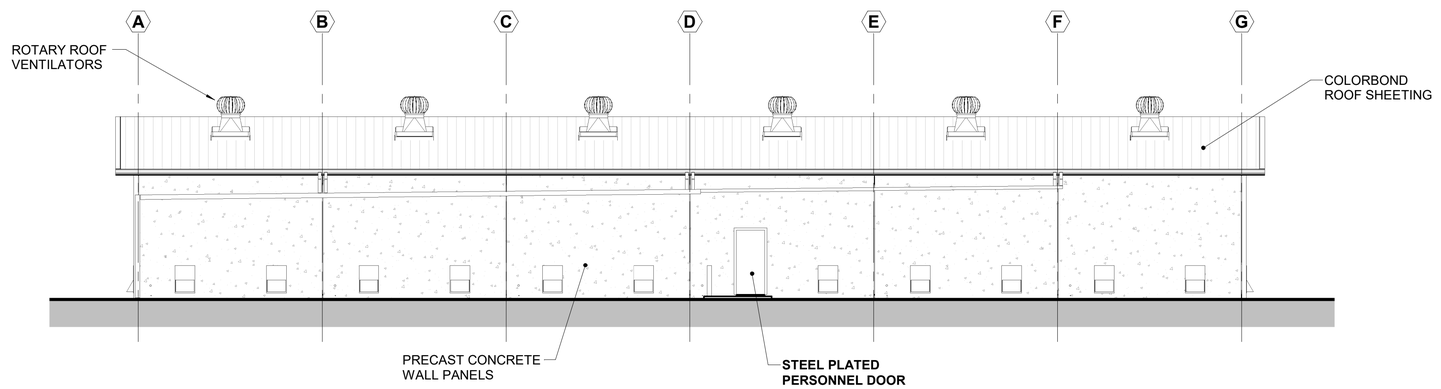
FRONT ELEVATION
SCALE 1 : 100 @ A1



RIGHT SIDE ELEVATION
SCALE 1 : 100 @ A1



LEFT SIDE ELEVATION
SCALE 1 : 100 @ A1



REAR ELEVATION
SCALE 1 : 100 @ A1

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DRAWING ISSUE

ISSUE	DATE	DETAILS	INITIALS
P1	07.07.23	PRELIMINARY	
P2	15.09.23	PRELIMINARY	
P3	13.10.23	PRELIMINARY	
P4	27.10.23	CLIENT REVIEW	
P5	28.11.23	CLIENT REVIEW	
A	20.12.23	ISSUED FOR CONSTRUCTION	

0 1m 2m 3m 4m 5m

SCALE 1:100 @ A1
SCALE 1:200 @ A3

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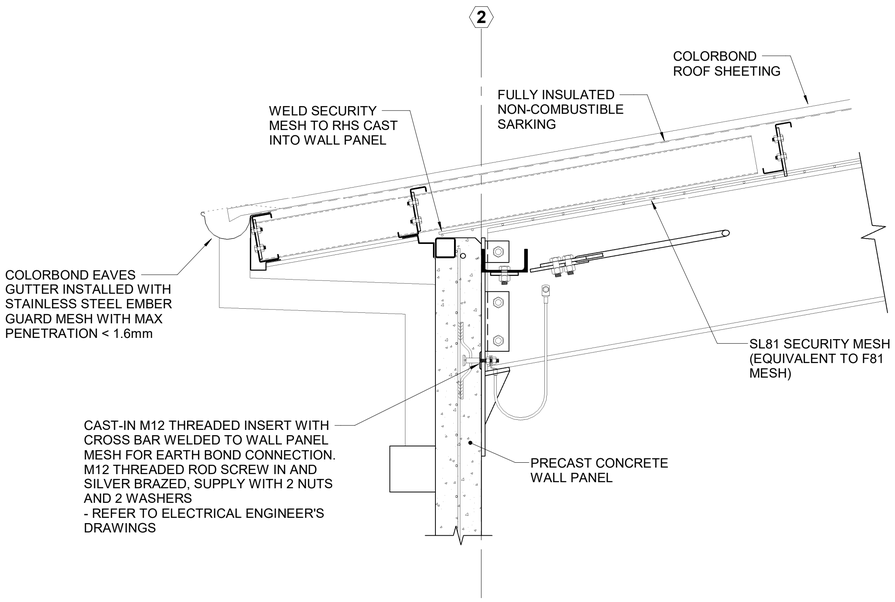
CLIENT
ORICA

PROJECT
TOCUMWAL MAGAZINES

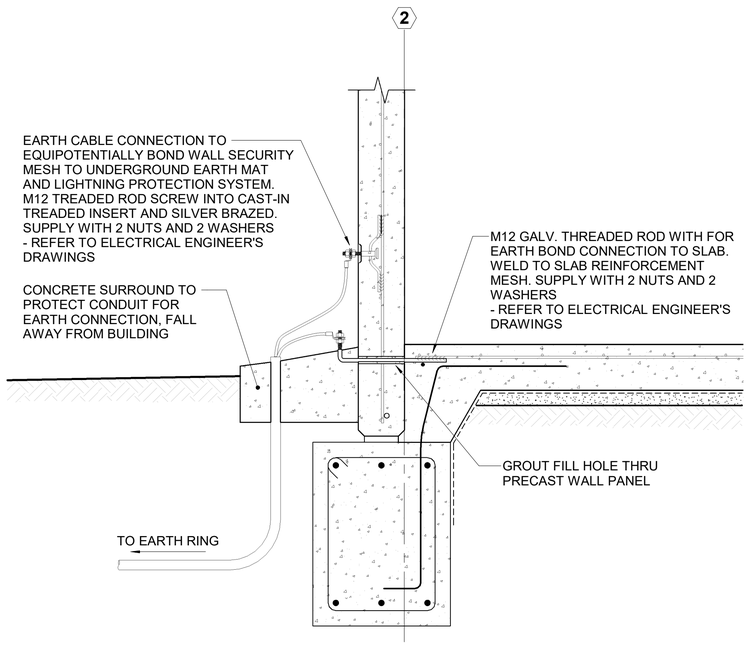
DRAWING TITLE
ELEVATIONS

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CHECKED	JP		
APPROVED		DRAWING NUMBER	B03
DATE		ISSUE	A

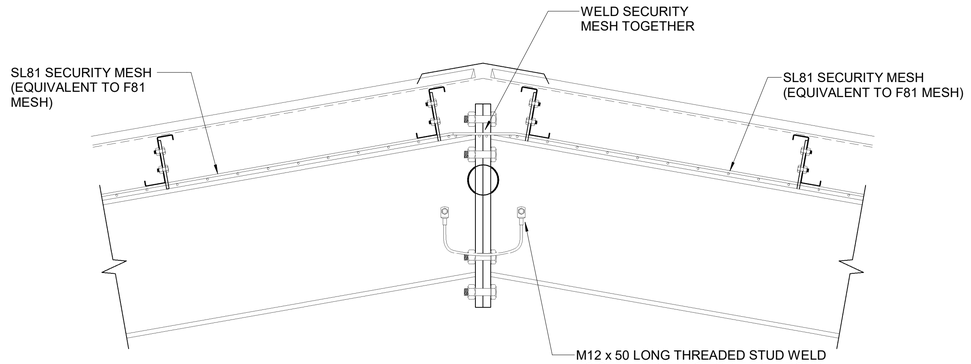
THE ROOF IS TO BE CONSTRUCTED INACCORDANCE WITH AS3959 'CONSTRUCTION OF BUILDING IN BUSHFIRE PRONE AREAS' TO ACHIEVE A MINIMUM BAL 12.5, ANY GAPS > 2mm TO BE SEALED



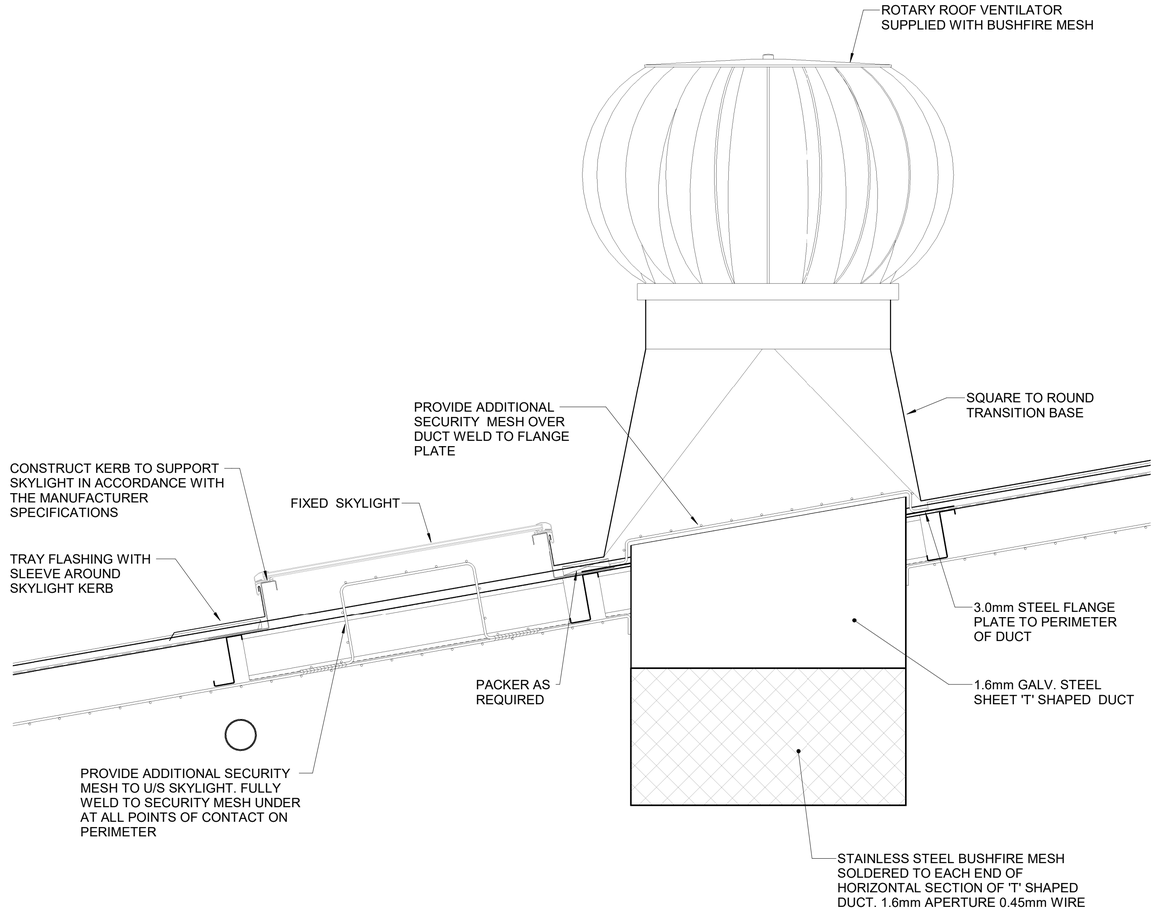
DETAIL B04
SCALE 1 : 10 @ A1



DETAIL A04
SCALE 1 : 10 @ A1



DETAIL C04
SCALE 1 : 10 @ A1



DETAIL D04
SCALE 1 : 10 @ A1

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DRAWING ISSUE

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P2	15.09.23	PRELIMINARY	
P3	13.10.23	PRELIMINARY	
P4	27.10.23	CLIENT REVIEW	
P5	28.11.23	CLIENT REVIEW	
P6	14.12.23	CLIENT REVIEW	
A	20.12.23	ISSUED FOR CONSTRUCTION	

0 0.1m 0.2m 0.3m 0.4m 0.5m

SCALE 1:10 @ A1
SCALE 1:20 @ A3

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DRAWING TITLE
DETAILS

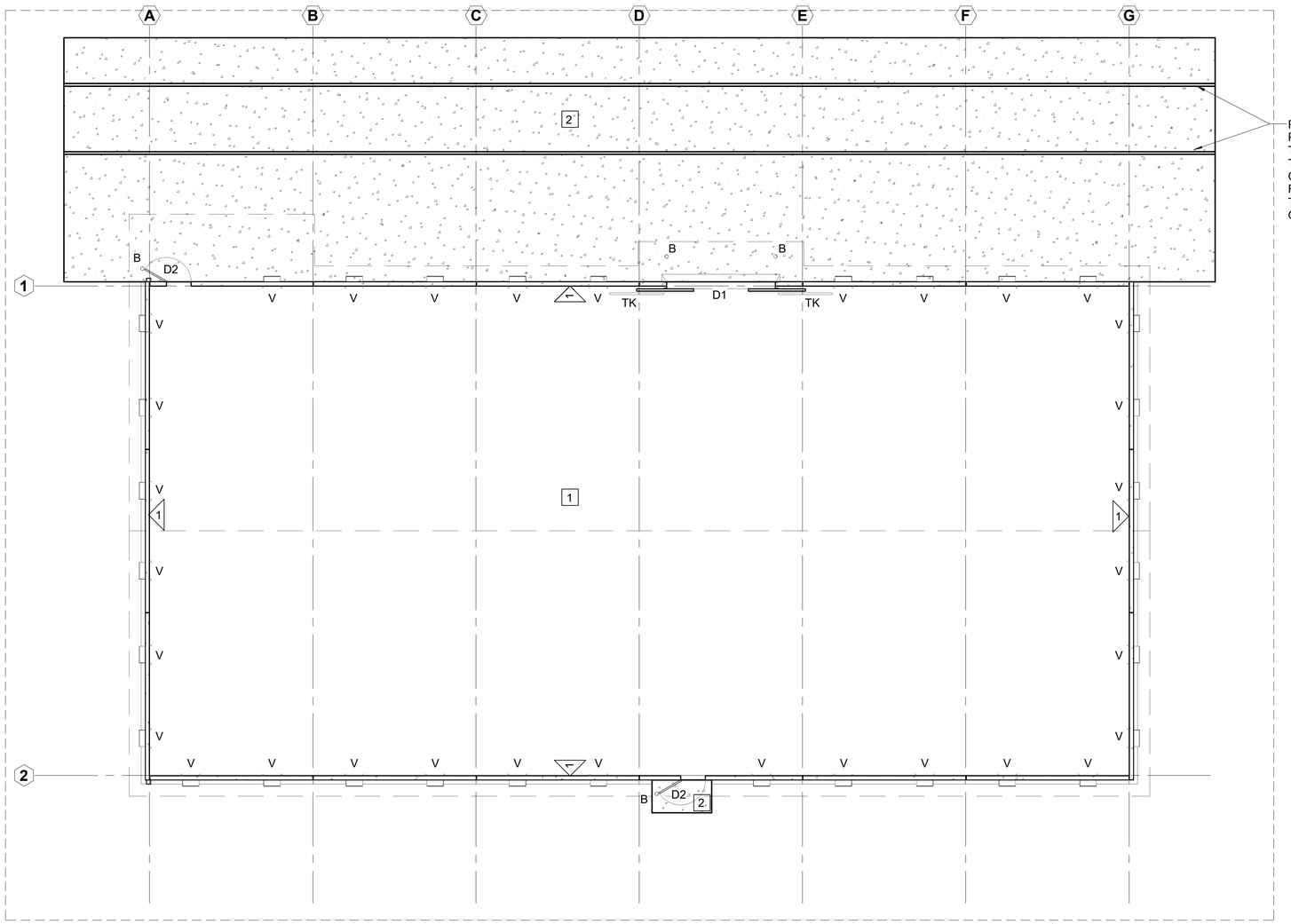
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CHECKED	JP		
APPROVED		DRAWING NUMBER	B05
DATE		ISSUE	A

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P4	28.11.23	CLIENT REVIEW	
A	20.12.23	ISSUED FOR CONSTRUCTION	



POST CONSTRUCTION OF THE MAGAZINE PAINTED YELLOW LINES ARE TO BE PAINTED ON THE CONCRETE SLAB APRON TO AID IN GETTING THE DELIVERY TRUCKS PARKED IN THE CORRECT SPOT ADJACENT TO THE MAGAZINE FORKLIFT DOOR. FINAL FORM AND LOCATION OF THESE PAINTED LINES WILL BE CONFIRMED BY ORICA WHEN THE MAGAZINES ARE BEING BUILT

THE BUILDING SURROUNDS TO BE CLEARED OF ALL VEGETATION INCLUDING TRESS FOR A MINIMUM OF 5m (OR AS ADVISED BY THE LOCAL FIREFIGHTING AUTHORITY) TO FORM A FIRE BREAK

WALL AND FLOOR FINISHES LAYOUT

SCALE 1 : 100 @ A1

0 1m 2m 3m 4m 5m

SCALE 1:100 @ A1
SCALE 1:200 @ A3

F I X T U R E S S C H E D U L E

B	139.5 x 5.0 CHS COREFILLED BOLLARD 1300 HIGH ABOVE FINISHED SURFACE LEVEL CAST INTO BORED PIER. WELD M10 x 40 LONG STUD TO BASE OF BOLLARD FOR EARTH BOND CONNECTION. SUPPLY WITH NUT AND WASHERS, SURROUND TO BE FREE OF PAINT. PROVIDE DOOR CATCH WHERE REQUIRED. APPLY EXTERIOR GRADE HIGH GLOSS ENAMEL PAINT SYSTEM FINISH. COLOUR - SAFETY YELLOW
V	FABRICATED WALL VENTILATOR, 5mm MILD STEEL EXTERNAL COVER PLATE AND WEATHER SHIELD WITH PERFORATED PLATE TO OPENING, HOT DIPPED GALVANISED FINISH 1.6mm GALVANISED STEEL SHEET DUCT WITH OFFSET OPENINGS, COVER OPENINGS WITH WOVEN WIRE MESH 12mm PLYWOOD INTERNAL COVER PLATE WITH HARDWOOD STRIP FENDER EACH SIDE, SATIN POLYURETHANE CLEAR FINISH REFER TO DRAWING B09 FOR DETAILS
TK	200x75 HWD (VERTICAL) TIMBER KERB. FIX TO TOP OF FLOOR SLAB WITH M12 MASONRY ANCHORS @ 1500 CTS MAX FINISH BELOW SURFACE AND PLUG HOLE WITH TIMBER DOWEL. APPLY SATIN POLYURETHANE CLEAR FINISH

NOTE:
- PAINT SYSTEM REFERS TO THE FINAL COAT AND SHALL INCLUDE THE RECOMMENDED WITH THE MANUFACTURERS SPECIFICATION AND AS2311. THE SURFACE SHALL BE PREPARED TO A STANDARD NOT LESS THAN DESCRIBED IN AS2311 SECTION 3 PREPARATION OF UNPAINTED SURFACE

D O O R S C H E D U L E

D1	2100 HIGH x 1000 WIDE FABRICATED STEEL FRAME MAGAZINE DOOR WITH CAST-IN DOOR FRAME, 10 STEEL PLATE EXTERNAL LINING AND 17mm PLYWOOD INTERNAL LINING. APPLY EXTERIOR GRADE PAINT SYSTEM FINISH.
D2	FABRICATED STEEL FRAME SLIDING MAGAZINE DOOR TO SUIT 4000 WIDE x 3000 HIGH OPENING WITH CAST-IN DOOR FRAME, 10mm STEEL PLATE EXTERNAL LINING AND 17mm PLYWOOD INTERNAL LINING. INSTALL BAL-FZ RATED NYLON BRUSH STRIP SEALS TO BOTTOM OF DOOR AND PERIMETER OF DOOR FRAME. INSTALL MIN BAL 19 RATED SELF-ADHESIVE SEAL TO ONE LEAF. APPLY EXTERIOR GRADE PAINT SYSTEM FINISH.

NOTE:
- REFER TO DRAWING B07 AND B08 FOR MAGAZINE DOOR DETAILS
- PROVIDE TIMBER ARCHITRAVES AND JAMBS AS DETAIL, ALL STEELWORK TO BE COVERED
- DOOR CONSTRUCTION TO BE IN ACCORDANCE WITH AS2187.1 'EXPLOSIVES - STORAGE, TRANSPORT AND USE PART 1 : STORAGE
- DOOR INSTALLATION TO BE IN ACCORDANCE WITH AS3959 'CONSTRUCTION OF BUILDINGS IN BUSHFIRE-PRONE AREAS' TO ACHIEVE A MINIMUM BAL 12.5

F I N I S H E S S C H E D U L E

FLOOR FINISHES	
1	STEEL TROWEL CONCRETE APPLY CLEAR CONCRETE SEALER SYSTEM
2	BROOM FINISH NATURAL CONCRETE
WALL FINISHES	
1	STEEL TROWEL FINISH CONCRETE WALL PANEL, INSTALL WITH FIRE RESISTANT SEALANT TO EXTERNAL SIDE OF JOINTS. APPLIED AN EXTERIOR GRADE ELASTOMERIC COATING TO THE EXTERIOR FACE. COLOUR -

NOTE:
- INSTALLATION OF ALL PRODUCTS TO BE STRICTLY IN ACCORDANCE WITH THE MANUFACTURERS INSTALLATION MANUALS
- THE CONTRACTOR IS TO PROVIDE ADDITIONAL TAMPER RESISTANT FIXINGS WHERE REQUIRED TO ENSURE THE BUILDING IS SECURE
- ALL FIXINGS TO BE COLOUR MATCHED
- WALL CONSTRUCTION TO BE INACCORDANCE WITH AS3959 'CONSTRUCTION OF BUILDINGS IN BUSHFIRE-PRONE AREAS' TO ACHIEVE A MINIMUM BAL 12.5

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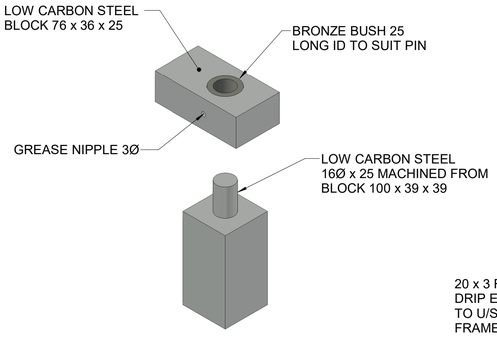
CIVIL | STRUCTURAL | HYDRAULIC

CLIENT
ORICA

PROJECT
TOCUMWAL MAGAZINES

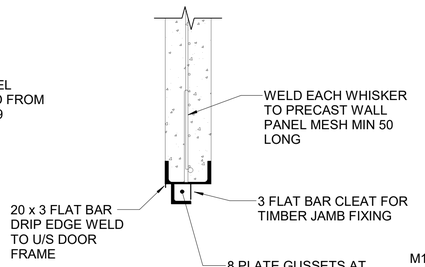
DRAWING TITLE
WALL AND FLOOR FINISHES LAYOUT

DESIGN		ORIGINAL SIZE	A1
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CHECKED	JP		
APPROVED		DRAWING NUMBER	B06
DATE		ISSUE	A



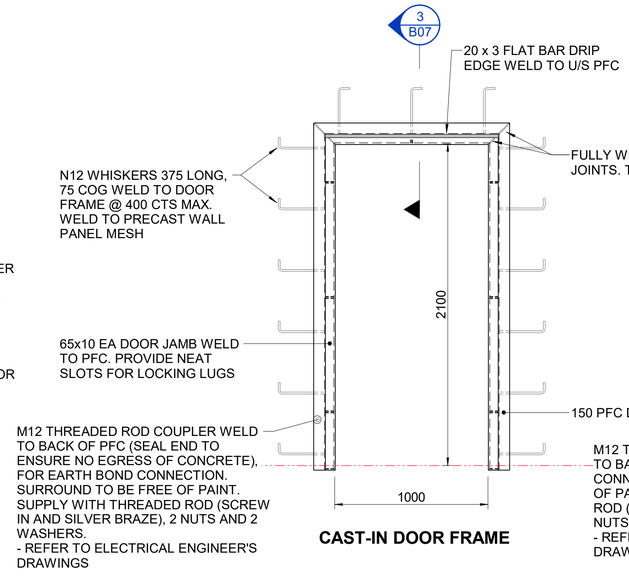
HINGE DETAIL

SCALE : NTS

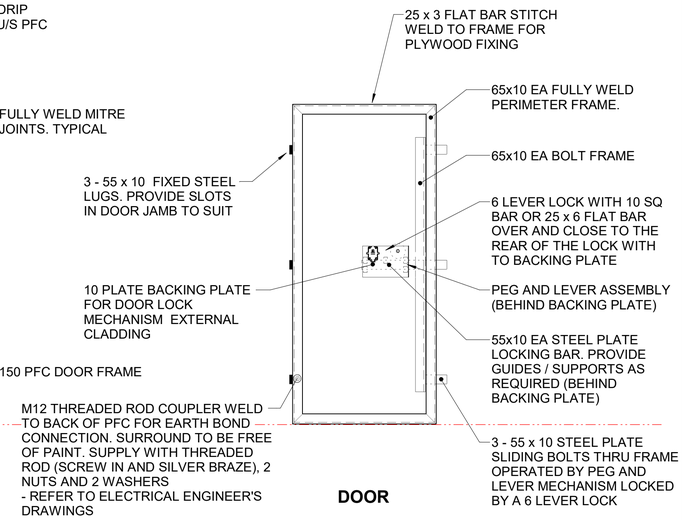


SECTION 3 B07

SCALE 1 : 10 @ A1



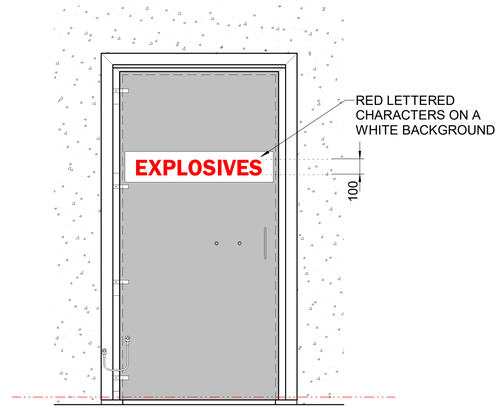
CAST-IN DOOR FRAME

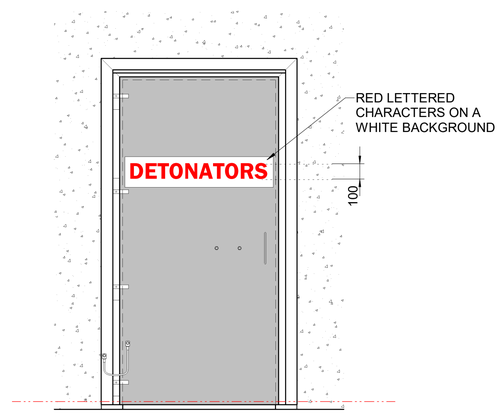


DOOR

D1 DOOR FRAME ELEVATIONS

SCALE 1 : 20 @ A1

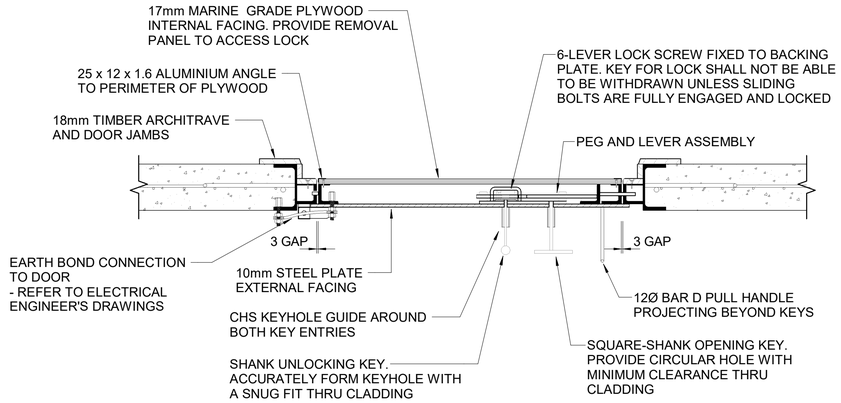




NOTE:
- ORICA TO ADVISE THE APPROPRIATE MARKING TO BE USED FOR THE MAGAZINE

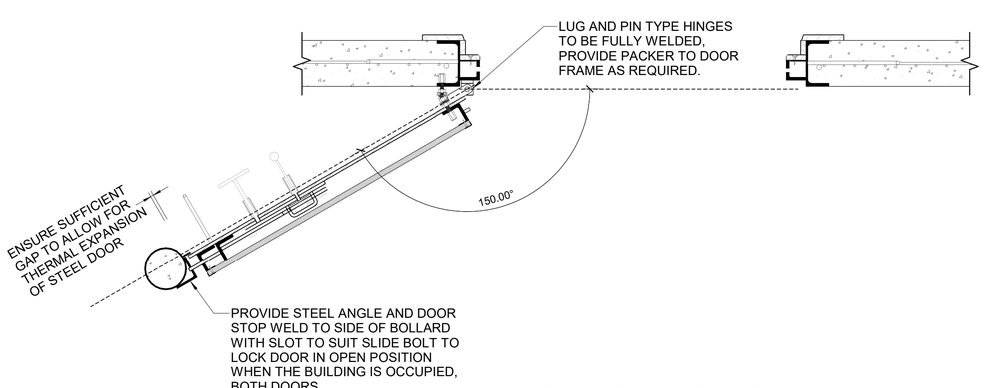
DOOR MARKINGS

SCALE 1 : 20 @ A1



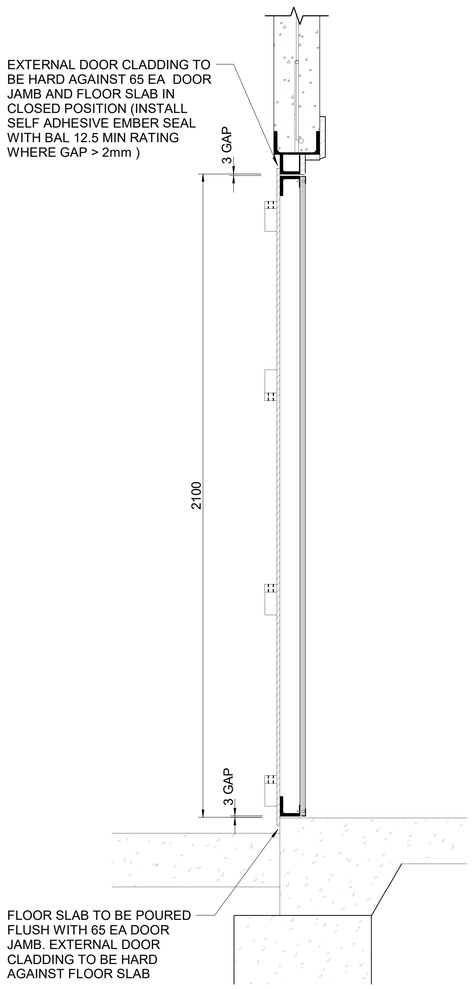
DOOR D1 CLOSED POSITION

SCALE 1 : 10 @ A1



DOOR D1 OPEN POSITION

SCALE 1 : 10 @ A1



D1 DOOR SECTION

SCALE 1 : 10 @ A1

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P4	28.11.23	CLIENT REVIEW	
A	20.12.23	ISSUED FOR CONSTRUCTION	

0 0.1m 0.2m 0.3m 0.4m 0.5m

SCALE 1:10 @ A1
SCALE 1:20 @ A3

0 0.2m 0.4m 0.6m 0.8m 1m

SCALE 1:20 @ A1
SCALE 1:40 @ A3

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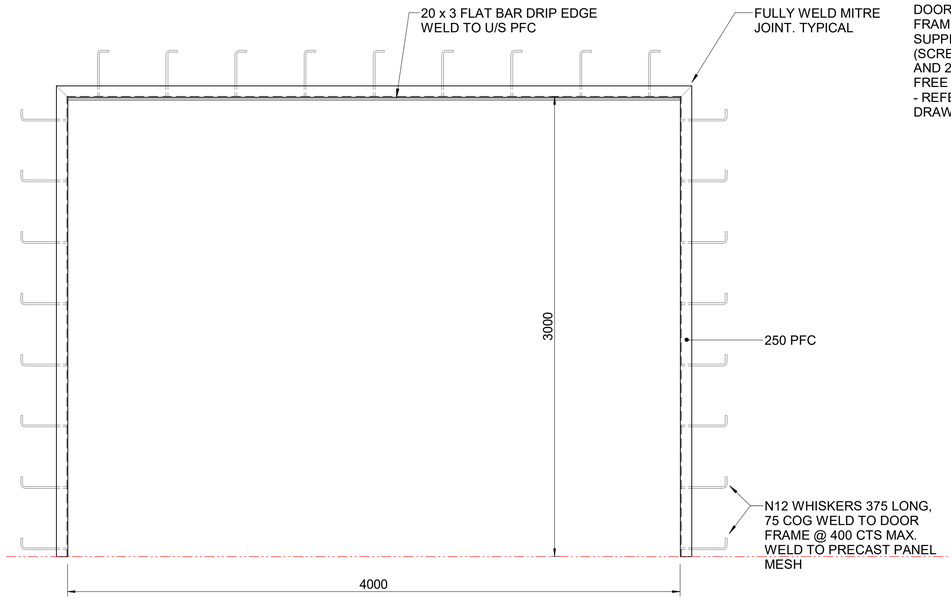
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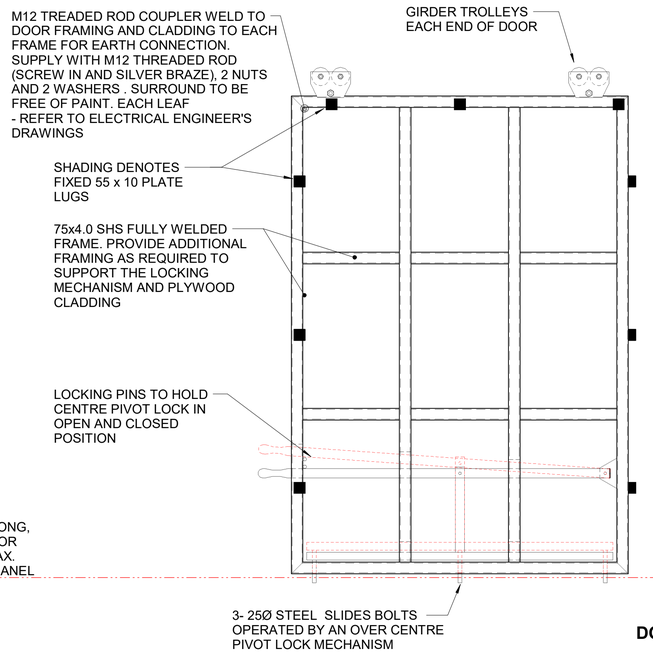
PROJECT
TOCUMWAL MAGAZINES

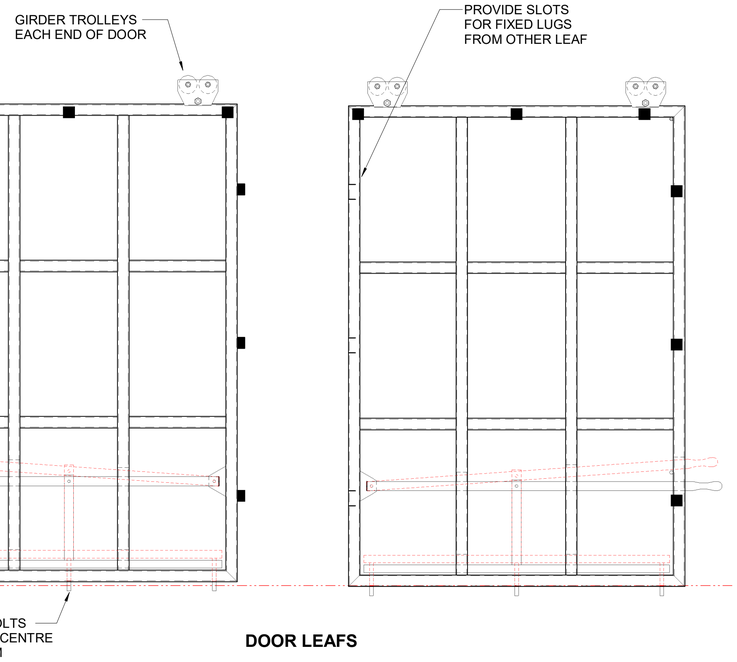
DRAWING TITLE
MAGAZINE DOOR D1 DETAILS

DESIGN		ORIGINAL SIZE	A1
DRAWN	BJF	PROJECT NUMBER	S2223404
CHECKED	JP		
APPROVED		DRAWING NUMBER	B07
DATE		ISSUE	A



CAST-IN DOOR FRAME

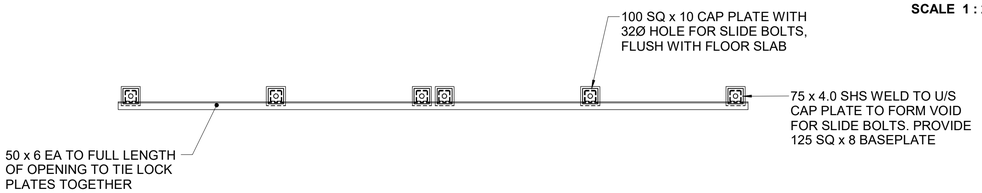




DOOR LEAFS

D2 DOOR FRAME ELEVATION

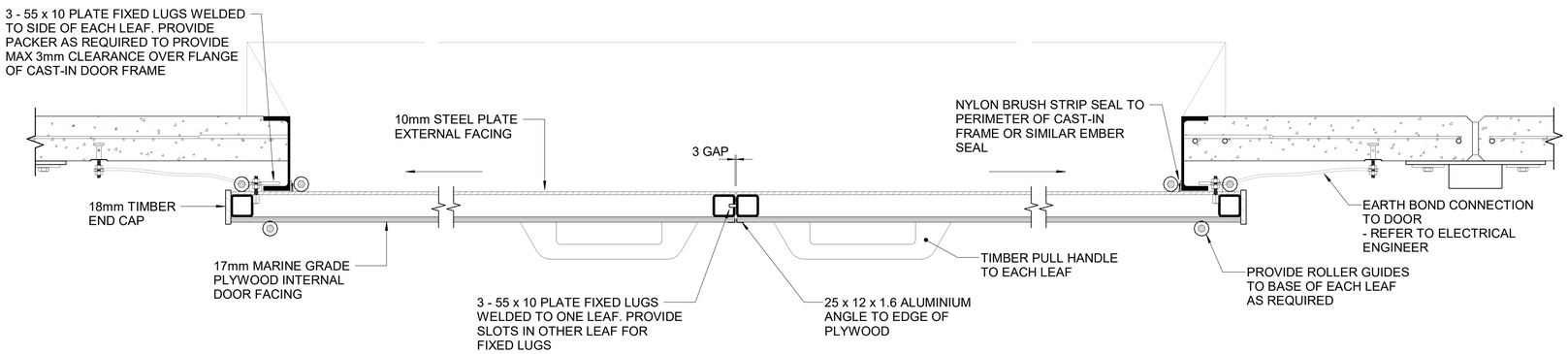
SCALE 1 : 20 @ A1



HOT DIPPED GALVANISED FINISH

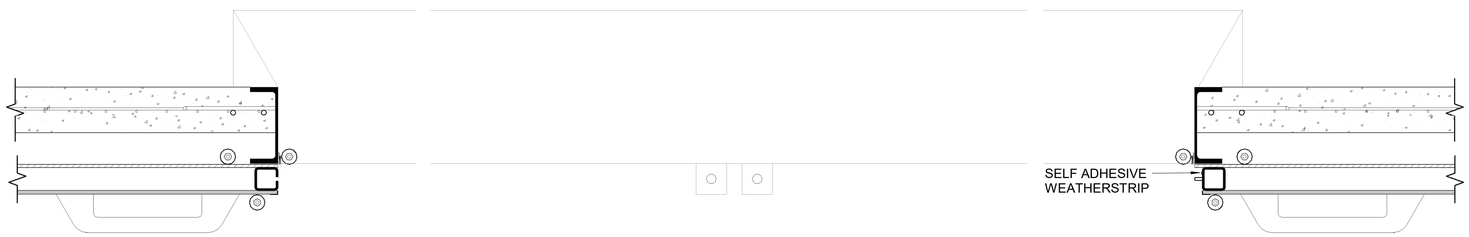
D2 DOOR CAST-IN LOCK PLATES

SCALE 1 : 20 @ A1



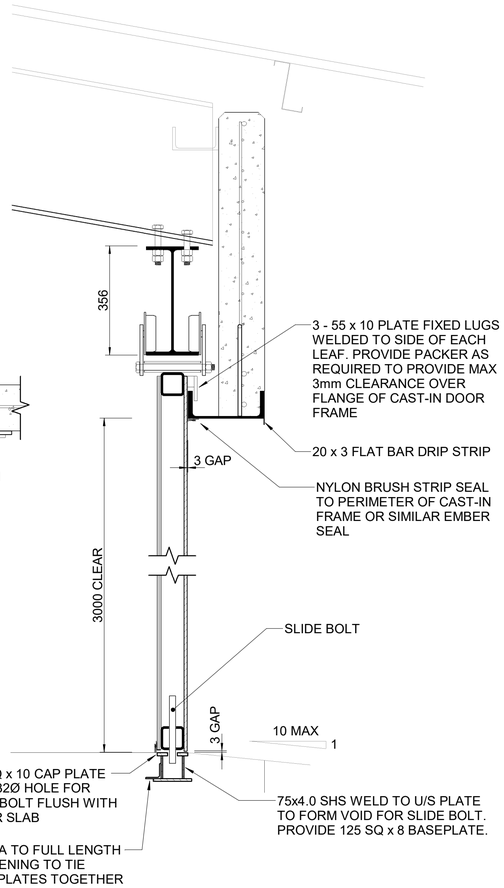
DOOR D2 CLOSED POSITION

SCALE 1 : 10 @ A1



DOOR D2 OPEN POSITION

SCALE 1 : 10 @ A1



DOOR D2 SECTION

SCALE 1 : 10 @ A1

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A	20.12.23	ISSUED FOR CONSTRUCTION	

0 0.1m 0.2m 0.3m 0.4m 0.5m

SCALE 1:10 @ A1
SCALE 1:20 @ A3

0 0.2m 0.4m 0.6m 0.8m 1m

SCALE 1:20 @ A1
SCALE 1:40 @ A3

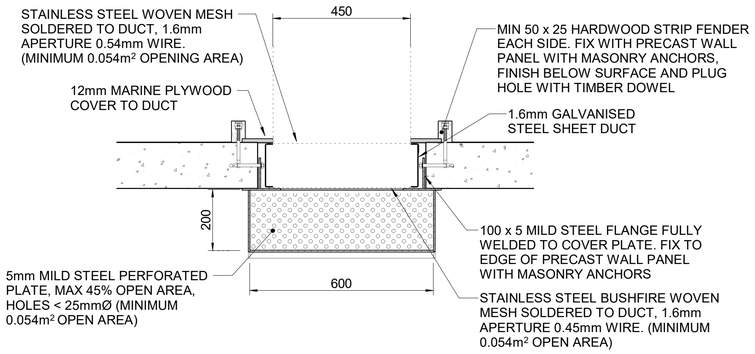
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DRAWING TITLE
MAGAZINE DOOR D2 DETAILS

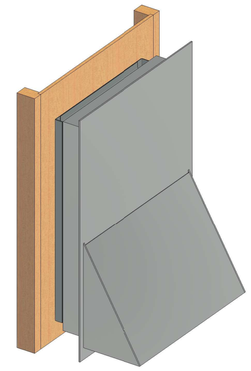
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DRAWN	BJF	PROJECT NUMBER	S2223404
CHECKED	JP		
APPROVED		DRAWING NUMBER	B08
DATE		ISSUE	A



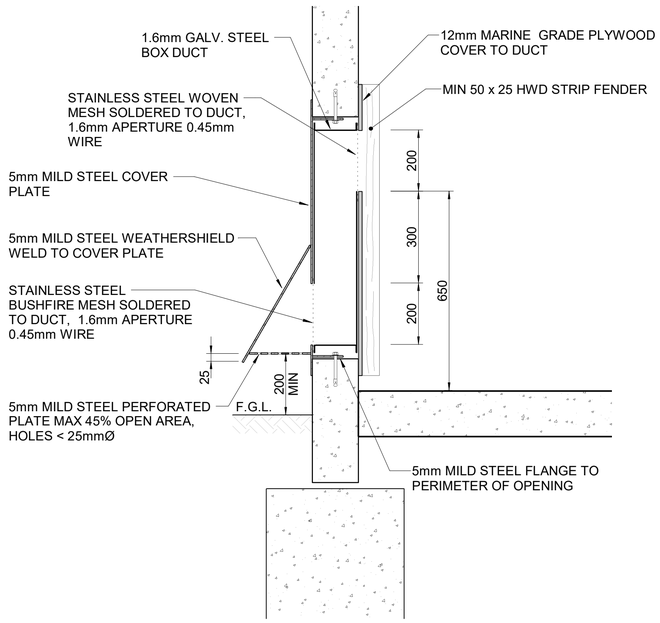
PLAN
SCALE 1 : 10 @ A1



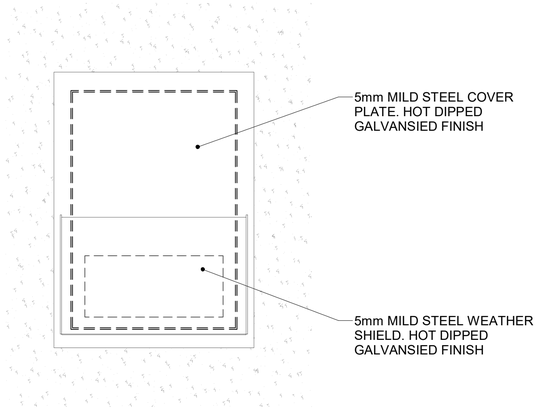
INTERNAL 3D VIEW
SCALE @ A1



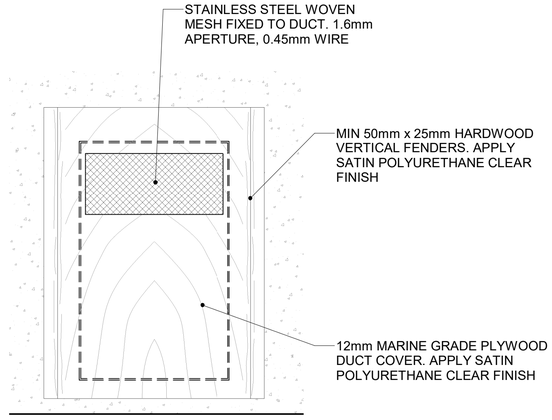
EXTERNAL 3D VIEW
SCALE @ A1



SECTION
SCALE 1 : 10 @ A1



EXTERNAL ELEVATION
SCALE 1 : 10 @ A1



INTERNAL ELEVATION
SCALE 1 : 10 @ A1

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SCALE 1:10 @ A1
SCALE 1:20 @ A3

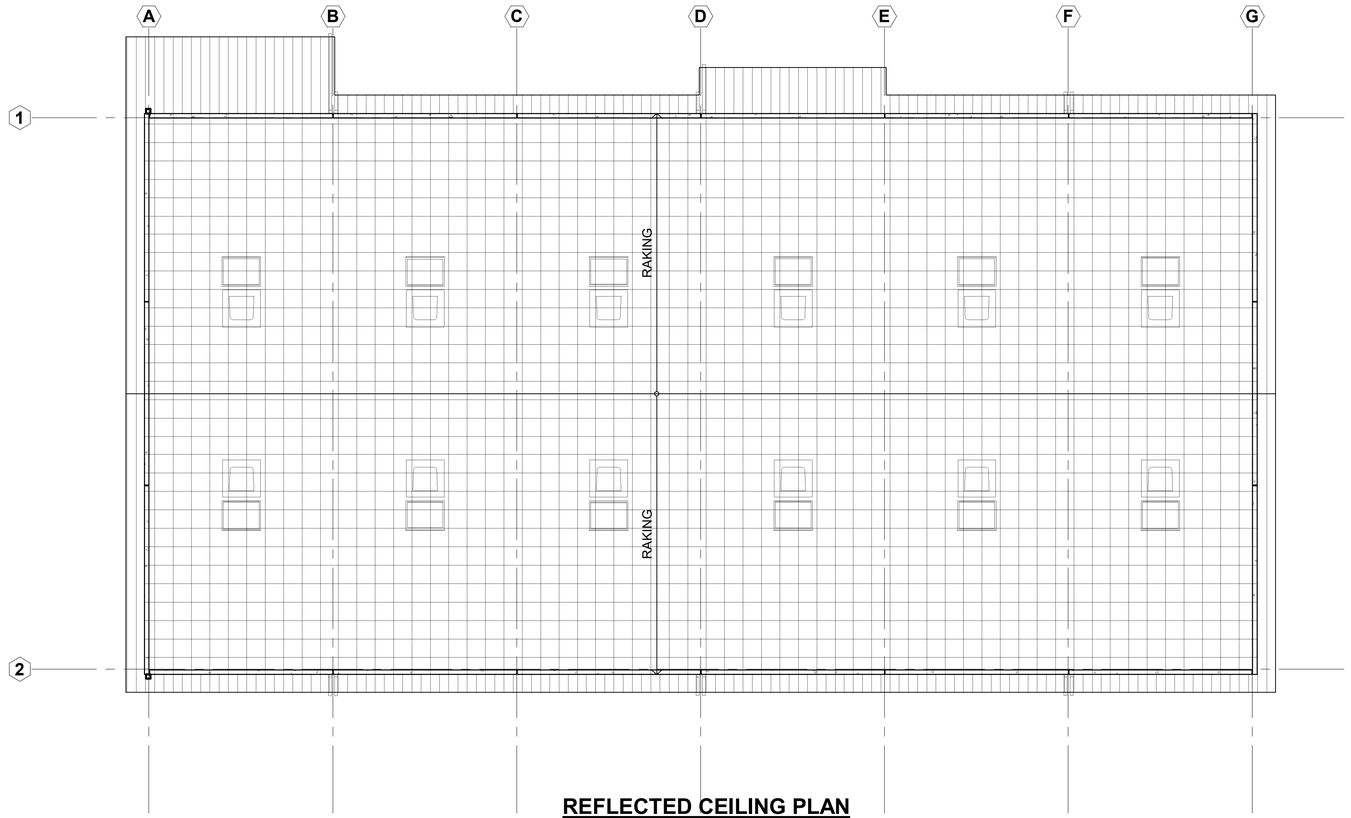
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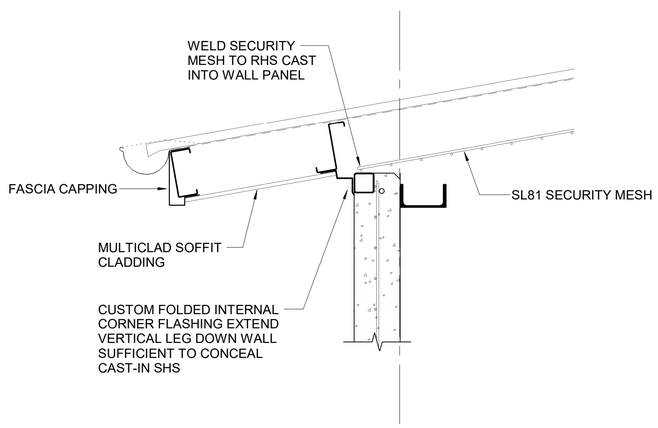
DRAWING TITLE
WALL VENT DETAILS

DESIGN		ORIGINAL SIZE	A1
DRAWN	BJF	PROJECT NUMBER	S2223404
CHECKED	JP		
APPROVED		DRAWING NUMBER	B09
DATE		ISSUE	A



REFLECTED CEILING PLAN

SCALE 1 : 100 @ A1



TYPICAL SOFFIT DETAIL

SCALE 1 : 10 @ A1

CEILING FINISHES SCHEDULE	
	0.42 BMT 'LYSAGHT MULTICLAD' EAVES SOFFIT CLADDING COLORBOND FINISH SCREW FIX TO U/S ROOF PURLINS. FINISH TO ADJACENT WALL WITH CUSTOM FORMED 0.55 BMT STEEL SHEET FLASHINGS / CAPPINGS COLORBOND FINISH COLOUR -
	SL81 REINFORCING MESH (MIN GRADE 450) GALVANISED FINISH, LAID OVER ROOF FRAMING. LAP MESH 200 ADJACENT VERTICALS TO BE STITCH WELDED 6 FILLET WELD 50 MISS 200. STITCH WELD TO TOP OF PRECAST WALL PANELS. FIX TO U/S ROOF PURLINS WITH WELDMESH U CLIPS

NOTE:
- ALL SOFFITS TO BE VERMIN AND BIRDPROOF
- SOFFITS TO BE CONSTRUCTED IN ACCORDANCE WITH AS3559 'CONSTRUCTION OF BUILDINGS IN BUSHFIRE PRONE AREAS' TO ACHIEVE A MINIMUM BAL 12.5

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0 1m 2m 3m 4m 5m

SCALE 1:100 @ A1
SCALE 1:200 @ A3

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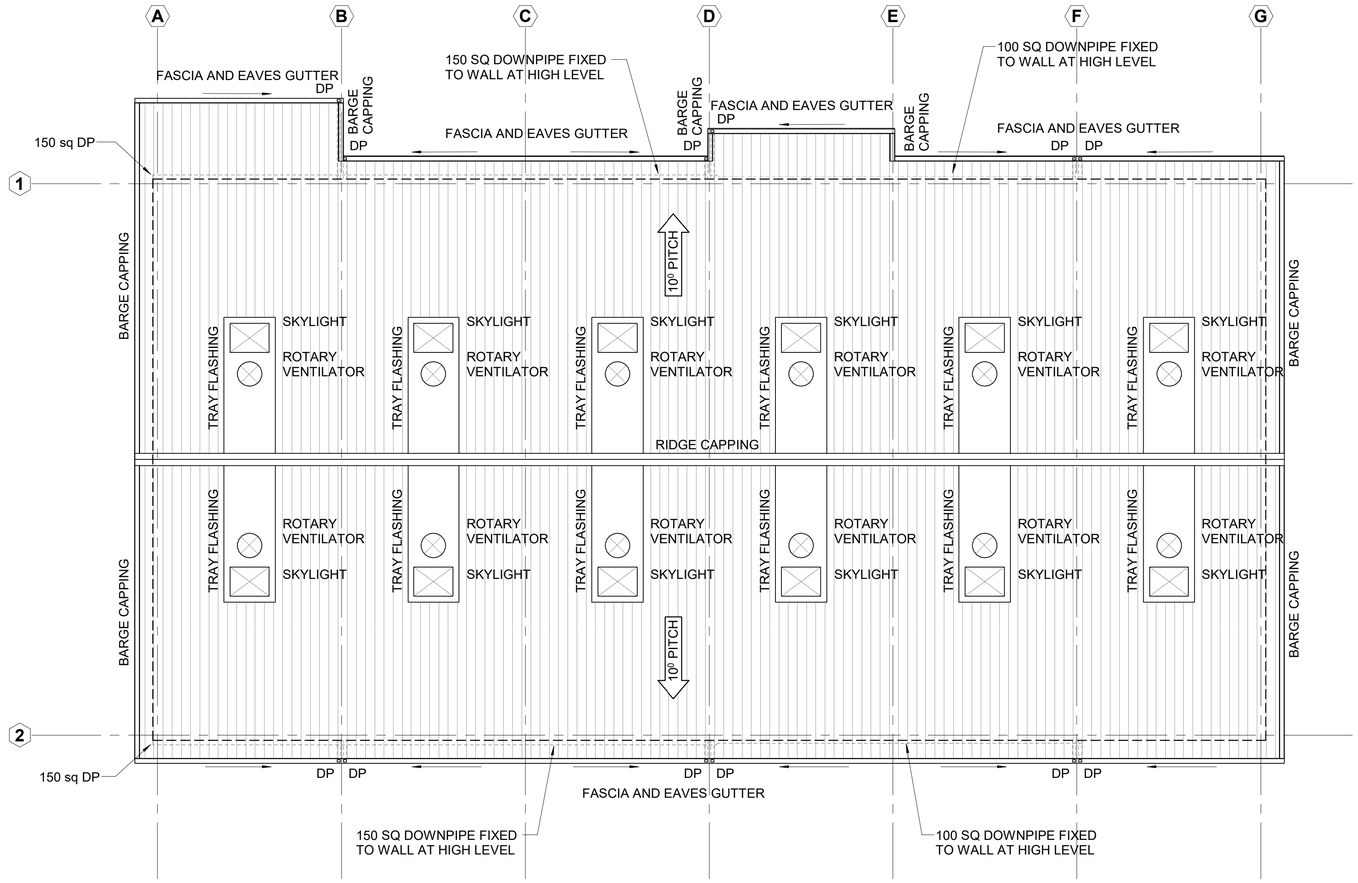
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DRAWING TITLE
REFLECTED CEILING PLAN

DESIGN		ORIGINAL SIZE	A1
DRAWN	BJF	PROJECT NUMBER	S2223404
CHECKED	JP		
APPROVED		DRAWING NUMBER	B10
DATE		ISSUE	A

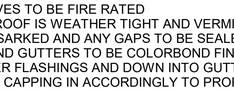


MAXIMUM DESIGN RAINFALL INTENSITY 160mm/hr (Q20)

ROOF PLAN

SCALE 1 : 100 @ A1

ROOF FINISHES SCHEDULE

ROOF SHEETING	0.42 BMT 'LYSAGHT TRIMDEK' ROOF SHEETING COLORBOND FINISH OVER NON-COMBUSTIBLE SARKING TO ENTIRE ROOF AREA. INSTALL BAL-FZ RATED ROOF INFILL STRIPS ALONG ROOF EDGES. FIX SHEETING SIDE LAPS @ 450 CTS AND ALTERNATIVELY ALONG ROOF EDGES @ 450 CTS WITH 'POWERS SFS IRUS DRIVE' TAMPER RESISTANT SCREWS. COLOUR -
RIDGE CAPPING	THREE BREAK CAPPING COLORBOND FINISH SCRIBED TO SUIT ROOF PROFILE. INSTALL OVER BAL-FZ RATED ROOF INFILL STRIPS. FIX ALTERNATIVELY WITH 'POWERS SFS IRUS DRIVE' TAMPER RESISTANT SCREWS @ 450 CTS COLOUR -
BARGE CAPPING	CUSTOM FORMED 0.55 BMT STEEL SHEET BARGE CAPPING OVER FASCIA PURLIN, PROVIDE PACKERS AS REQUIRED, COLORBOND FINISH COLOUR - 
EAVES GUTTER	'LYSAGHT HALF ROUND 200' EAVES GUTTER COLORBOND FINISH. INSTALL AT MIN 1 IN 250 GRADE FIX WITH INTERNAL BRACKETS @ 1200 CTS MAX. FINISH WITH AN APPROVED STAINLESS STEEL EMBER GUARD MESH. MINIMUM CROSS SECTIONAL AREA 12 800mm² COLOUR -
FASCIA	CUSTOM FORMED 0.55 BMT STEEL SHEET FASCIA OVER FASCIA PURLIN, PROVIDE PACKERS AS REQUIRED, COLORBOND FINISH COLOUR - 
DOWNPIPE	100x100 0.55 BMT STEEL SHEET MITRE JOINTED DOWNPIPE COLORBOND FINISH. FIX WITH PURPOSE MADE BRACKETS COLORBOND FINISH @ 2000 CTS MAX VERTICALLY
ROTARY VENTILATOR	800Ø THROAT ROTARY VENTILATOR CAPABLE OF ACHIEVING A MINIMUM OF 1.125m³/sec AT 4km/hr. FITTED WITH BUSHFIRE MESH, COLORBOND FINISH. PROVIDE 1.6mm STEEL STEEL 'T' SHAPED DUCT TO U/S THRU ROOF, HAVING A CLOSED BASE AND SCREENED SIDE OPENINGS WITH STAINLESS STEEL MESH TO BASE OF THROAT, 1.6mm APERTURE 0.45mm WIRE COLOUR -
SKYLIGHT	970 x 1275 FIXED DOUBLE GLAZED SKYLIGHT, MINIMUM BAL 12.5 RATED. INSTALL WITH ADDITIONAL SL81 SECURITY MESH TO U/S WELDED TO ROOF SECURITY MESH AT ALL POINTS OF CONTACT
TRAY FLASHING	0.55 BMT STEEL SHEET TRAY OVER ROOF SHEETING EXTENDING UP TO U/S RIDGE CAPPING (TURN UP UNDER CAPPING, TURN DOWN ALONG SIDES AND SCRIBED TO SUIT ROOF PROFILE AT BOTTOM). INSTALL SLEEVE TURNDOWN TO SUIT SKYLIGHT AND ROTARY VENTILATOR. COLORBOND FINISH

ROOF NOTES

- INSTALLATION OF ALL PRODUCTS TO BE STRICTLY IN ACCORDANCE WITH THE MANUFACTURERS INSTALLATION MANUALS
- ALL FIXINGS TO BE IN ACCORDANCE WITH MANUFACTURERS SPECIFICATION AND COLOUR MATCHED WHERE VISIBLE
- ALL SEALANTS AND ADHESIVES TO BE FIRE RATED
- ENSURE THAT THE ENTIRE ROOF IS WEATHER TIGHT AND VERMIN PROOF
- ENTIRE ROOF TO BE FULLY SARKED AND ANY GAPS TO BE SEALED
- ALL FLASHINGS, CAPPING AND GUTTERS TO BE COLORBOND FINISH
- TURN UP SHEET ENDS UNDER FLASHINGS AND DOWN INTO GUTTERS
- SCRIBE ALL FLASHINGS AND CAPPING IN ACCORDINGLY TO PROFILES. UPSTANDS TO BE MIN 100 HIGH, OVER FLASHINGS TO BE MIN 200 WIDE AND HORIZONTAL LAPS TO BE 150 WIDE
- ROOF CONSTRUCTION TO BE INACCORDANCE WITH AS3959 'CONSTRUCTION OF BUILDINGS IN BUSHFIRE PRONE AREAS' TO ACHIEVE A MINIMUM BAL 12.5

ROOF ACCESS SYSTEM

- INSTALL A PROPRIETARY ROOF ACCESS LANYARD SYSTEM TO ASSIST IN THE SAFE ACCESS AND MAINTENANCE OF THE WHOLE ROOFED AREAS. THE SYSTEM IS TO COMPLY WITH AS/NZS1891.1/1891.2
- PROPRIETARY ROOF ACCESS SYSTEM TO BE DESIGNED, INSTALL AND CERTIFY THE SUPPLIER / INSTALLER
- SUPPLIER / INSTALLER TO PROVIDE APPROPRIATE ROOF ACCESS SYSTEM AND SAFETY WARNING SIGNS IN ACCORDANCE WITH AS1657. SUPPLIER/INSTALLER TO CONFIRM COMPLIANCE OF ROOF SAFETY SYSTEM WITH RELEVANT STANDARDS PRIOR TO INSTALLATION

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0 1m 2m 3m 4m 5m

SCALE 1:100 @ A1
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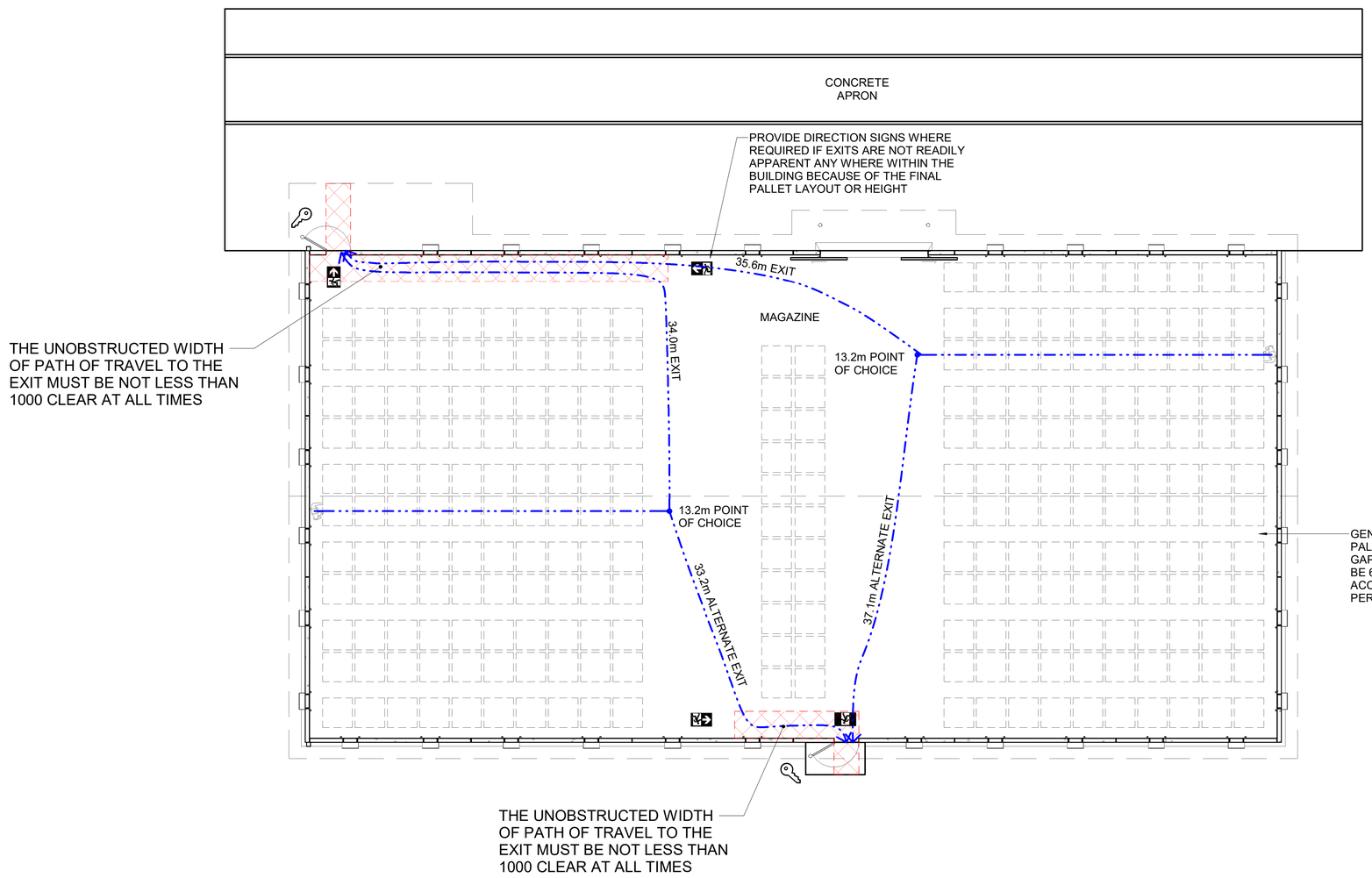
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DRAWING TITLE
ROOF PLAN

DESIGN		ORIGINAL SIZE	A1
DRAWN	BJF	PROJECT NUMBER	S2223404
CHECKED	JP		
APPROVED		DRAWING NUMBER	B11
DATE		ISSUE	A



CLASS 7b EXPLOSIVE STORAGE, TYPE C CONSTRUCTION

FLOOR AREA 648.36m²

FIRE SERVICES PLAN

SCALE 1 : 100 @ A1

L E G E N D	
	THE MAGAZINE RULES FOR THE OPERATION OF THIS BUILDING TO STATE THAT THIS MAGAZINE DOOR TO BE LOCKED IN OPEN POSITION BEFORE THE BUILDING CAN BE OCCUPIED AND FOR THE DURATION THAT THE BUILDING IS OCCUPIED, TO PERMIT COMPLIANT EGRESS
	EXIT TRAVEL DISTANCE 20m/40m ALTERNATE EXIT 60m

FIRE EXTINGUISHERS

- PROVIDE FIRE EXTINGUISHER ADJACENT SWITCHBOARD TO COMPLY WITH NCC AND AS2444

FIRE HOSE REEL AND EXTERNAL HYDRANT SYSTEM

- A VARIATION TO THE PROVISIONS OF THE APPROPRIATE BUILDING CODE TO BE OBTAINED TO ALLOW VARIATION TO ALLOW OMISSION OF A FIRE HOSE REEL SYSTEM FOR INITIAL EXTINGUISHMENT OF A FIRE WITHIN THE BUILDING AND THE PROVISION OF AN EXTERNAL FIRE HYDRANT
- DUE TO THE CONSIDERABLE RISK DETERMINES IT NECESSARY TO REMOVE ALL PERSONNEL TO A SAFE LOCATION IMMEDIATELY, HENCE THE FIRE CANNOT BE CONTAINED BY FIRST AID FIRE FIGHTING MEANS.
- DUE TO THE CONSIDERABLE RISK TO FIRE FIGHTERS, FIRE IN PROXIMITY TO THE BUILDING OR WITHIN THE BUILDING SHOULD NOT BE FOUGHT. HENCE THE LOCAL FIRE AUTHORITY TO BE CONSULTED FOR REQUIREMENTS OF A SUITABLE FIRE HYDRANT SYSTEM

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0 1m 2m 3m 4m 5m

SCALE 1:100 @ A1
SCALE 1:200 @ A3

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DRAWING TITLE
FIRE SERVICES PLAN

DESIGN		ORIGINAL SIZE	A1
DRAWN	BJF	PROJECT NUMBER	S2223404
CHECKED	JP		
APPROVED		DRAWING NUMBER	B12
DATE		ISSUE	A

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BUILDING WORKS

B01	SITE PLAN
B02	FLOOR PLAN
B03	ELEVATIONS
B04	SECTIONS
B05	DETAILS
B06	WALL AND FLOOR FINISHES LAYOUT
B07	MAGAZINE DOOR D1 DETAILS
B08	MAGAZINE DOOR D2 DETAILS
B09	WALL VENT DETAILS
B10	REFLECTED CEILING PLAN
B11	ROOF PLAN
B12	FIRE SERVICES PLAN

STRUCTURAL

S01	NOTES
S02	FOOTING AND FLOOR SLAB LAYOUT
S03	PRECAST CONCRETE WALL PANEL LAYOUT AND DETAILS
S04	PRECAST CONCRETE WALL PANEL ELEVATIONS
S05	ROOF FRAMING LAYOUT
S06	SECTIONS
S07	ROOF FRAMING SECTIONS AND DETAILS

TOCUMWAL MAGAZINES

431 NEWELL HIGHWAY, TOCUMWAL NSW

S2223404

FOUNDATION NOTES

1. FOOTINGS HAVE BEEN DESIGNED FOR AN ALLOWABLE BEARING CAPACITY OF 100 kPa FOUNDING INTO NATURAL MATERIAL (GEOTECHNICAL REPORT TO BE OBTAINED FOR EACH BUILDING LOCATION TO CONFIRMED FOOTING DETAILS PRIOR TO CONSTRUCTION) THE FOUNDATION MATERIAL IS TO BE APPROVED BY THE ENGINEER FOR THIS BEARING CAPACITY BEFORE PLACING REINFORCEMENT OR CONCRETE.
2. FOOTINGS SHALL BE LOCATED CENTRALLY UNDER WALLS AND COLUMNS U.N.O.
3. FOOTINGS TO BE CONSTRUCTED AND HAVE CONCRETE PLACED AS SOON AS POSSIBLE FOLLOWING EXCAVATION TO AVOID SOFTENING OR DRYING BY EXPOSURE.
4. EXCAVATIONS SHALL BE KEPT FREE OF PONDED WATER BEFORE PLACING CONCRETE.
5. TO ENSURE THAT THE MOISTURE CONTENT OF THE SOIL REMAINS REASONABLY STABLE AND HENCE LIMIT GROUND MOVEMENTS, THE GROUND AROUND THE BUILDINGS IS TO BE SLOPED AWAY FROM THE BUILDING AT ALL TIMES AND NO TREES, SHRUBS ETC. SHOULD BE PLACED CLOSE TO THE BUILDING. STORMWATER FROM DOWNPIPES TO BE DISCHARGED INTO THE PIPED SYSTEM. EXTERNAL PLUMBING CONNECTIONS TO BE PROVIDED WITH FLEXIBLE JOINTS TO TOLERATE SOME FOUNDATION MOVEMENT. WHERE OVERSIZE SLEEVES ARE USED SEAL WITH APPROVED FLEXIBLE COMPOUND TO EXCLUDE MOISTURE FROM UNDER THE SLAB. SERVICE TRENCHES SHALL BE NO CLOSER THAN 2m TO THE FOOTINGS. SLOPE TRENCHES AWAY FROM THE BUILDING AND BACKFILL WITH CLAY IN THE TOP 300mm WITHIN 2m OF THE BUILDING.

GENERAL NOTES

1. THESE DRAWINGS ARE TO BE READ IN CONJUNCTION WITH ALL CONSULTANTS DRAWINGS AS APPLICABLE AND THE SPECIFICATION.
2. ALL SET OUT DIMENSIONS SHALL BE CONFIRMED ON SITE PRIOR TO COMMENCEMENT OF WORK. DIMENSIONS SHALL NOT BE OBTAINED BY SCALING FROM THE DRAWING. REFER TO ENGINEER FOR DECISION IF ANY DISCREPANCIES EXIST.
3. WORK AS DETAILED ON THE DRAWINGS SHALL NOT BE VARIED WITHOUT THE PRIOR WRITTEN CONSENT OF THE ENGINEER.
4. ALL WORKMANSHIP AND MATERIALS SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF CURRENT SAA STANDARDS AND CODES OF PRACTICE (EXCEPT AS VARIED BY THE CONTRACT DOCUMENTS) AND OF THE BY- LAWS OF THE LOCAL AUTHORITY.
5. THE CONTRACTOR SHALL MAINTAIN THE STRUCTURE IN A STABLE CONDITION DURING CONSTRUCTION. NO STRUCTURAL ELEMENTS SHALL BE OVERSTRESSED BY CONSTRUCTION LOADINGS.
6. THE STRUCTURE HAS BEEN DESIGNED FOR THE FOLLOWING LOADS IN ACCORDANCE WITH AS/NZS 1170 SAA LOADING CODE:-

   WIND LOAD

REGION	A0
TERRAIN CATEGORY	T2
Ms = 1.0 Mt = 1.0 M_C = 1.0	
AS1684.2 WIND CLASSIFICATION	N2

   LIVE LOAD

ROOF	0.25kPa UDL / 1.4kN PL
FLOOR	5.00kPa UDL / 4.5kN PL

REINFORCED CONCRETE NOTES

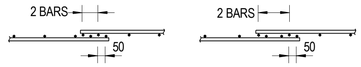
1. MATERIALS AND CONSTRUCTION SHALL COMPLY WITH THE REQUIREMENTS OF:-
   - AS3600 CONCRETE STRUCTURES.
2. CONCRETE QUALITY TO BE:-

ELEMENT	STRENGTH GRADE (MPa)	SLUMP	MAX. SIZE AGGREGATE (mm)	PROJECT ASSESSMENT REQUIRED
FOOTINGS	N25	80	20	YES
BORED PIERS	N32	80	20	YES
SLAB ON GROUND	N32	80	20	YES

3. CHEMICAL ADMIXTURES SHALL NOT BE USED WITHOUT THE PRIOR APPROVAL OF THE ENGINEER.
4. ALL REINFORCEMENT SHALL BE AS INDICATED:-
   - N DENOTES GRADE D500N BARS AS/NZS 4671.
   - R DENOTES GRADE 230 R HOT ROLLED PLAIN BARS TO AS1302.
   - SL/RL DENOTES WELDED WIRE MESH GRADE D500L TO AS/NZS 4671.
   - REINFORCEMENT IS SHOWN DIAGRAMMATICALLY AND NOT NECESSARILY SHOWN IN TRUE PROJECTION.
5. ALL REINFORCEMENT TO BE SUPPORTED IN POSITION DURING POURING BY USE OF CHAIRS AT NOT GREATER THAN 1 METRE CENTERS BOTH WAYS. ALL STARTER BARS ARE TO BE POSITIONED AND TIES PRIOR TO POURING. PLACING STARTER BARS INTO WET CONCRETE IS NOT PERMITTED. UNLESS NOTED OTHERWISE PROVIDE THE FOLLOWING CLEAR CONCRETE COVER TO REINFORCEMENT:-

ELEMENT	COVER (mm)
FOOTINGS, BORED PIERS	50
SLAB ON GROUND	30 TOP

6. SPLICES IN REINFORCEMENT TO BE MADE ONLY IN POSITIONS SHOWN OR OTHERWISE APPROVED IN WRITING BY THE ENGINEER. LAPS TO BE MADE IN ACCORDANCE WITH AS3600 AND NOT LESS THAN THE DEVELOPMENT LENGTH OF EACH BAR. WELDING OF REINFORCEMENT NOT TO BE PERMITTED UNLESS SHOWN ON THE STRUCTURAL DRAWINGS OR APPROVED BY THE ENGINEER. FABRIC TO BE LAPPED BY TRANSVERSE BARS PLUS 50mm.



7. THE REINFORCEMENT STEEL SUPPLIER MUST BE CERTIFIED BY ACRS (AUSTRALIAN STANDARDS CERTIFICATION & VERIFICATION OF REINFORCING, PRESTRESSING & STRUCTURAL STEELS) FOR THE SUPPLY OF REINFORCEMENT STEEL. CURRENT ACRS CERTIFICATES ARE TO BE SUBMITTED TO THE ENGINEER PRIOR TO THE DELIVERY OF REINFORCEMENT STEEL TO SITE. REFER www.steelcertifcation.com FOR CURRENT CERTIFICATE HOLDERS.
8. ALL CONCRETE TO BE COMPACTED DURING PLACEMENT BY MECHANICAL VIBRATORS.
9. NO CONCRETE IS TO BE PLACED WHEN SITE TEMPERATURE IS OUTSIDE THE RANGE OF 5°C AND 35°C.
10. CONCRETE PLACED DURING ADVERSE DRYING CONDITIONS SHALL HAVE AN EVAPORATIVE RETARDANT (SUCH AS 'MBT CONFILM' OR APPROVED EQUIVALENT) APPLIED IMMEDIATELY AFTER PLACEMENT OF CONCRETE. THIS IS NOT TO BE USED AS A CURING METHOD.
11. CONSTRUCTION JOINTS SHALL BE PROPERLY FORMED AND USED ONLY WHERE DETAILED OR SPECIFICALLY APPROVED BY THE ENGINEER.
12. ALL CONCRETE SURFACES TO BE CURED BY AN APPROVED METHOD IMMEDIATELY AFTER FINISHING AND CONTINUE FOR A MINIMUM OF SEVEN DAYS.
13. THE ENGINEER IS TO BE GIVEN 24 HOURS NOTICE FOR REINFORCEMENT INSPECTION AND CONCRETE NOT TO BE DELIVERED UNTIL FINAL APPROVAL IS GIVEN.
14. BOTTOM OF ALL TRENCHES AND BORED PIERS TO BE CLEANED OF ALL LOOSE MATERIALS AND WATER.
15. NO CONCRETE IS TO BE DROPPED FROM A HEIGHT GREATER THAN 2000mm. CONCRETE TO BE PLACED USING A TREMIE PIPE OR PUMP EXTENDING TO BASE OF FOOTING OR PIER.

PRECAST PANEL NOTES

1. ALL PANELS TO BE REINFORCED AS SHOWN ON DRAWING S03 AND S04 ALL REINFORCEMENT TO BE TIED IN PLACE AND SUPPORTED BY APPROVED CLIP-ON PLASTIC BAR CHAIRS PRIOR TO PLACEMENT OF CONCRETE. USE OF PLASTIC TIPPED BAR CHAIRS IS NOT PERMITTED.
2. CAST-IN LIFTING INSERTS TO BE DESIGNED BY OTHERS AND INSTALLED STRICTLY IN ACCORDANCE WITH MANUFACTURERS RECOMMENDATIONS. INSERTS TO BE USED ONLY WITH MANUFACTURERS ASSOCIATED LIFTING EQUIPMENT.
3. ONLY SPECIFICALLY APPROVED BOND BREAKING COMPOUND IS TO BE USED IN ACCORDANCE WITH MANUFACTURERS SPECIFICATION.
4. CONCRETE QUALITY TO BE:-

MAX. SIZE AGGREGATE (mm)	SLUMP	STRENGTH GRADE (MPa)	MIN. MEAN COMPRESSIVE STRENGTH (mm)	PROJECT ASSESSMENT REQUIRED
20	80	N40	25	YES

5. CONCRETE CURING IS TO BE IN ACCORDANCE WITH CONCRETE NOTES.
6. THE WORKSHOP DRAWINGS TO BE SUBMITTED TO THE ENGINEER FOR APPROVAL AT LEAST 10 WORKING DAYS PRIOR TO COMMENCEMENT OF CONSTRUCTION. DRAWINGS ARE TO INCLUDE CAST-IN STRUCTURAL STEEL CONNECTION PLATE, PANEL LIFTING INSERTS AND PROPPING POINT DETAILS, AND ARE TO BE COORDINATED WITH STRUCTURAL STEEL WORKSHOP DRAWINGS.
7. ALL PANEL DIMENSIONS ARE TO BE CHECKED ON SITE AFTER SETTING OUT OF BUILDING AND PRIOR TO BOXING UP FOR POURING ANY DIMENSIONS TO BE CHANGED SHALL BE APPROVED BY THE ENGINEER. THE CAST FACE OF PANELS IS TO FORM THE OUTER FACE OF WALLS.
8. PANELS TO BE SUPPORTED AT THEIR LOAD BEARING EDGE DURING ERECTION BY APPROVED SHIMS/PACKERS TO ACHIEVE LEVELING AND 20mm GAP FOR LATER GROUTING. POSITIONS TO BE GENERALLY ONE SIXTH OF THE LENGTH OF THE PANEL FROM THE CORNERS OR AS APPROVED BY THE ENGINEER. PANELS TO BE BRACED DURING CONSTRUCTION BY AN APPROVED ADJUSTABLE STRUT/BRACING SYSTEM ANCHORED TO THE FLOOR SLAB AND FIXED TO THE PANELS WITH M20 BOLTS INTO CAST-IN FERRULES AT LOCATIONS SHOWN THUS.
9. SEATING DETAIL INSERTS TO BE APPROVED M20 CAST-IN FERRULES. INSERT LOCATIONS SHOWN THUS ' I '.
10. PANEL ERECTION SEQUENCE TO BE APPROVED BY THE ENGINEER.
11. PANEL CASTING SEQUENCE AND CRANE ACCESS ON THE FLOOR SLAB TO BE APPROVED BY THE ENGINEER. THE LIFTING CRANE BEARING PADS ARE TO BE A MINIMUM OF 2.5m² IN AREA AND OF A TYPE APPROVED BY THE ENGINEER.
12. CAST-IN FERRULES FOR STRUCTURAL STEEL ROOF FRAMING ARE TO BE APPROVED M16 AND M20 FERRULES AS NOTED ON THE DRAWINGS AND ON THE PANEL ELEVATIONS. LOCATIONS AS PER THE DETAILS AND CONFIRMED BY REFERENCE TO THE STRUCTURAL STEELWORK SHOP DRAWINGS.
13. ELECTRICAL AND MECHANICAL SERVICES CABLING CONDUITS TO BE CAST INTO PANELS IN POSITIONS COORDINATED WITH EACH SUB CONTRACTOR AND IN LOCATIONS AS APPROVED BY THE ENGINEER. POSITIONS ON THE PANEL WORKSHOPS DRAWINGS. CONDUITS TO BE PLACED CENTRAL IN PANEL IN 1 LAYER.

STRUCTURAL STEELWORK NOTES

1. MATERIAL AND CONSTRUCTION TO COMPLY WITH THE REQUIREMENTS OF:-
   - AS4100 STEEL STRUCTURES
   - AS1554 SAA STRUCTURAL STEEL WELDING CODE.
2. ALL STRUCTURAL STEEL SECTIONS TO BE MINIMUM GRADE 300 AND COMPLY WITH:-
   - AS1163, AS1594, AS3678 AND AS3679 U.N.O.
3. DO NOT SCALE OFF THE STRUCTURAL DRAWINGS. VERIFY ALL SETOUT DIMENSIONS WITH THE BUILDING PLAN. THREE COPIES OF THE WORKSHOP FABRICATION DRAWINGS TO BE SUBMITTED TO THE ENGINEER FOR APPROVAL AT LEAST 10 WORKING DAYS PRIOR TO COMMENCEMENT OF FABRICATION.
4. UNLESS OTHERWISE NOTED:-
   - ALL BOLTS TO BE M20 8.8/S IN 22mmØ HOLES
   - ALL FILLET WELDS TO BE 6mm CONTINUOUS FILLET FROM E48XX GP MILD STEEL ELECTRODES.
   - ALL BUTT WELDS TO BE FULL PENETRATION
   - ALL PLATES TO BE 10mm THICK, NO CONNECTION SHALL HAVE LESS THAN 2 BOLTS U.N.O.
   - PURLIN/GIRTS CLEATS TO BE 8mm THICK WITH 18mmØ HOLES AND PURLIN/GIRTS BOLTS TO BE M12 4.6/S WITH INTEGRAL WASHERS.
5. BOLT TYPES AND BOLTING PROCEDURES ARE DESIGNATED AS FOLLOWS:-
   - 4.6/S REFERS TO COMMERCIAL BOLTS SNUG TIGHTENED.
   - 8.8/S REFERS TO HIGH STRENGTH STRUCTURAL BOLTS SNUG TIGHTENED.
   - ALL BOLTS TO BE OF SUFFICIENT LENGTH SO THAT NO THREADED PORTION TO BE WITHIN THE THICKNESS OF THE CONNECTION STEEL SECTIONS AT ANY JOINT. ALL BOLTS TO HAVE AT LEAST ONE FULL THREAD EXPOSED BEYOND THE NUT AFTER THE NUT HAS BEEN TIGHTENED. WASHERS TO BE PROVIDED UNDER NUTS IN ALL BOLTING PROCEDURES. PROVIDE HARDENED WASHERS OR PLATES TO SLOTTED HOLES.
6. THE BUILDER IS TO PROVIDE ALL MISCELLANEOUS HOLES, CLEATS, BRACKETS, TRIMMERS, BATTENS ETC REQUIRED TO SUPPORT NON-STRUCTURAL ELEMENT, SERVICES, WALL AND ROOF FINISHES (PERIMETER, PENETRATIONS, HIPS AND VALLEYS ETC) WHETHER SPECIFICALLY SHOWN ON THE DRAWINGS OR NOT.
7. TEMPORARY BRACING NECESSARY TO STABILISE THE STRUCTURES DURING ERECTION SHALL BE PROVIDED BY THE CONTRACTOR. BRACING IS TO REMAIN IN POSITION UNTIL THE ENGINEER INSPECTS AND APPROVES THE PERMANENT BRACING ELEMENTS OF THE COMPLETED STRUCTURE.
8. ALL STRUCTURAL STEEL TO BE PROVIDED IN A RUST AND MILL SCALE FREE CONDITION, SURFACE PREPARED AS SPECIFIED BY THE PRIMER MANUFACTURER AND PAINTED WITH ONE (1) COAT OF ZINC PHOSPHATE OR EQUIVALENT (COLOUR: GREY). AREAS REQUIRING SITE WELDING TO BE FREE FROM PAINT UNTIL WELDING IS COMPLETED AND CLEANED UP. ALL WELDING OF 'DURAGAL' MEMBERS, HOT DIPPED GALVANIZED MEMBERS AND ASSOCIATED PLATES TO BE TOUCHED UP WITH 2 COATS OF COLD GALVANIZING PAINT AND FINISHED WITH CHROME SPRAY ENAMEL OR APPROVED EQUIVALENT. REFER ARCHITECTS SPECIFICATIONS FOR TREATMENT OF EXPOSED STEELWORK.
9. CONCRETE ENCASED STEELWORK NOT TO BE PAINTED AND ENCASED IN CONCRETE WITH A STRENGTH OF N25 WITH 65mm COVER OR ADEQUATE TO SUIT FIRE RATING OR EXPOSURE CONDITIONS.
10. PROVIDE SEAL PLATES TO ALL HOLLOW SECTIONS, WITH 'BREATHER' HOLES IF MEMBER TO BE HOT DIPPED GALVANIZED.
11. HOT DIP GALVANIZING THICKNESS TO BE A MINIMUM OF:-
    - 600g/m² FOR MEMBERS > 5mm THICK (EQUIV. THICKNESS 85 µm)
    - 450g/m² FOR MEMBERS < 5mm THICK
12. OVERSEAS SOURCE STRUCTURAL STEEL IS NOT PERMITTED UNLESS THE STRUCTURAL STEEL MATERIAL SUPPLIER IS CERTIFIED BY ACRS (AUSTRALIAN STANDARDS CERTIFICATION AND VERIFICATION OF REINFORCING, PRESTRESSING AND STRUCTURAL STEELS) FOR THE SUPPLY OF STRUCTURAL STEEL. CURRENT ACRS CERTIFICATES ARE TO BE SUBMITTED TO THE ENGINEER. REFER TO www.steelcertification.com FOR CURRENT CERTIFICATE HOLDERS.

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DATUM

DRAWING ISSUE

ISSUE	DATE	DETAILS	INITIALS
A	20.12.23	ISSUED FOR CONSTRUCTION	

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SCALE 1:100 @ A1
SCALE 1:200 @ A3

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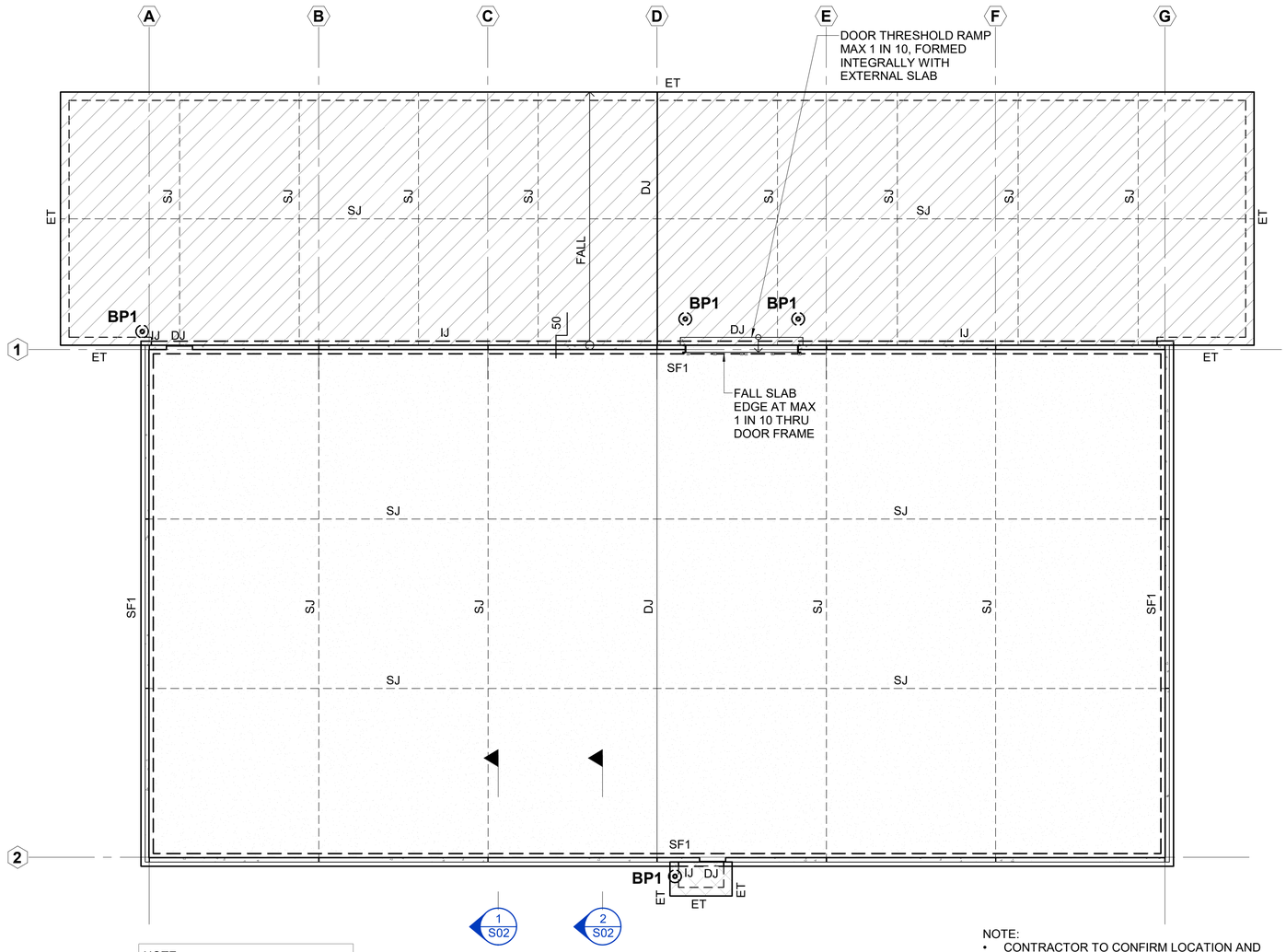
CLIENT
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PROJECT
TOCUMWAL MAGAZINES

DRAWING TITLE
NOTES

DESIGN	KG	ORIGINAL SIZE	A1
DRAWN	BJF	PROJECT NUMBER	S2223404
CHECKED	JP		
APPROVED		DRAWING NUMBER	S01
DATE		ISSUE	A

REFER TO DRAWING S01 FOR STRUCTURAL NOTES



NOTE:
- ALL MESH CONTINUITY TO BE CHECKED TO EARTH CONNECTION POINT PRIOR TO POURING CONCRETE

FOOTING AND FLOOR SLAB LAYOUT

SCALE 1 : 100 @ A1

NOTE:
- CONTRACTOR TO CONFIRM LOCATION AND DEPTH OF ALL IN GROUND SERVICES PRIOR TO EXCAVATING FOOTINGS, REFER TO SITE CIVIL WORKS LAYOUTS FOR APPROXIMATE LOCATION OF ALL KNOWN SERVICES.

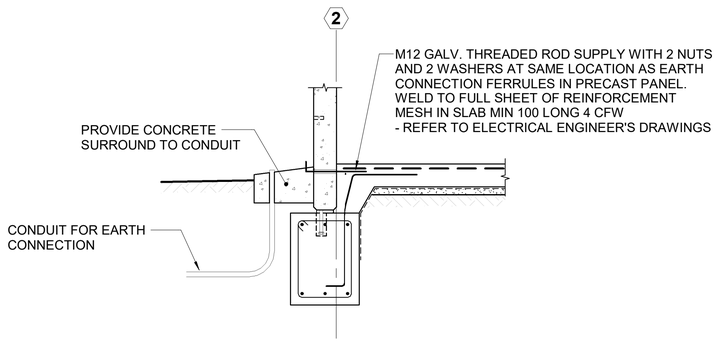
LEGEND

*		175 THICK N32 SLAB 1 LAYER SL82 MESH 40 TOP COVER
*		150 THICK SLAB 1 LAYER SL82 MESH TOP • THE FLOOR SLAB HAS BEEN DESIGNED FOR A LOADING OF 5.0kPa UDL / 4.5kN PL
*		100 THICK SLAB 1 LAYER SL82 MESH TOP
*	ET	300 WIDE x MIN 300 DEEP MASS CONCRETE EDGE THICKENING
	DJ, SJ, IJ	SLAB JOINTS • REFER TO TYPICAL DETAILS
		SLAB STEP
	FALL	SLAB FALL

STRIP FOOTING SCHEDULE		
MARK	SIZE	REINFORCMENT
SF1	SUBJECT TO GEOTECHNICAL INVESTIGATION	TO BE DETERMINED

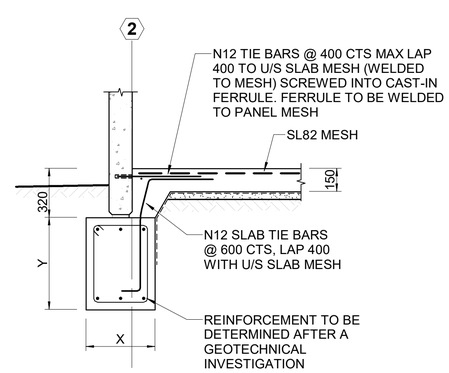
BORED PIER SCHEDULE		
MARK	SIZE	REINFORCEMENT
BP1	450Ø x 600 DEEP	MASS CONCRETE

* SLAB AND FOOTING DESIGN IS INDICATIVE ONLY AND IS SUBJECT TO CHANGE ONCE GEOTECHNICAL INVESTIGATION REPORT IS UNDERTAKEN FOR EACH SITE AND ONCE CIVIL WORKS DESIGN HAS BEEN COMPLETED



SECTION 1 / S02

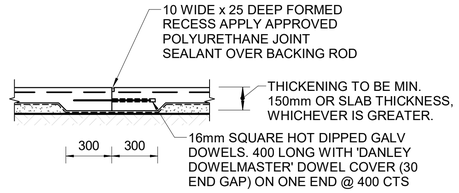
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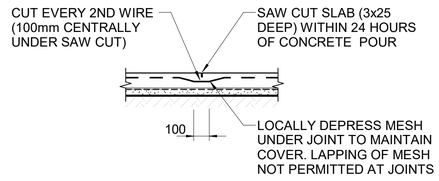
TYPICAL STRIP FOOTING 'SF1' DETAIL

SECTION 2 / S02

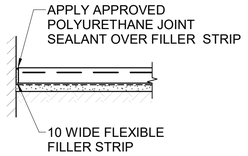
SCALE 1 : 20 @ A1



TYPICAL 'DJ' DOWEL JOINT DETAIL



TYPICAL 'SJ' SAWN JOINT DETAIL



TYPICAL 'IJ' ISOLATION JOINT DETAIL

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DATUM

DRAWING ISSUE

ISSUE	DATE	DETAILS	INITIALS
P1	13.10.23	PRELIMINARY	
P2	27.10.23	CLIENT REVIEW	
P3	28.11.23	CLIENT REVIEW	
A	20.12.23	ISSUED FOR TENDER	

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SCALE 1:100 @ A1
SCALE 1:200 @ A3

NOT FOR CONSTRUCTION

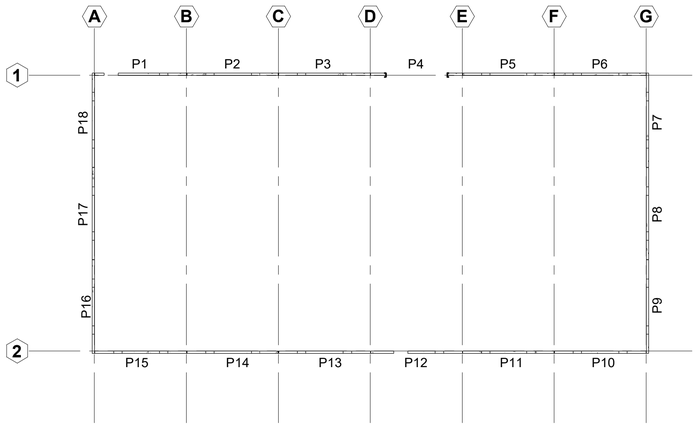
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DRAWING TITLE
FOOTING AND FLOOR SLAB LAYOUT

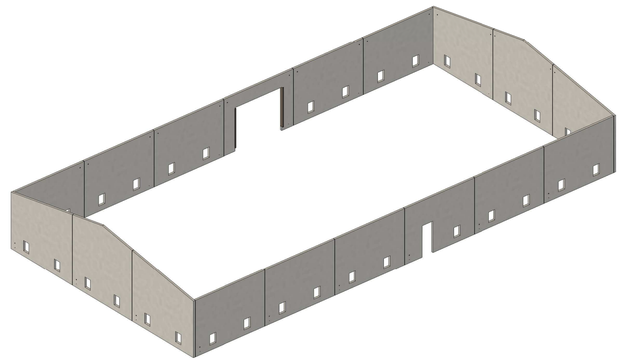
DESIGN	KG	ORIGINAL SIZE	A1
DRAWN	BJF	PROJECT NUMBER	S2223404
CHECKED	JP		
APPROVED		DRAWING NUMBER	S02
DATE		ISSUE	A



150 THICK PANELS, 1 LAYER SL81 MESH PLACED CENTRAL

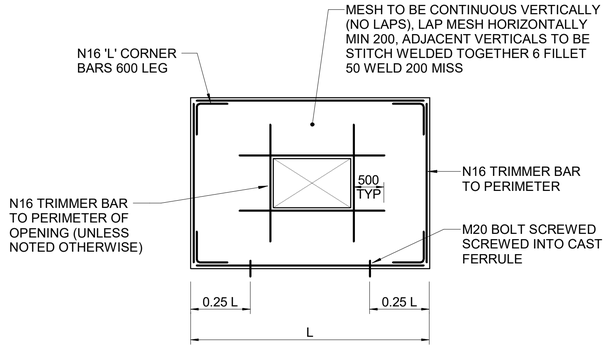
PRECAST WALL PANEL LAYOUT

SCALE 1 : 200 @ A1



PRECAST WALL PANEL PERSPECTIVE

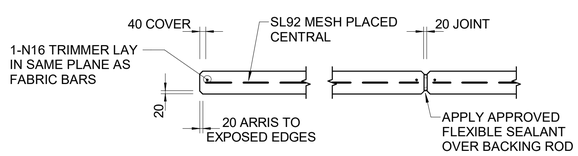
SCALE @ A1



1 LAYER SL81 MESH CENTRAL

TYPICAL PANEL REINFORCMENT

SCALE 1 : 50 @ A1

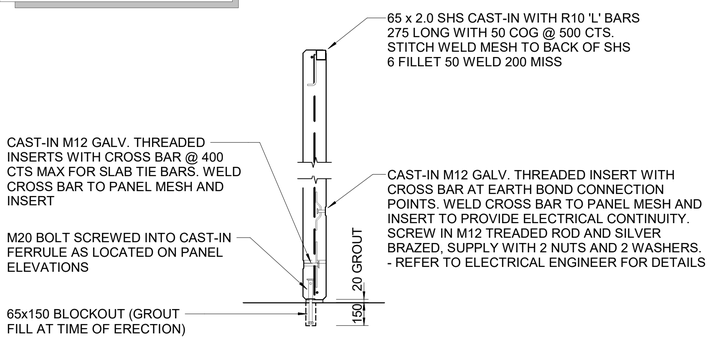


PANEL EDGE **PANEL JOINT**

TYPICAL PRECAST PANEL DETAILS

SCALE 1 : 20 @ A1

NOTE:
- ALL MESH CONTINUITY TO BE CHECKED TO EARTH CONNECTION POINT PRIOR TO POURING CONCRETE



TYPICAL PRECAST PANEL SECTION

SCALE 1 : 20 @ A1

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P2	27.10.23	CLIENT REVIEW	
P3	28.11.23	CLIENT REVIEW	
A	20.12.23	ISSUED FOR CONSTRUCTION	

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SCALE 1:20 @ A1
SCALE 1:40 @ A3

0 0.5m 1m 1.5m 2m 2.5m

SCALE 1:50 @ A1
SCALE 1:100 @ A3

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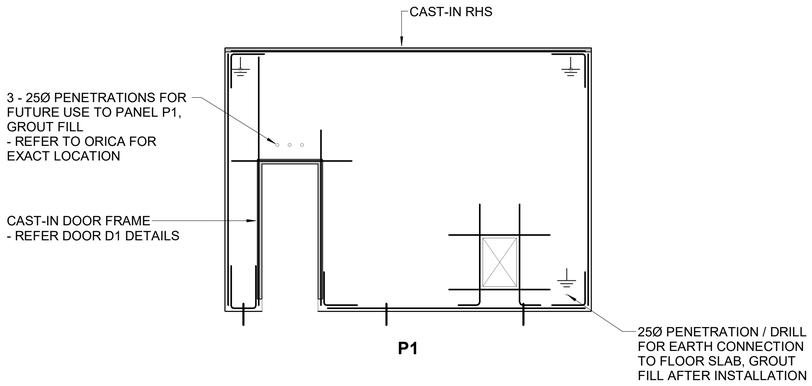
PROJECT

TOCUMWAL MAGAZINES

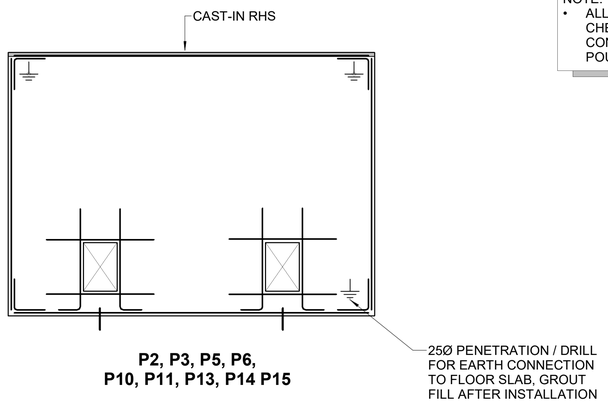
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PRECAST CONCRETE WALL PANEL LAYOUT AND DETAILS

DESIGN	KG	ORIGINAL SIZE	A1
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CHECKED	JP		
APPROVED		DRAWING NUMBER	S03
DATE		ISSUE	A

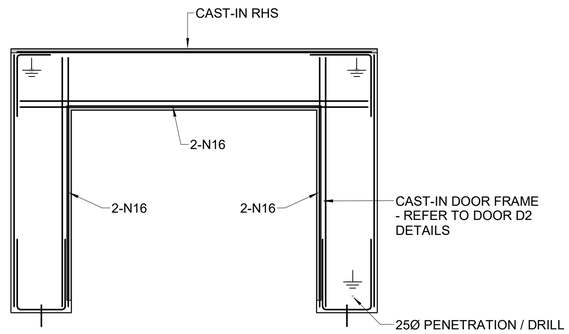


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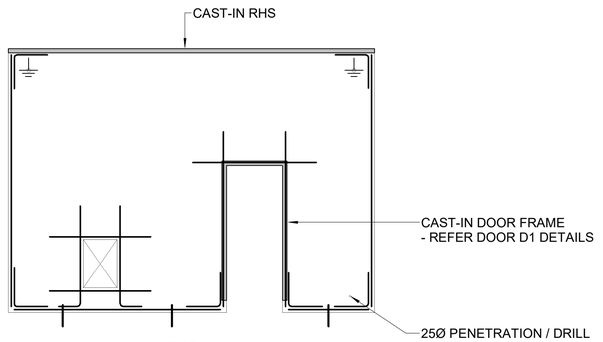


P2, P3, P5, P6, P10, P11, P13, P14 P15

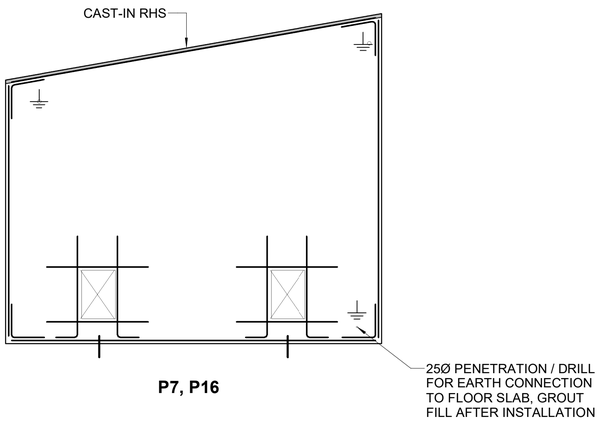
NOTE:
- ALL MESH CONTINUITY TO BE CHECKED TO EARTH CONNECTION POINT PRIOR TO POURING CONCRETE



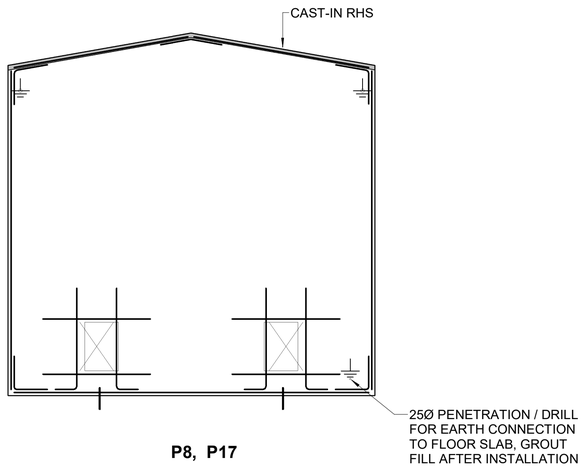
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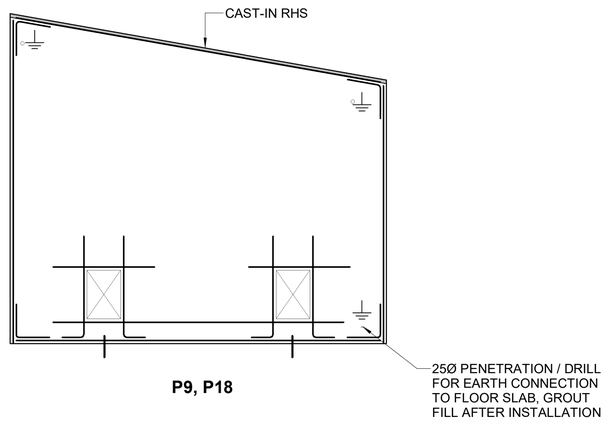
P12



P7, P16



P8, P17



P9, P18

PRECAST CONCRETE PANEL ELEVATIONS

SCALE 1 : 50 @ A1

LEGEND

	M12 CAST-IN FERRULE (WITH CROSS BAR WELDED TO MESH) FOR EARTH CONNECTION. SUPPLY WITH M12 TREADED ROD (SCREW IN AND SILVER BRAZE), 2 NUTS AND 2 WASHERS - REFER TO ELECTRICAL CONSULTANT

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DRAWING ISSUE

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P1	13.10.23	PRELIMINARY	
P2	27.10.23	CLIENT REVIEW	
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A	20.12.23	ISSUED FOR CONSTRUCTION	

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SCALE 1:50 @ A1
SCALE 1:100 @ A3

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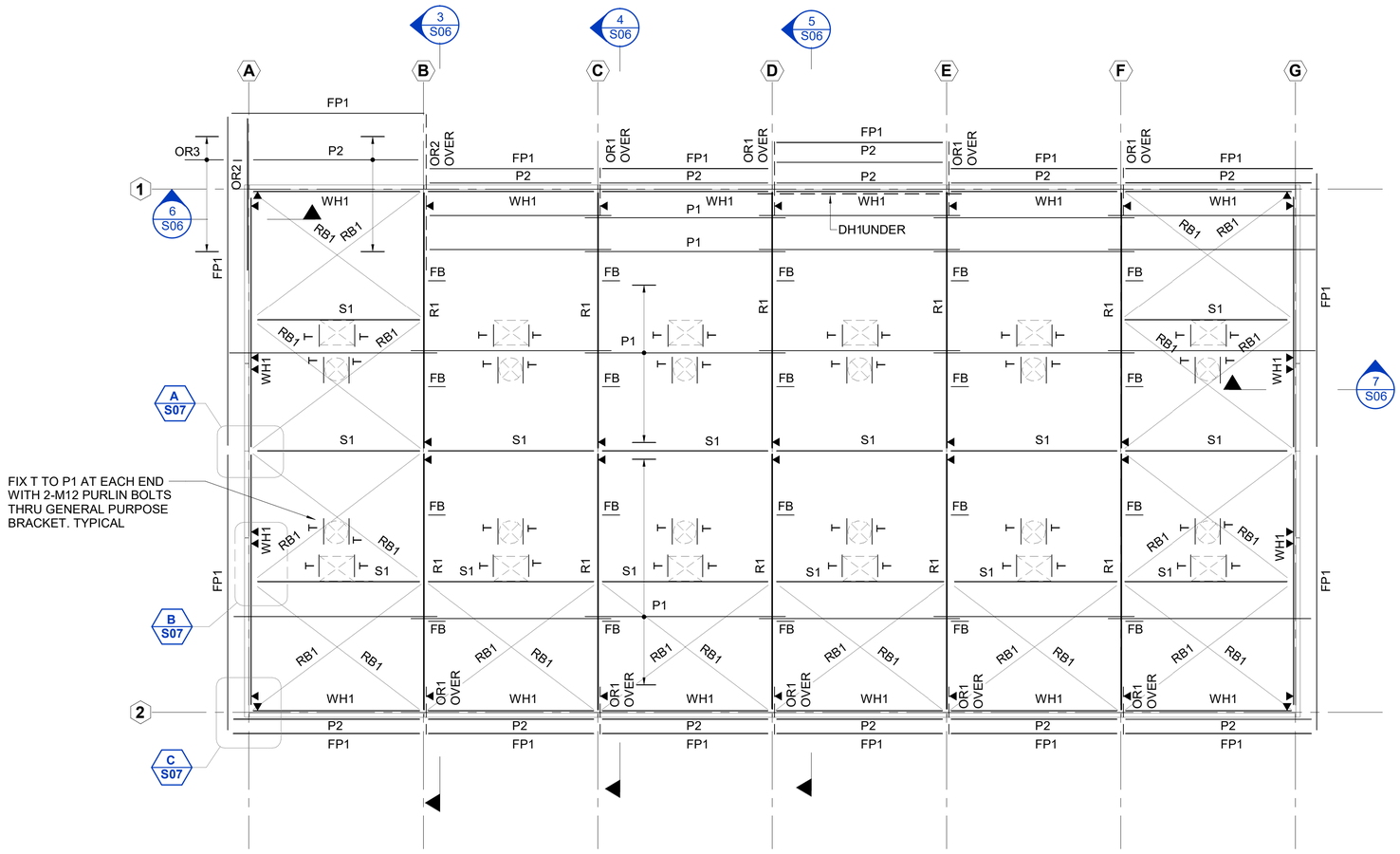
CLIENT
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PROJECT
TOCUMWAL MAGAZINES

DRAWING TITLE
PRECAST CONCRETE WALL PANEL ELEVATIONS

DESIGN	KG	ORIGINAL SIZE	A1
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CHECKED	JP		
APPROVED		DRAWING NUMBER	S04
DATE		ISSUE	A

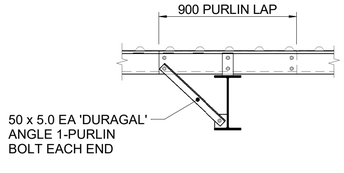
REFER TO DRAWING S01 FOR STRUCTURAL NOTES



ROOF FRAMING LAYOUT

SCALE 1 : 100 @ A1

▲ DENOTES M12 x 50 LONG THREADED STUD WELD TO STEEL FRAMING. SUPPLY WITH 2 NUTS AND 2 WASHERS



ELEVATION

TYPICAL FLYBRACE 'FB' DETAIL

SCALE 1 : 20 @ A1

MEMBER SCHEDULE		
MARK	MEMBER	DESCRIPTION
DH1	360UB50.7	DOOR HEAD
FB	50 x 5.0 EA	FLYBRACE - REFER TO TYPICAL FLYBRACE DETAIL
FP1	C150-24	FASCIA PURLIN
OR1	125 x 75 x 4.0 RHS	OUTRIGGER
OR2	150 x 100 x 5.0 RHS	OUTRIGGER
OR3	150 x 50 x 3.0 RHS	OUTRIGGERS @ 1200 CTS MAX
P1	Z150-19	PURLINS @ 1200 CTS MAX LAP 900 WITH 1 ROW OF BRIDGING
P2	Z150-24	PURLIN
R1	460UB74.6	RAFTER
RB1	20mmØ	GRADE 250 BRACING ROD WITH GRADE 8.8/S (GRADE S) TURNBUCKLE AND LOCK NUTS
S1	101.6 x 4.0 CHS	STRUT
T	C150-15	TRIMMER PURLIN
TA	50 x 2.5 EA	TRIMMER ANGLE
WH1	150 PFC	WALL HEAD (ON FLAT, TOES UP)

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DATUM

DRAWING ISSUE

ISSUE	DATE	DETAILS	INITIALS
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P3	28.11.23	CLIENT REVIEW	
A	20.12.23	ISSUED FOR CONSTRUCTION	

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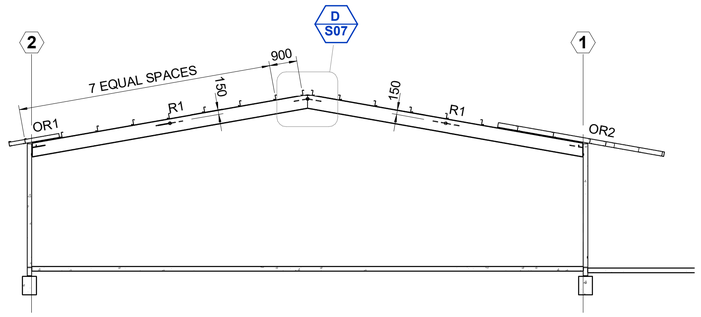
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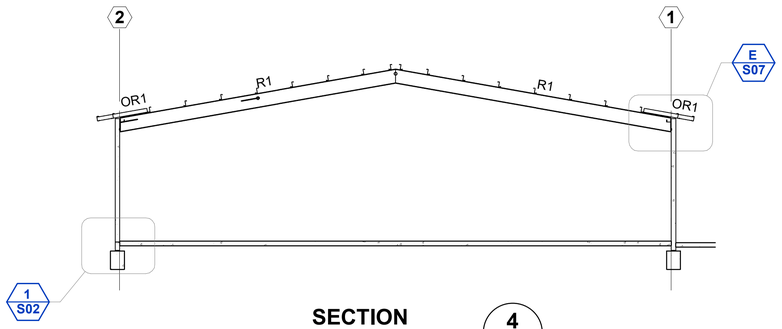
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ROOF FRAMING LAYOUT

DESIGN	KG	ORIGINAL SIZE	A1
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CHECKED	JP		
APPROVED		DRAWING NUMBER	S05
DATE		ISSUE	A



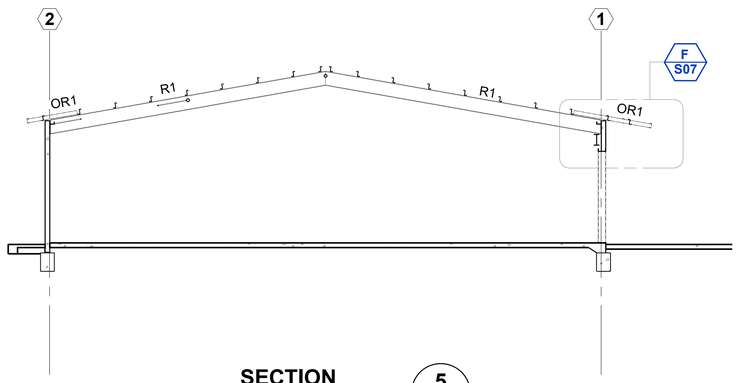
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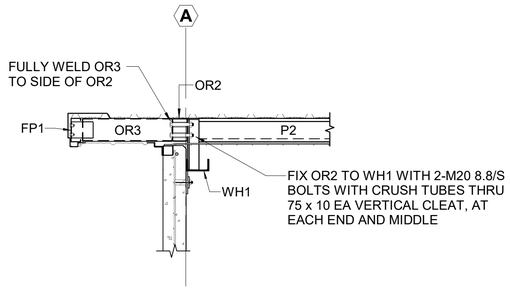
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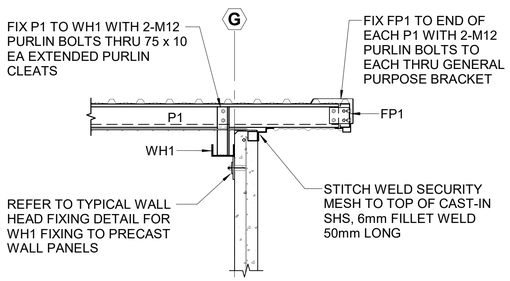
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SECTION 6 / S05

SCALE 1 : 20 @ A1



SECTION 7 / S05

SCALE 1 : 20 @ A1

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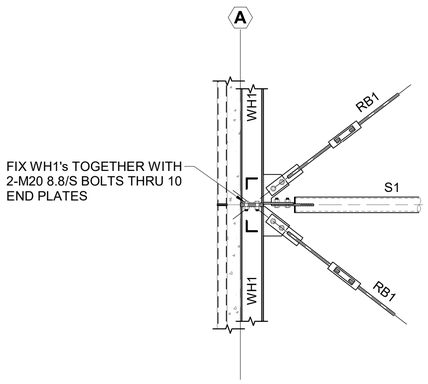
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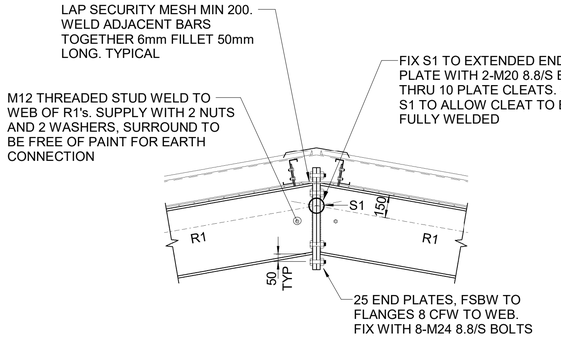
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CHECKED	JP		
APPROVED		DRAWING NUMBER	S06
DATE		ISSUE	A

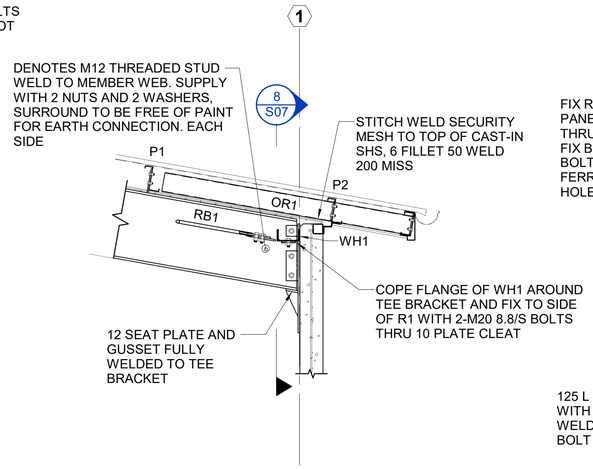
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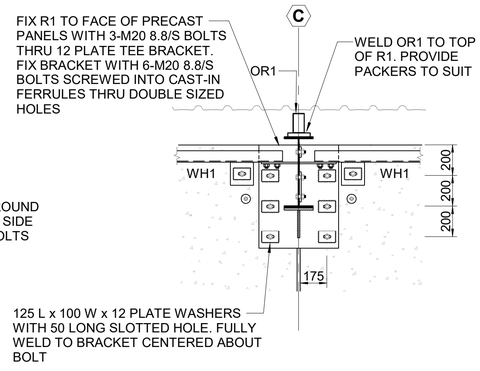
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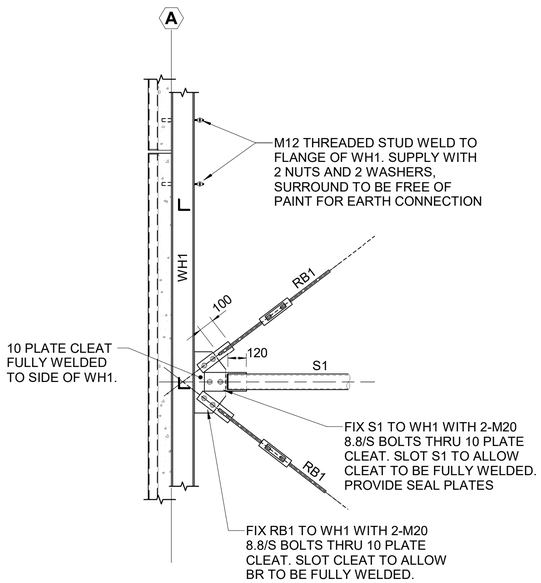
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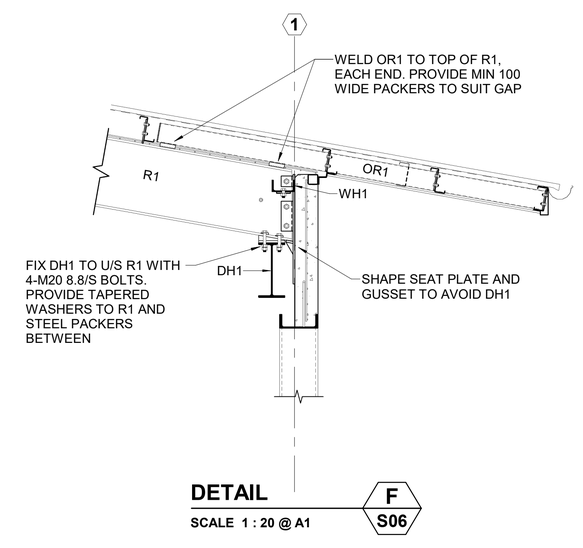
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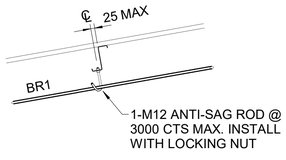
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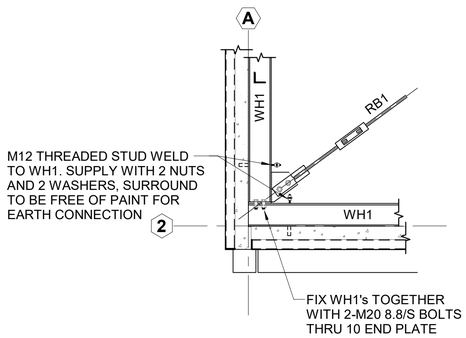
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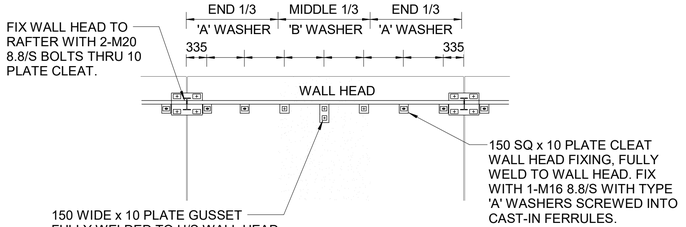


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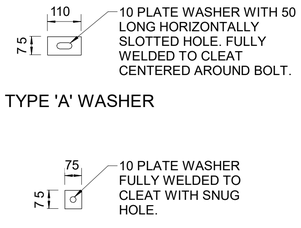


DETAIL C S05
SCALE 1 : 20 @ A1

TYPICAL ROOF BRACING ROD ANTI-SAG DETAIL
SCALE 1 : 20 @ A1



TYPICAL WALL HEAD FIXING
SCALE 1 : 50 @ A1



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DRAWING TITLE
ROOF FRAMING SECTIONS AND DETAILS

DESIGN	KG	ORIGINAL SIZE	A1
DRAWN	BJF	PROJECT NUMBER	S2223404
CHECKED	JP		
APPROVED		DRAWING NUMBER	S07
DATE		ISSUE	A

Appendix C

Statutory Compliance

C-1 Approval pathway and permissibility

C-1-1 Environmental Planning and Assessment Act 1979

The key legislation in NSW regulating the use of land is the EP&A Act and the EP&A Regulation. The EP&A Act establishes a regime for the making of development applications, assessment of their environmental impacts, and the determination of those applications. It also allows for the making of environmental planning instruments such as Local Environmental Plans (LEPs) and State Environmental Planning Policies (SEPPs).

Part 4, Division 4.7 of the EP&A Act provides for declaration, assessment and approval of SSD. The project requires development consent in accordance with the requirements of Part 4 of the EP&A Act as a result of the operation of *Berrigan Local Environment Plan 2013* (the 'LEP') and as it is considered to be SSD as Major Hazard Facility pursuant to Schedule 1, Clause 10(3) of the *State Environmental Planning Policy (Planning Systems) 2021* (Planning Systems SEPP).

The process for environmental assessment and approval for SSD is set out as follows:

– Scoping Report and Application for EIS scope requirements
– Development and issuance of SEARs
– Preparation of an EIS
– Public exhibition of the EIS
– Response to submission(s) received during public exhibition of the EIS
– Assessment of development application

Determination regarding the development by the Minister.

Assessment under Part 4 of the EP&A Act

Section 4.15 of the EP&A Act outlines the matters that must be taken into consideration by a consent authority when assessing a DA under Part 4 of the EP&A Act. Table C.1 provides a summary of matters listed under section 4.15 and their relevance to the project.

Table C.1 Section 4.15 of the EP&A Act – Matters for consideration

Matter for consideration – general	Report section
(a) the provisions of:	
(i) any environmental planning instrument	Applicable State Environmental Planning Policy's (SEPPs) are addressed in in Section C-1-3. The LEP is discussed in Section C-1-3.
(ii) any proposed instrument that is or has been the subject of public consultation under this Act and that has been notified to the consent authority (unless the Planning Secretary has notified the consent authority that the making of the proposed instrument has been deferred indefinitely or has not been approved), and	Not applicable
(iii) any development control plan	The DCP is addressed in Section C-2-1.
(iiia) any planning agreement that has been entered into under section 7.4 of the (EP&A Act), or any draft planning agreement that a developer has offered to enter into under section 7.4 of the (EP&A Act)	Not applicable
(iv) the regulations (to the extent that they prescribe matters for the purposes of this paragraph), that apply to the land to which the development application relates	Not applicable
(b) the likely impacts of that development, including environmental impacts on both the natural and built environments, and social and economic impacts in the locality	Impacts to the environment are assessed in Section 6.

Matter for consideration – general	Report section
(c) the suitability of the site for the development	The site is an existing facility. The project would ensure that the facility operates in accordance with the AS2187 Standard and enhance existing operations. The technical assessments provided in Chapter 6 and the associated appendices demonstrate that where potential impacts are identified, the impacts can be avoided or mitigated. Land uses in the vicinity of the site are sufficiently separated from the project. The project has been designed to adhere with the codes of practice and to minimise risk. The project will continue to operate in accordance with the suite of safety plans applicable to the project. For these reasons, the site is suitable for the project.
(d) any submissions made in accordance with this Act or the regulations	Should any submissions be received as a result of the project, it is envisaged that these can be addressed by this report.
(e) the public interest.	The project would have a long-term positive social, environmental, and economic impact for the wider community and would ensure the continued supply of munitions in the network. Given the planning merits, low-negligible environmental impacts, the significant benefits associated with the project, the project is in the public interest.

State Significant Development

Section 4.36(2) of the EP&A Act provides that a State Environmental Planning Policy (SEPP) may declare any development, or any class or description of development, to be SSD.

The project is deemed SSD in accordance with Schedule 1, Clause 10(3) of the Planning Systems SEPP. Consequently, the project is to be assessed in accordance with the provisions of Division 4.7 of the EP&A Act.

Additionally, the project would be development for the purpose of the manufacture, storage or use of dangerous goods in such quantities that constitute the development as a major hazard facility within the meaning of Chapter 6B of the Occupational Health and Safety Regulation 2001. The Minister for Planning or the Independent Planning Commission would be the consent authority.

Approvals not required for SSD

Under section 4.41 of the EP&A Act, certain other approvals are integrated into the SSD approval process and are not required to be separately obtained for the proposal. Such approvals are listed in Table C.2. None of these are relevant to the project.

Although approvals are not required under the legislation listed in Table C.2, the objectives of the legislation have been considered in the environmental impact assessment for the project.

Table C.2 Approvals that would not be required for the project

Legislation	Purpose / description	Approval required / not required
Fisheries Management Act 1994 (FM Act)	The objectives of the FM Act are to conserve, develop and share the fisheries resources of NSW for the benefit of present and future generations. Part 7 of the FM Act outlines a number of permits required for works within fisheries areas, including dredging or reclamation works (section 201), marine vegetation in protected areas (section 205) and fish passages (section 219).	Not required for SSD. The project would not impact any fisheries resources.
Heritage Act 1977 (Heritage Act)	The Heritage Act is concerned with all aspects of the conservation of heritage places and items, with items of state significance listed on the State Heritage Register. Part 4 of the Heritage Act states that approval must be obtained for works that have the potential to interfere with an item on the State Heritage Register or that is subject to an Interim Heritage Order.	Not required for SSD. The project would not impact any heritage items. Refer Section 6.12.1.
National Parks and Wildlife Act 1974 (NPW Act)	The NPW Act provides for the protection of Aboriginal objects and places in NSW. Section 86 of the NPW Act states it is an offence to harm an Aboriginal object, defined as destroying, defacing, damaging or moving an object from the land. Section 87 states a defence to the harm or destruction of an Aboriginal object is the authorisation of an Aboriginal Heritage Impact Permit (AHIP) issued under section 90 of NPW Act.	Not required for SSD. The project would not impact any known Aboriginal objects. Refer Section 6.10 and Appendix G.
Rural Fires Act 1997 (RF Act)	The objectives of the RF Act are to provide for the prevention, mitigation, and suppression of bush and other fires; for the co-ordination of bush firefighting and bush fire prevention; for the protection of persons from injury or death, and property from damage, arising from fires; and for the protection of infrastructure and environmental, economic, cultural, agricultural, and community assets from damage arising from fires. A bush fire safety authority must be obtained before developing in bush fire prone land under section 100B of the RF Act.	Not required. The Bushfire Hazard Assessment prepared by GHD (Appendix F) identifies that the project can provide bushfire protection measures meeting the objectives of Planning for Bush Fire Protection 2019 (NSW RFS, 2019) and meeting all Acceptable Solutions.
Water Management Act 2000 (WM Act)	The WM Act provides for the sustainable and integrated use and management of water resources in NSW. The WM Act controls the extraction of water, its use, and the carrying out of activities on or near water sources.	Not required. The project would not affect water resources or require a controlled activity approval.

Legislation	Purpose / description	Approval required / not required
	Part 3 of the WM Act outlines the approval requirements for water use (section 89), management works approvals (section 90), and activity approvals other than aquifer interference (section 91). These approvals include two activity types, controlled activity approvals and aquifer interference approvals. A controlled activity approval allows the holder to carry out a specific controlled activity on waterfront land, defined as land within 40 metres of a river, lake, estuary, or shoreline.	

Approvals required for SSD

Under section 4.42 of the EP&A Act, certain approvals are still required for SSD and cannot be refused if it is necessary for carrying out SSD that is authorised by a development consent under Division 4.7 of the EP&A Act. They must also be substantially consistent with the SSD approval. Such approvals are outlined in Table C.3.

Table C.3 Approvals that would be required for the project

Legislation	Purpose / description	Approval required / not required
FM Act	Part 7 of the FM Act outlines a number of permits required for works within fisheries areas including aquaculture. The project is not located within a fisheries area and would not require an aquaculture permit under section 144 of the FM Act.	Not required. The project is not located within a fisheries area and would not require an aquaculture permit under section 144 of the FM Act.
Coal Mine Subsidence Compensation Act 2017 (CMSC Act)	The object of the CMSC Act is to provide for a fair, efficient, and sustainable compensation framework for dealing with the impacts of coal mine subsidence. In particular, it provides for the provision of compensation for damage caused by subsidence resulting from coal mine operations, and assessment and management of risks associated with subsidence resulting from coal mine operations. Certain development within mine subsidence districts require approval.	Not required The project is not located within a mine subsidence district, therefore the project does not require approval.
Mining Act 1992	The Mining Act 1992 facilitates the discovery and development of mineral resources in NSW, having regard to the need to encourage ecologically sustainable development. Mining leases are issued under Part 5 of the Act. The project would not include mining for mineral resources or any activity which would require a lease under the Act.	Not required. The project would not include mining for mineral resources or any activity which would require a lease under the Act.
Petroleum (Onshore) Act 1991	The Petroleum (Onshore) Act 1991 facilitates the discovery and development of petroleum resources in NSW, having regard to the need to encourage ecologically sustainable development. The project would not include any activity which would develop any petroleum resources which would require a production lease.	Not required. The project would not include any activity which would develop any petroleum resources which would require a production lease.
Protection of the Environment Operations Act 1997 (POEO Act)	The objectives of the POEO Act are to protect, restore and enhance the quality of the environment, in recognition of the need to maintain ecologically sustainable development. The POEO Act provides for an integrated system of licensing and contains a core list of activities requiring an Environment Protection Licence (EPL) from the NSW EPA. These activities are called 'scheduled activities' and are listed in Schedule 1 of the POEO Act.	The project would not include any scheduled activities listed under Schedule 1 of the POEO Act, therefore no EPL would be required for the project.

Legislation	Purpose / description	Approval required / not required
Roads Act 1993 (Roads Act)	The Roads Act provides for the classification of roads and requirements for carrying out road works within NSW. Section 138 requires consent from TfNSW to be obtained prior to any works which occur on or over a public road.	The project would require work to be carried out in, on, or over a public road. Consent under section 138 would be required for the project from Berrigan Shire Council (Council). Council has regulatory authority for the Newell Highway and will require concurrence from TfNSW for the proposed upgrade.
Pipelines Act 1967	The Pipelines Act 1967 outlines the licensing application requirements for pipelines in NSW. A licence is required under section 11 to commence, or continue, the construction of a pipeline, alter or reconstruct a pipeline or operate a pipeline. The project would not include pipeline construction, alteration of an existing pipeline or operation of a pipeline. A pipeline licence will not be required for the project.	Not required.

C-1-2 Environmental Planning and Assessment Regulation 2021

Part 8 of the EP&A Regulation describes the requirements for an EIS. Section 190 outlines the required form for an EIS, while Section 192 outlines the required content. These requirements and where they are addressed in the EIS are outlined below in Table C.4.

Table C.4 EP&A Regulation checklist

Requirement	Assessment/ EIS Reference
61 Additional matters that consent authority must (1) In determining a development application for the demolition of a building, the consent authority must consider the Australian Standard *AS 2601—2001: The Demolition of Structures.*	The project is capable of complying with this requirement. A condition of consent can be applied in this regard.
190 Form of the environmental impact statement An environmental impact statement must contain the following information:	
(a) the name, address and professional qualifications of the person by whom the statement is prepared	Certification.
(b) the name and address of the responsible person	Certification.
(c) the address of the land: (i) in respect of which the development application is to be made, or (ii) on which the activity or infrastructure to which the statement relates is to be carried out,	Certification.
(d) a description of the development, activity or infrastructure to which the statement relates	Section 3.
(e) an assessment by the person by whom the statement is prepared of the environmental impact of the development, activity or infrastructure to which the statement relates, dealing with the matters referred to in this Schedule	Throughout the EIS.
(3) a declaration by the person by whom the statement is prepared to the effect that: (a) the statement has been prepared in accordance with this Schedule, and (b) the statement contains all available information that is relevant to the environmental assessment of the development, activity or infrastructure to which this statement relates, and (c) that the information contained in this statement is neither false nor misleading.	Certification.
192 Content of environment impact statement (1) An environmental impact statement must also include each of the following:	
(a) a summary of the environmental impact statement	Summary.
(b) a statement of the objectives of the development, activity or infrastructure	Summary.

Requirement	Assessment/ EIS Reference
(c) an analysis of any feasible alternatives to the carrying out of the development, activity or infrastructure, having regard to its objectives, including the consequences of not carrying out the development or infrastructure	Section 2.4.
(d) an analysis of the development, activity or infrastructure, including: (i) a full description of the development, activity or infrastructure, and	Section 3
(ii) a general description of the environment likely to be affected by the development, activity or infrastructure, together with a detailed description of those aspects of the environment that are likely to be significantly affected, and	Throughout the EIS, in particular Section 6.
(iii) the likely impact on the environment of the development, activity or infrastructure, and	Section 6
(iv) a full description of the measures proposed to mitigate any adverse effects of the development, activity or infrastructure may lawfully be carried out,	Section 6, and Section 7.2
(v) a list of the approvals that must be obtained under another Act or law before the development, activity or infrastructure may lawfully be carried out	Appendix C
(e) a compilation (in a single section of the environmental impact statement) of the measures referred to in item (d) (iv),	Section 7.2 and Appendix L
(f) the reasons justifying the carrying out of the development, activity or infrastructure in the manner proposed, having regard to biophysical, economic and social considerations, including the principles of ecologically sustainable development set out in subclause (4).	Section 8
(2) This section is subject to the environmental assessment requirements that relate to the environmental impact statement.	Appendix A

C-1-3 Environmental planning instruments

Environmental planning instruments (EPIs) are made under Part 3 of the EP&A Act. The relevant EPIs are discussed in the following sections.

Berrigan Local Environmental Plan 2013

Zoning and Permissibility

The site is zoned RU1 Primary Production. The proposed development is defined as a 'heavy industrial storage establishment', which is defined in the LEP as follows:

> ***"heavy industrial storage establishment*** *means a building or place used for the storage of goods, materials, plant or machinery for commercial purposes and that requires separation from other development because of the nature of the processes involved, or the goods, materials, plant or machinery stored, and includes any of the following—*
>
> *(a) a hazardous storage establishment,*
>
> *(b) a liquid fuel depot,*
>
> *(c) an offensive storage establishment".*

Heavy industrial storage establishments are permissible with development consent in the RU1 zone.

The objectives of the zone are:

> ***"Zone RU1 Primary Production***
>
> ***1 Objectives of zone***
>
> • *To encourage sustainable primary industry production by maintaining and enhancing the natural resource base.*
>
> • *To encourage diversity in primary industry enterprises and systems appropriate for the area.*
>
> • *To minimise the fragmentation and alienation of resource lands.*

- *To minimise conflict between land uses within this zone and land uses within adjoining zones.*
- *To permit development that enhances the agricultural and horticultural production potential of land in the locality.*
- *To permit low-key tourist and visitor accommodation that is compatible with the scenic amenity, and promotes the character, of the area.*
- *To enable function centres to be developed in conjunction with agricultural uses".*

The project aligns with the objectives of the zone for the following reasons:

– The proposal does not further fragment or alienate resource lands, or create further land use conflict within the zone or adjoining land use zones given the land use is existing, and clause 6.11 of the LEP identifies the site as" "Explosive Storage Area Map".
– The proposal is antipathetic to the remaining objectives.

Clause 2.7 Demolition

This clause requires that *"the demolition of a building or work may be carried out only with development consent*". This application seeks consent for the demolition of eight (8) of the existing magazines.

Clause 5.10 Heritage Conservation

The site does not contain any heritage items and is not located in a Heritage Conservation Area (Refer Section 6.12.1). An Aboriginal Cultural Heritage Stu Assessment Report (ACHAR) undertaken by Ozark (dated October 2023), (Appendix G), which identifies that:

> *"No Aboriginal sites were identified and no landforms within the Study Area were assessed as having potential to contain subsurface archaeological deposits. Further, no Aboriginal cultural heritage values have been identified through consultation with the Aboriginal community".*

On this basis, the proposal is consistent with the objectives of this clause.

Clause 5.21 Flood Planning

The site is not mapped as flood prone land, however the SEARs requested a detailed Flooding Assessment be undertaken. Section 6.1.3 of this EIS provides an assessment of the project in relation to flooding, and identifies:

> *"In accordance with the LEP, this would designate the Flood Planning Level to be 0.5m above the 1% AEP flood level. Following the Berrigan Shire DCP, for commercial and industrial development, the magazine floor levels would need to be at least the height of the Flood Planning Level".*

Subject to compliance with the floor levels, the consent authority can be satisfied that the project is capable of compliance with the matters in clause 5.21 (2).

Clause 6.1 Earthworks

The project requires ancillary earthworks to construct the magazines and the earthen mounds. An assessment against clause 6.1(3) is provided in Table C.4 below.

Table C.4 Clause 6.1 Earthworks

Clause	Assessment
(a) the likely disruption of, or any detrimental effect on, drainage patterns and soil stability in the locality of the development,	Refer to assessment at Section 6.1.
(b) the effect of the development on the likely future use or redevelopment of the land,	Refer to assessment at Section 8.
(c) the quality of the fill or the soil to be excavated, or both,	The Consent Authority is invited to impose conditions in relation to this matter.

Clause	Assessment
(d) the effect of the development on the existing and likely amenity of adjoining properties,	Given the size of the site, and the location of the proposed earthworks in relation to surrounding development, the project is unlikely to have any impacts on the amenity of adjoining properties.
(e) the source of any fill material and the destination of any excavated material,	The Consent Authority is invited to impose conditions in relation to this matter.
(f) the likelihood of disturbing relics,	Refer to assessment at Section 6.1.
(g) the proximity to, and potential for adverse impacts on, any waterway, drinking water catchment or environmentally sensitive area,	The Consent Authority is invited to impose conditions in relation to this matter.
(h) any appropriate measures proposed to avoid, minimise or mitigate the impacts of the development.	The Consent Authority is invited to impose conditions in relation to this matter.

In summary the proposed ancillary earthworks are unlikely to have a significant impact on the matters for consideration in this clause.

Clause 6.3 Terrestrial biodiversity

A BDAR was undertaken by Ozark (dated May 2024), which identifies that:

> *"The significance of the proposed impact to EPBC Act-listed threatened, migratory, wetland and marine species, populations and communities predicted to occur within a 10 km search area was assessed. No significant impact to any threatened entity likely to result in the extinction of a local population was identified. The residual ecological impacts of the proposal would be adequately mitigated and offset using the management actions recommended and the offset requirements detailed within this BDAR. Therefore, a referral of the proposal to the Federal Department of Climate Change, Energy, the Environment and Water (DCCEEW) for these matters is not required".*

Further discussion is provided in Section 6.11.

Clause 6.11 Development near explosive storage area

The objectives of this clauses are reproduced below:

> *"(a) to ensure that the explosive storage area near Tocumwal is preserved and protected from the impacts of development,*
>
> *(b) to allow development within a buffer area to the explosive storage area that is compatible with the potential hazard.*

As the site is identified on the "Explosive Storage Area Map" as "Explosive storage area", this clause applies.

Development consent must not be granted unless the consent authority has considered the following:

> *"(a) any likely adverse impacts on the proposed development from the explosive storage area,*
>
> *(b) any likely adverse impacts on the explosive storage area from the proposed development".*

Given the proposal relates to building four new 250 t HE magazines and a new detonator magazine in new locations on the existing Orica site, compliant with the construction requirements for Fixed or Permanent Magazines – Above Ground as defined in AS 2187.1 – 1998, it is unlikely that the proposal would have any adverse impacts on the existing explosive storage area, or that the existing explosive storage area would have any adverse impacts on the proposed development.

NSW Legislation

Environmental planning instruments and legislation applicable to the project are summarised in Table C.5.

Table C.5 NSW Legislation

Environmental Planning Instruments		
SEPP	**Relevance**	**Comment**
The Planning Systems SEPP	The Planning Systems SEPP replaced *State Environmental Planning Policy (State and Regional Development) 2011* (SRD SEPP) on 1 March 2021. The transfer of provisions is in Chapter 2 of the Planning Systems SEPP. Section 4.36(2) of the EP&A Act provides that a State Environmental Planning Policy (SEPP) may declare any development, or any class or description of development, to be SSD.	The project is deemed SSD in accordance with Schedule 1, Clause 10(3) of the Planning Systems SEPP. The project would be development for the purpose of the manufacture, storage or use of dangerous goods in such quantities that constitute the development as a major hazard facility within the meaning of Chapter 6B of the Occupational Health and Safety Regulation 2001. The Minister for Planning or the Independent Planning Commission would be the consent authority.
State Environmental Planning Policy (Transport and Infrastructure) 2021 (the Transport and Infrastructure SEPP)	The Transport and Infrastructure SEPP replaced *State Environmental Planning Policy (Infrastructure) 2007* on 1 March 2021. The provisions were adopted into Chapter 2 of the Transport and Infrastructure SEPP. The Transport and Infrastructure SEPP aims to facilitate effective delivery of infrastructure across NSW.	There is no power infrastructure located proximate to the project. Based on the TIA, the project does not require referral to TfNSW as it will not generate more than 50 or more motor vehicles per hour (any other purpose Column 3 to Schedule, 1 of this SEPP).
State Environmental Planning Policy (Resilience and Hazards) 2021 (Resilience and Hazards SEPP)	**Hazardous and offensive development** The Resilience and Hazards SEPP replaced the State Environmental Planning Policy (Hazardous and Offensive Development) (SEPP 33) on 1 March 2022. The Provisions of SEPP 33 are carried over to Chapter 3 of the Resilience and Hazards SEPP. The Resilience and Hazards SEPP presents a systematic approach to planning and assessing projects for potentially hazardous and offensive development or industry. The Resilience and Hazards SEPP applies to any project which falls under the policy's definition of 'potentially hazardous industry' or 'potentially offensive industry'. If not controlled appropriately some activities within these industries may create an offsite risk or offence to people, property or the environment, thereby making them potentially hazardous or potentially offensive. Clause 3.2 of the Resilience and Hazards SEPP defines a 'potentially hazardous industry' as: *'development for the purposes of any industry which, if the development were to operate without employing any measures (including, for example, isolation from existing or likely future development on other land) to reduce or minimise its impact in the locality or on the existing or likely future development on other land, would pose*	A Preliminary Hazard Analysis (PHA) was prepared by GHD dated 15 May 2024 (Refer Appendix J). The PHA concluded as follows: *"This report includes a risk screening of the proposal in accordance with the requirements of the SEPP (Resilience and Hazards). The results indicate that the screening thresholds for DG storage and transportation during construction and operation are not exceeded by any of the DGs proposed to be stored.* *Although none of the thresholds are exceeded a hazard identification process was completed to identify hazards with potential for off-site impacts. The process identified six hazards with the potential for off-site impact.* *A consequence analysis was completed to confirm any off-site impacts. The consequence results validated that there is suitable separation of the magazine and diesel storages from, each other and the site boundary. The site upgrades, specifically the relocation of the magazines further from the site boundary, are an improvement from the previous storage arrangement. Furthermore, the new placement of the diesel tank ensures a safer distance between the diesel which is a possible ignition source and the magazines. The consequence analysis found that the hazards with potential off-site impact can be suitably controlled using the safeguards defined in Table 7.*

Environmental Planning Instruments		
SEPP	**Relevance**	**Comment**
	a significant risk in relation to the locality: *(a) to human health, life or property, or* *(b) to the biophysical environment and includes a hazardous industry and a hazardous storage establishment.'* Clause 2 of the Resilience and Hazards SEPP defines a 'potentially offensive industry' as: *'development for the purposes of an industry which, if the development were to operate without employing any measures (including, for example, isolation from existing or likely future development on other land) to reduce or minimise its impact in the locality or on the existing or likely future development on other land, would emit a polluting discharge (including for example, noise) in a manner which would have a significant adverse impact in the locality or on the existing or likely future development on other land, and includes an offensive industry and an offensive storage establishment".'* **Remediation of land** The Resilience and Hazards SEPP also replaced the State Environmental Planning Policy No. 55 - Remediation of Land (SEPP 55) on 1 March 2022. The provisions of SEPP 55 are carried over to Chapter 4 of the Resilience and Hazards SEPP. Chapter 4 of the Resilience and Hazards SEPP provides a state-wide planning approach to the remediation of contaminated land and states that all remediation work must be carried out in accordance with: – The contaminated land planning guidelines. – Any guidelines in force under the Contaminated Land Management Act 1997. – In the case of remediation work defined as category 1 remediation work under the Resilience and Hazards SEPP, a plan of remediation approved by the consent authority and prepared in accordance with the contaminated land planning guidelines. Chapter 4 Clause 4.6 of the Resilience and Hazards SEPP states that "a consent authority must not consent to the carrying out of any development on land unless: a. It has considered whether the land is contaminated.	*The hazard identification and analysis demonstrate that the proposal can be designed, constructed, and operated in a manner that will minimise hazardous impact to the public".* A Preliminary Site investigation (PSI) was prepared by GHD (14 June 2023, The PSI stated as follows: *"The assessment identified that there is a low potential for contamination to be present within the project area.* – *The potential impacts of contamination to human health and the environmental during construction and future operation of the project is considered to be low with the only potentially complete source-pathway-receptor linkages during construction of the project relate to soil potentially impacted from spills from storage, spillage or leakage of fuels / oils in the vicinity of the diesel AST.* – *During operation of the proposal, it is understood that all fuels and explosive materials will be stored undercover in buildings to prevent any unintended runoff of hazardous materials occurring. Given that this will occur under the implementation of Construction Environmental Management Plans (CEMPs) and Soil and Water Management Plans (SWMPs), the operation of the project is not anticipated to result in soil or groundwater contamination.* *To mitigate potential exposure to soil or groundwater contamination it is recommended that:* – *The soil in the vicinity of the diesel AST be further assessed if it is to be disturbed.*

Environmental Planning Instruments		
SEPP	**Relevance**	**Comment**
	b. If the land is contaminated, it is satisfied that the land is suitable in its contaminated state (or will be suitable, after remediation) for the purpose for which the development is proposed to be carried out. c. If the land requires remediation to be made suitable for the purpose for which the development is proposed to be carried out, it is satisfied that the land will be remediated before the land is used for that purpose*".*	– *The CEMP for the project includes an 'unexpected finds protocol', to manage any potential impacts associated with the disturbance of potentially contaminated soils (if encountered) during works of the project. The CEMP is to include actions to cease work on discovery, test suspected contaminated material, and safely store, treat, and dispose of the material as relevant".*
State Environmental Planning Policy (Biodiversity and Conservation) 2021	Chapter 3 of the Biodiversity and Conservation SEPP aims to encourage the proper conservation and management of areas of natural vegetation that provide habitat for koalas to ensure a permanent free-living population over their present range and reverse the current trend of koala population decline. The Biodiversity and Conservation SEPP applies to development assessed under Part 4 of the EP&A Act.	The BDAR (Appendix K) identified the following: "*Chapter 3 of the SEPPBC 2021 applies to the subject land as the Berrigan LGA is listed in Schedule 2 of the SEPPBC 2021 and the land is zoned RU1.* *Assessment of the subject land according to the provisions of Chapter 3 of the SEPPBC 2021 determined that areas of PCT 9 (0.5 ha) within the site (see Section 4.2) constitute potential koala habitat for the Koala as a feed tree listed under Schedule 1 of the SEPP, River Red Gum (Eucalyptus camaldulensis), is the sole canopy tree in these areas. The site does not constitute core koala habitat, however, as there are no historical records of a resident population within the site and targeted surveys conducted as part of the present assessment did not identify any evidence of ongoing or recent occupancy. No further consideration is required for this area".*
Other Relevant NSW Legislation		
BC Act	The purpose of the BC Act is to maintain a healthy, productive and resilient environment for the greatest well-being of the community, now and into the future. The BC Act lists threatened species, populations and ecological communities as well as critical habitat and key threatening processes that must be considered when assessing the effects of an activity. Refer to Section 19.2 which discusses the project in relation to this Act.	An application to carry out SSD is required to be accompanied by a BDAR under Section 7.9 of the BC Act. A BDAR has been prepared as part of this EIS. Biodiversity factors are discussed in further detail in Section 6.11 and Appendix K.

Environmental Planning Instruments		
SEPP	**Relevance**	**Comment**
NPW Act	The purpose of the NPW Act is to provide for the protection of Aboriginal objects and Aboriginal places. Section 86 of the NPW Act states it is an offence to harm or desecrate an object the person knows is an Aboriginal object. Section 87 of the NPW Act provides a series of defences against the offences listed in Section 86 which includes if the harm was authorised by and conducted in accordance with the requirements of an Aboriginal Heritage Impact Permit (AHIP) under Section 90 of the NPW Act.	Despite the requirements of the NPW Act, an AHIP is not required for SSD projects under Section 4.41 of the EP&A Act, however an appropriate level of assessment of potential impact to Aboriginal objects is required. An ACHAR has been prepared for the project. The ACHAR found that the project is unlikely to impact on any Aboriginal objects. Aboriginal heritage factors are discussed further in Section 6.10 and Appendix G.
Heritage Act	The purpose of the Heritage Act is to protect heritage items within NSW. Heritage places and items of particular importance are listed on the State Heritage Register. An application for approval under Section 59, Part 4 of the Heritage Act is required for any direct impacts on an item on the register. An application for a permit from the NSW Heritage Council under Section 139 of the Heritage Act is required to be made prior to disturbance or excavation likely to discover, expose, move, damage or destroy a relic.	The project is not expected to impact upon any identified heritage item or relic, and therefore would not require approval under the Heritage Act. Heritage factors are discussed further in Section 6.12.1.
Roads Act 1993 (Roads Act)	The purpose of the Roads Act is to make provisions for roads in NSW. Under Section 138 of the Roads Act a person must not impact on, or carry out work on or over, a public road other than with the consent of the appropriate road's authority.	The project would carry out work on or over, a public road for the upgraded access to the Newell Highway. An approval under Section 138 of the Roads Act is required. Traffic and transport factors are discussed further in Section 6.6 and Appendix E.
CLM Act	The purpose of the CLM Act outlines the circumstances under which notification to the NSW Environment Protection Authority (EPA) is required in relation to the contamination of land. Under Clause 60 of the CLM Act, the owner of land that has been contaminated must notify the EPA in writing that the land has been contaminated.	The site is not a registered contaminated site on the NSW EPAs contaminated sites register and is deemed suitable for the proposed land use. Contamination factors are discussed further in Section 6.2 and Appendix I
Biosecurity Act 2015 (Biosecurity Act)	The purpose of the Biosecurity Act is to provide the statutory framework to protect the NSW economy, environment, and community from the negative impact of pests, diseases, and weeds. In NSW, all plants are regulated through a general biosecurity duty to prevent, eliminate, or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated, or minimised, so far as is reasonably practicable.	Any biosecurity matters encountered during the project would need to be managed in accordance with the Biosecurity Act. Biodiversity factors are discussed in further detail in Section 6.11.

Environmental Planning Instruments		
SEPP	**Relevance**	**Comment**
WM Act	The WM Act main objective is to manage NSW water in a sustainable and integrated manner that will benefit today's generations without compromising future generations' ability to meet their needs.	The project does/ does not involve any activities that require a water use approval under section 89, a water management work approval under section 90 or an activity approval (other than an aquifer interference approval) under section 91.
RF Act	The objects of the RF Act are as follows: *"The objects of this Act are to provide—* *(a) for the prevention, mitigation and suppression of bush and other fires in local government areas (or parts of areas) and other parts of the State constituted as rural fire districts, and* *(b) for the co-ordination of bush fire fighting and bush fire prevention throughout the State, and* *(c) for the protection of persons from injury or death, and property from damage, arising from fires, and* *(c1)for the protection of infrastructure and environmental, economic, cultural, agricultural and community assets from damage arising from fires, and* *(d) for the protection of the environment by requiring certain activities referred to in paragraphs (a)–(c1) to be carried out having regard to the principles of ecologically sustainable development described in section 6 (2) of the Protection of the Environment Administration Act 1991".*	The Bushfire Assessment prepared by GHD (Appendix F) identifies that the project can provide bushfire protection measures meeting the objectives of Planning for Bush Fire Protection 2019 (NSW RFS, 2019).

C-1-4 Commonwealth legislation

Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act is administered by the Department of Climate Change, Energy, the Environment and Water (DCCEEW) and provides a legal framework to protect and manage nationally important flora, fauna, ecological communities and heritage places defined as 'matters of national environmental significance' (MNES). An action that 'has, will have or is likely to have a significant impact on a matter of National Environmental Significance' may not be undertaken without prior approval from the Commonwealth Minister for the Environment, under Part 9 of the EPBC Act. Approval under the EPBC Act is also required where actions are proposed on, or will affect, Commonwealth land and its environment.

The BDAR concludes "*that no MNES will be significantly impacted by the proposal".*

Native Title Act 1993

The objectives of the *Native Title Act 1993* (Native Title Act) are to:

– Recognise native title rights and set down basic principles in relation to native title in Australia.
– Provide for the validation of past acts and intermediate period acts, which may be invalid because of the existence of native title.

– Provide for a future regime in which native title rights are protected and conditions imposed on acts affecting native title land and waters.
– Provide a process by which native title rights can be established and compensation determined, and by which determinations can be made as to whether future grants can be made or acts done over native title land and waters.
– Provide for a range of other matters, including the establishment of a National Aboriginal and Torres Strait Islander Land Fund.

Under the Native Title Act, the valid grant of a freehold estate on or before 23 December 1996 is known as a 'previous exclusive possession act'. This means that native title has been extinguished over the area and native title claimants cannot include this land in their applications.

The project is located on freehold land owned by Orica and therefore native title does not exist within the project area The project is located on freehold land owned by Orica and therefore native title does not exist within the project area.

Protection of the Environment Operations Act 1997

The POEO Act is administered by the EPA, which is an independent statutory authority and the primary environmental regulator for NSW. The objectives of the POEO Act are to protect, restore and enhance the quality of the environment. Some of the mechanisms that can be applied under the POEO Act to achieve these objectives include programs to reduce pollution at the source and monitoring and reporting on environmental quality. The POEO Act regulates and requires licensing for environmental protection, including in some cases for waste generation and disposal and for water, air, land, and noise pollution.

The project would not include any scheduled activities listed under Schedule 1 of the POEO Act, therefore no EPL would be required for the project.

C-2 Local Requirements

C-2-1 Berrigan Development Control Plan 2014

The Berrigan Development Control Plan 2014 (the 'DCP') contains detailed guidelines and planning controls applying to all development within the LGA. Below provides an assessment of the project against relevant provisions of DCP 2022.

Table C.6 DCP 2022

Section of DCP	Controls	Assessment
CHAPTER 3 INDUSTRIAL DEVELOPMENT	**3.1 Appearance** **General** – Buildings are to have their main building facade and entries addressing the primary street frontage. – High quality materials and finishes should be used for building exteriors as well as any fences. – Office components shall be located at the street frontage of the structure to enable the placement of windows and doors to 'break up' the façade. – Industrial developments which are not located in industrial zones must be compatible with and minimize impacts on adjoining land uses Industrial developments which are not located in industrial zones must be compatible with and minimize impacts on adjoining land uses.	No new buildings are proposed. The site is located in the RU1 zone and is related to an existing development. The proposed location of the project, and distance to proximate development is sufficient to minimise impacts on adjoining land uses.
	3.2 Landscaping All industrial sites are to be landscaped. – Landscaping areas are to be identified on development application plans submitted to Council with a comprehensive landscape plan required to show all areas of vegetation, pathways and vehicles access areas. – A range of plant species of various heights are to be used in the landscaping to create interest, improve visual amenity and help screen storage and car parking areas. – Landscaping areas are to be protected from vehicle movement areas to prevent the damage to these vegetated areas. – Landscaping must be designed to ensure low maintenance. – Existing mature trees should be incorporated in the development where possible. – Where ever possible native plant species are to be utilised in landscaping with preference given to drought tolerant species.	The site is located in the RU1 zone and is related to an existing development. The proposed location of the project, and distance to proximate development is sufficient to minimise visual impacts on adjoining land uses. Accordingly, further landscaping is not deemed necessary.
	3.3 Building Setbacks	Not applicable. No new buildings are proposed.
	3.4 Parking Access **General** Parking is to be provided on-site at the following minimum rates: – Industry component: 1 space per 100 m^2 of gross floor area or part thereof. – Warehouse/storage component: 1 space per 100 m^2 of gross floor area or part thereof.	The site has sufficient area for the provision of car parking spaces in accordance with the DCP. No new car parking spaces will be generated. Refer to the TIA (Appendix E).

Section of DCP	Controls	Assessment
	– Office/showroom components: 1 space per 50 m2 of gross floor area or part thereof. – Disabled: Minimum of 1 space in accordance with the Building Code of Australia. – The total minimum number of parking spaces to be provided on-site is the sum of the components. – Council may consider a reduction in these controls if it can be demonstrated the proposed use of the premises does not warrant such provision. However, applicants must demonstrate there is sufficient room on the site to provide parking in accordance with the controls should the use of the premises change. – Council may require on-site parking at a rate in excess of the above if the proposed use of the premises warrants such an outcome. – Parking spaces must be physically separated from access ways, loading and unloading areas, and manoeuvring areas. – All parking areas are to be constructed so as to allow for the catchment and disposal of stormwater to a point of discharge agreed to by Council. – All parking, loading or unloading of vehicles is to be carried out on the development site. – All vehicles (including trucks) must be capable of entering and exiting the site in a forward direction. – Developments must be designed with sufficient turning areas for the vehicles expected to require access to the site. If the development is likely to be accessed by larger vehicles, the appropriate access and manoeuvring areas are to be shown on plans provided with the development application. – It is expected that major expansion of existing developments and new developments will provide the required parking spaces. Should this not be the case, Council may require a financial contribution towards the provision of parking within the town area. To calculate these payments, refer to Council's s.94 Contributions Plan in force at the time	
	3.5 Outdoor Areas – Outdoor storage and work areas are to be substantially screened from public roads and adjoining lots by landscaping, fencing, etc. – Outdoor storage and work areas must be suitably surfaced to prevent dust rising from vehicle movements or wind, should this be a potential impact dust suppression measures are to be employed.	Not applicable. No new outdoor areas proposed.
	3.6 Amenity **General** – All development is required to comply with the requirements of the Protection of the Environment Operations Act 1997 (as amended) and it's Regulation. – Applications for potentially hazardous or offensive development are to submit information demonstrating compliance with SEPP 33- Hazardous and Offensive Development. – Outdoor areas must be treated and maintained to minimize the impacts of dust. – All stormwater is to be appropriately managed.	Not applicable. Refer to assessment at Section 6.7. Not applicable. Refer to Section 6.1. The project relates to an existing development.

Section of DCP	Controls	Assessment
	– A trade waste agreement is to be entered into with Council for disposal of liquid waste to Councils sewerage system for certain activities. – Land uses or development considered by Council to potentially have a detrimental impact on adjoining properties through noise or air emissions (e.g. dust or odour) are to provide information in respect to the likely impacts and proposed mitigation measures of these impacts. – Land uses or development considered by Council to potentially have a detrimental impact on existing or future residential areas through noise or air emissions (e.g. dust or odour) will be discouraged without the submission of a relevant Impact Statement by the applicant demonstrating otherwise. Compliance with the Impact Statements will then become a condition of consent.	Not applicable. The site is located in a rural zone.
11 FLOOD PRONE LAND	The objectives of this chapter are to: a. Provide detailed controls and criteria for the assessment of development applications on land effected by flooding in Berrigan Shire. b. Consolidate existing flood planning principles and policies from relevant government agencies into a coherent framework for application at the development control level by Berrigan Shire Council. c. Reduce the impact of flooding and flood liability on individual property owners and occupiers. d. Reduce private and public losses resulting from flooding. e. Restrict the intensification of development below the Flood Planning Level (FPL). f. Limit development below the FPL to those activities and works considered to have an essential relationship with the river and its floodplain. g. Provide specific measures for the control of caravan parks and associated development types within flood affected areas. h. Provide for the consideration of the cumulative effects of any development on flood affected land, which in or of itself may be considered to be insignificant. i. Provide for and protect the natural passage, storage and quality of flood waters. j. Recognise and help sustain the natural ecosystems of floodplains and riparian zones.	Refer to Section 6.1.
12 NOTIFICATION POLICY		It is anticipated that the Consent Authority will notify the project in accordance with the Legislative requirements.

C-2-2 Developer contributions

The Minister for Planning and Public Spaces has the discretion to impose a condition of approval requiring payment of a development contribution after considering the provisions of any applicable development contributions plan. Council has confirmed that there is no nexus for the imposition of Developer contributions for the project.

C-3 Summary of statutory position

The following approvals must be obtained before the project may commence:

– Development consent granted pursuant to Division 4.3 the EP&A Act.
– A Section 138 application under the Roads Act.

Appendix D

AS2187 Assessment



TOCUMWAL EXPLOSIVES RESERVE MAGAZINE REPLACEMENT PROJECT

AS2187 CLAUSE BY CLAUSE COMPLIANCE

JANUARY 2024

Tocumwal New Magazines

AS2187.1 - 1998 Clause by Clause Compliance Statement

Disclaimer – This document is to support the compliance of the design of the proposed new magazines for the Orica Tocumwal NSW Explosive Reserve. The following Clause by Clause and other statements below only address the clauses of AS2187.1 1998 Explosives – Storage, Transport and Use, Part 1: Storage that pertain to the design of these proposed magazines which will be "Fixed Permanent Above Ground" magazines when they are built. The clauses of the standard that do not apply to the design of this style of magazine are not addressed in this document.

AS2187 Clause Number	AS2187 Clause Content	Compliance Rationale	Drawing Number	Comments
2.1.1.5 - Fencing	Where required all external magazines shall be fenced in accordance with the guidelines of Appendix C.	After each new magazine is built it will be surrounded by a fence that complies with Appendix C.	84859	Orica Site Plan shows fence around magazine at 3 metres from the extremities of the magazine building.
2.1.3 - Marking (a) (ii)	The word 'EXPLOSIVES' or 'DETONATORS', as appropriate, shall be displayed in red lettered characters on a white background, of height as follows: For magazines of design capacity greater than 500 kg, not less than 100 mm high.	The doors of the new magazines will have signage that complies with this clause.	S2223404-B07-A-MAGAZINE DOOR D1 DETAILS	

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2.1.4 - Lighting	Lighting in magazines may be either natural or artificial. Electrical fittings and wiring shall comply with AS 3000 for electrical equipment in hazardous locations and satisfy the requirements of the Hazardous Zone Classification specified in Section 2 of OSC(E)81/1.	Orica is planning to install electrically powered lights inside these new magazines because the buildings are quite large and operation commence early in the mornings. All the explosives that are planned to be stored in these proposed new magazines are contained within sealed packages. At no time will there be any explosives that "Sublime" be stored. Orica has therefore determined that the interior of the magazines at Tocumwal are classified as Non Hazardous areas. Regardless of this Orica will ensure that any electrical installation within the magazines is installed with a very high Ingress Protection (IP) rating to enhance the safety of the electrical installation.		
2.1.5 - Lightning Protection	Lightning protection shall be provided and maintained in accordance with the requirements of AS 1768 relating to the protection of structures with explosive contents.	The steel roof of the new magazines will be equipotentially bonded to the structural roof support system which is in turn bonded to the security mesh under the roof which is in turn bonded to the security mesh within the pre-cast concrete wall panels which is in turn bonded to the reinforcing mesh in the concrete floor. The pre-cast wall panels each have a cast in earthing stud which is bonded to the internal security mesh. These earthing studs are then bonded to earthing rods and a ring of bare copper buried around the walls of the magazine.	23-0434 E001-P2-Legend & Notes, 23-0434 E020-P2-Electrical Details & 23-0434 E500-P2-Lightning Protection Layout	The entire building will be the lightning rod. In the case of a strike the current will be carried through the building structure to the ring style earthing system surrounding the building.

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		No lightning rods will be used because the entire steel roof structure is bonded to the underground earthing system.		
2.1.10 - Locks	The door(s) or lid(s) of every magazine shall be fitted with a six lever 'safe lock'	The proposed pedestrian doors for these new magazines will have six point locking (3 x locking tabs on each vertical side). The 2 x large sliding door leafs will have 3 x steel tabs on the top edge that lock over the internal lip of the cast in door frame and 3 x steel drop/ slide bolt tangs that lock into holes in the concrete floor when the doors are closed and locked. Each door leaf will have six pint locking.	S2223404-B07-A-MAGAZINE DOOR D1 DETAILS & S2223404-B08-C-MAGAZINE DOOR D2 DETAILS	
2.1.11 - Door and Lid Restraint	Every magazine door and lid shall be fitted with a restraint device for securing the door or lid in the fully open position	The pedestrian doors will be able to be locked in the open position at the 150 degree swing point by latching onto a concrete filled bollard outside the doors. The large sliding door leafs will be able to be locked in the open position by using the same method that are locked closed. The locking slide bolts will be able to be lowered into extra cast in holes in the floor under the door.	S2223404-B07-A-MAGAZINE DOOR D1 DETAILS & S2223404-B08-C-MAGAZINE DOOR D2 DETAILS	
2.3.2.4 - Doors	Outer doors shall comply with the following: (a) Steel or concrete magazines: (i) The doors shall be fabricated from steel plate with a 10 mm minimum thickness to provide a maximum clearance of 3 mm all round from the frame to the door.	Clause (i) – all doors will have a 10mm steel plate front face with 3mm side top and bottom clearances. Clause (ii) – the door frames will meet the requirements of clause 2.3.2.2 (a)	S2223404-B07-A-MAGAZINE DOOR D1 DETAILS & S2223404-B08-C-MAGAZINE DOOR D2 DETAILS	

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	(ii) Doors shall be hung from a structural steel frame at least equal to the requirements of Clause 2.3.2.2(a). They shall be built in to the masonry, concrete or steel structure surrounding them. (iii) The door hinges shall be external lug and pin type, bronze bushed and attached either by dowelling and screwing or by continuous welding. (iv) Hinge blocks and sockets shall be of not less than 25 mm square bar for magazines of capacity up to 500 kg, and not less than 38 mm square bar for magazines of capacity 1000 kg and over with a hole drilled and threaded in the side and through the bronze bush of both upper and lower hinge blocks to take a grease nipple. (v) The doors shall swing outwards through at least 150° moving freely without binding. They shall close parallel with the frame, finishing with a recess of 5 mm min below the face of the door frame when closed.	Clause (iii) & (iv) – the hinges on both pedestrian swinging doors will be brass bushed made from 39 x 39mm and fitted with a grease nipple Clause (v) – Both pedestrian doors will be open to swing open to 150 degree where they can be locked onto a concrete filled bollard		
2.3.3.1 - Ventilation General	With the door(s) of the magazine closed, the ventilation system shall be adequate to— (a) ensure that there is no build-up of hazardous or dangerous vapours or fumes; and (b) minimize temperature cycling damage to the stored products. With the door(s) of the magazine open, the ventilation system shall have a capacity, at a wind velocity of 4 km/h, of not less than 15 air changes per hour for nitroglycerine or other preparations which produce hazardous fumes and no less than 5 air changes per hour or other products.	The new magazines will be fitted with compliant wall vents. 2 vents near the ground end base of each of the 3 metre wide pre-cast concrete wall panels. In addition to the numerous wall vents there will be 12 x roof mounted rotary ventilators fitted with security compliant ducting and fire ember blocking meshes	S2223404-B09-A-WALL VENT DETAILS, S2223404-B11-B-ROOF PLAN, S2223404-B10-A-REFLECTED CEILING PLAN, S2223404-B03-A-ELEVATIONS, S2223404-B05-A-DETAILS,	

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			S2223404-B02-A-FLOOR PLAN, S2223404-B06-A-WALL AND FLOOR FINISHES LAYOUT	
2.3.3.2 - Weather shields for Openings	Weather shields for ventilation openings shall comply with the following: (a) Side openings shall— (i) be shrouded externally with closed side weather shields fabricated from5 mm thick steel plate extending 25 mm below the bottom of the vent; (ii) have a minimum open area in the horizontal plane of 375 mm × 100 mm; (iii) be welded to the case; and (iv) consist of 5 mm thick steel plate perforated with holes that do not occupy more than 45% of the gross area and are not larger than 25 mm diameter. (b) The roof ventilation duct shall be a steel channel 200 mm × 100 mm × 6 mm or equivalent, stitch welded across the top of the magazine to protect the vertical steel vent pipe.	All wall vents will be fitted with complying weather shields. The weather shields will be made from 5mm thick mild steel plate.	S2223404-B09-A-WALL VENT DETAILS	
2.3.3.3 - Screens for Openings	Ventilation openings shall have a screen fitted internally to prevent the ingress of insects and other foreign matter. NOTE: Screens may be made of— (a) wire gauze of stainless steel wire with 1.6 mm aperture and 0.45 mm diameter; or (b) steel plate 1 mm thick perforated with holes that do not occupy more than 45% of the gross area and are not larger than 3.0 mm in diameter.	All wall and roof vents will be fitted with complying screens. The inside screens will be stainless steel wire mesh in accordance with Note (a). The bottom of the weather shield will be covered by a mild steel perforated mesh in accordance with Note (b) In addition, a bushfire ember prevention mesh will be installed that covers the outer hole in the vent.	S2223404-B09-A-WALL VENT DETAILS & S2223404-B05-A-DETAILS	

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2.3.3.4 – Passages to Inner Openings	Internal passages to ventilation openings shall comply with the following: (a) Side openings, which shall— (i) be formed from 1.6 mm steel sheet fabricated into a box section; (ii) be staggered to provide a minimum clear distance of 300 mm between the inner and outer vents; (iii) be the same size as the outer vents; (iv) have two timber blocks vertically fitted to prevent blockage, with one on each side of the inner passages with minimum dimensions for— (A) magazines of up to 100 kg design capacity, 400 mm × 50 mm × 25 mm; or (B) magazines over 100 kg design capacity, 600 mm × 50 mm × 25 mm; and (v) be fitted with a screen (see Clause 2.3.3.3). (b) Top openings into the roof ventilation duct shall be vertical steel pipe, 100 mm diameter 3 mm thick, fully welded to the top plate of the magazine and protruding not less than 25 mm above the bottom plate and below the inner lining. The top of the vent shall be fitted with a screen in accordance with Clause 2.3.3.3.	All wall and roof vents will be designed and built in accordance with this clause. See details in drawings listed.	S2223404-B09-A-WALL VENT DETAILS & S2223404-B05-A-DETAILS	

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2.3.3.5 Rotary Type Roof Ventilators	Except where permitted below, where rotary-type roof ventilators are installed, the internal opening shall be covered with timber and be fitted with 'T'-shaped metal duct formed from 1.6 mm thick steel or aluminium sheet, having a closed base and screened side openings in accordance with the Note to Clause 2.3.3.3. Alternatively, rotary-type roof ventilators may be fitted to the top of an external weather-shield channel (see Clause 2.3.3.2(b)).	The new magazines will each be fitted with 12 x Rotary Type ventilation units. The ventilators will be fitted with ember mesh in the above roof section, have a compliant steel security mesh under the roof section and a "T" shaped duct section below the roof level made from 1.6mm steel sheet. The end openings of the "T duct will be covered with stainless steel ember mesh. The physical security of the rotary ventilators will be very high.	S2223404-B05-A-DETAILS & S2223404-B11-B-ROOF PLAN	
2.3.4.1 Locking Devices - Standard	Locking devices for doors shall comply with the following: (a) In addition to lugs, doors shall be provided with steel sliding bolts on the opening side of minimum size 55 mm × 10 mm, as follows: (i) For magazine capacities up to and including 200 kg, two bolts shall be provided. (ii) For magazine capacities greater than 200 kg, three bolts shall be provided. (b) The sliding bolts shall be welded to a steel angle frame, and shall be retained and guided by neat slots in 64 mm × 64 mm × 10 mm steel angle welded continuously on both of its sides to the door, as close as possible to the door edge and over its full height. The bolt frame shall be operated by a peg-and-lever, socketed for a square-shank key. The bolt frame shall be locked by a 6-lever lock screwed to a steel mounting plate welded continuously to the inside face of the door. A cover of minimum 10 mm square or 25 mm × 6 mm steel bar shall be placed over and close to the rear of the lock and	Both the 2 x pedestrian doors and the double sliding doors for the new magazines have been designed with 3 x lug and 3 x sliding bolt locking mechanisms. The rear pedestrian door and the sliding doors will only be able to be opened from inside the magazine. The front pedestrian door will be able to be opened from the outside using a square shank key which is captive when the door is unlocked. All doors will comply with the dimensional details for the security structure of their locking mechanisms. See drawings listed for details.	S2223404-B07-A-MAGAZINE DOOR D1 DETAILS & S2223404-B08-C-MAGAZINE DOOR D2 DETAILS	

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	be secured by welding continuously to the mounting plate or the inside face of the door, to prevent dislodgment of the lock by punching, in such manner that the lock can be removed sideways for maintenance. An alternative anti-punch arrangement may be installed if it will give equivalent protection or an improved level of protection. The key for the lock shall not be able to be withdrawn there from unless the sliding bolts are fully engaged and locked. NOTE: The bolt frame of one door only needs to be provided with a lock and peg-and-lever operating mechanism provided that the bolt frame opening mechanism of the second door is accessible only when the first door (fitted with the lock) is open. (c) In addition to sliding bars, the doors shall be secured by steel fixed lugs of minimum dimensions 55 mm × 10 mm, as follows: (i) For magazine capacities up to and including 200 kg, two lugs shall be fitted. (ii) For magazine capacities greater than 200 kg, three lugs shall be fitted. (d) The fixed lugs shall be welded to the door on the hinged side and into closed slots, in a single length of 64 mm × 64 mm × 10 mm steel angle welded continuously on both of its sides to the door, as close as possible to the door edge and over its full height. (e) Where two fixed lugs or sliding bolts are used, the distance from the centre of each lug or bolt to the adjacent horizontal edge of the door shall be 25% of the door height. Where three fixed lugs or sliding bolts are used, the distance shall be one sixth of the door height.			

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	(f) The lever-lock keyhole through the door plate shall be accurately formed with a snug fit to the shape of the key. The keyhole for the square-shank key shall be circular with minimum clearance for the key. Tubular steel pipe extensions of a minimum length of 65 mm, shall be welded to the door face around entries for both keys. (g) All bolts and lugs shall be free from misalignment or binding and shall engage with minimum clearance to an adequate depth in or behind the frame of the door opening. Sliding bolts when operated by a square-shank key shall move freely and easily. (h) For double opening doors, it is necessary that the bolt frame of one door only be provided with a lock and peg-and-lever operating mechanism, provided that the bolt frame opening mechanism of the second door is accessible only when the first door fitted with the lock is open. The opening mechanism on the second door shall have an over centre pivot lock arrangement.			
2.4.1 Fixed or Permanent Magazines – Above Ground - General	Fixed or permanent (non-relocatable) magazines located above ground shall be constructed from brick, concrete, steel, stone or equivalent and designed for the appropriate loads as specified in AS 1170 (all Parts).	The new magazines will be constructed from pre-cast concrete tilt up walls, secured to a concrete slab and supporting a steel framed roof structure clad in colourbond steel sheet roofing.	S2223404-B03-A-ELEVATIONS, S2223404-B11-B-ROOF PLAN, S2223404-B05-A-DETAILS, S2223404-B02-A-FLOOR PLAN	
2.4.2 - Construction	Permanent magazines shall comply with the BCA and the following: (a) Floors shall be of concrete.	Clause (a) – The floors of the new magazines will be concrete slabs. The slabs will be reinforced with steel	S2223404-B03-A-ELEVATIONS,	

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	(b) Walls shall be constructed from 5 mm mild steel, double brick, concrete block, concrete or equivalent. A steel mesh enclosure of Grade 450 steel or better shall be incorporated in the structure of the concrete, block or brick walls. For double brick walls size F81 galvanized steel mesh shall be used and located within the cavity. For concrete block walls 10 mm diameter reinforcing bars shall be used at 200 mm centres vertically and between courses horizontally to form a 200 mm square grid. The cavity in the blocks shall be filled with 25 MPa concrete. For reinforced concrete walls the minimum reinforcement shall be F81 mesh. Laps in the mesh shall be 200 mm and adjacent verticals shall be joined by a 6 mm fillet weld 50 mm long. When galvanized mesh or bars are used welds shall be cleaned of slag and treated with a suitable galvanizing paint. The security mesh wall shall be secured to the reinforcing mesh in the concrete floors and roof or ceiling by a lap weld as before. (c) Structural steel frames, if used, shall comply with AS 1170 (all Parts), AS 3679.2 and AS 1538. The steel mesh security enclosure shall be welded to the frames to provide electrical continuity. The surfaces shall be suitably treated to protect against corrosion. (d) Where a wall lining is used, the material shall be non-sparking and may be plywood, aluminium or a suitable synthetic formulation (see Clause 2.3.2.3). (e) Roofs shall be either metal sheeting or reinforced concrete. A non-combustible	reinforcing plus security mesh. This security mesh in the slab and the steel reinforcing will be equipotentially bonded to the steel security mesh in the pre-cast wall panels. Clause (b) – The walls of the new magazines will be pre-cast tilt up concrete panels. Each panel will have a security mesh encased inside the concrete panel. These security meshes in each panel will have an electrical equipotential bonding earth stud welded to the mesh. This stud will protrude on the outside of each panel. The mesh will also be welded to a steel top plate on each panel. The steel top plate of each panel will have the security mesh that is installed under the roof structure welded to it The earth studs will allow each panel to have its security mesh electrically bonded to the panel on either side and also to the reinforcing mesh inside the concrete slab. Clause (c) – The roof of the new magazines will be supported by a structural steel frame. All sections of this frame will be equipotentially bonded to each other by cables between welded on earthing studs. Clause (d) – there will be no interior wall linings inside the new magazines	S2223404-S01-A-NOTES, S2223404-S03-A-PRECAST CONCRETE WALL PANEL LAYOUT AND DETAILS, S2223404-S04-A-PRECAST CONCRETE WALL PANEL ELEVATIONS, S2223404-S02-A-FOOTING AND FLOOR SLAB LAYOUT, S2223404-B02-A-FLOOR PLAN, S2223404-B05-A-DETAILS	

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	insulation shall be provided under metal roofs and the roof space shall be well ventilated. Eaves projecting at least 500 mm from the wall should be incorporated in the design. The use of gutters should be avoided. F81, Grade 450 security mesh shall be included in the roof section and welded to the security mesh or reinforcing bars in the walls as described. Flashings shall be installed to ensure the structure is weatherproof and restricts entry of birds and vermin. (f) Ceilings may be provided if so required. If provided, a ceiling shall be of timber or plywood installed below the security mesh. Where the ceiling is insulated, it is not necessary to provide insulation directly below the metal roof.	Clause (e) – The roofs of the new magazines will be colourbond steel sheeting. Fully insulated non combustible sarking will be installed under the steel roof sheets. The roofs will have eaves that project 600mm from the wall and that are enclosed by Lysaght steel Multiclad Soffit cladding on their under sides. The roofs will have gutters fitted along their full length. These gutters will be fitted with stainless steel fire ember mesh and will be drained by steel downpipes to a single dispersion point that will be plumbed to empty into the surrounding paddocks. Clause (f) – No ceilings will be installed		
2.4.3 Dimensions	The dimensions of the magazine shall be such that there is at least 2 m2 of internal floor space for every tonne of explosives stored.	Each new magazine has a floor area of 664.7 square metres. Each magazine will have a capacity of 250 tonnes.	S2223404-B02-A-FLOOR PLAN	
2.4.4 Doors	The doorframe, door and door hardware shall comply with Clauses 2.3.2.2(a)(ii), 2.3.2.4 and 2.3.4. The steel mesh security enclosure shall be welded to the doorframes.	The doors and doorframes will be in accordance with Clauses 2.3.2.2 (a)(ii), 2.3.2.4 and 2.3.4 See above comments for Clause 2.3.2.2 (a)(ii), 2.3.2.4 and 2.3.4	S2223404-B07-A-MAGAZINE DOOR D1 DETAILS & S2223404-B08-C-MAGAZINE DOOR D2 DETAILS	
2.4.5 Ventilation	The construction, dimensions, weather shields and number of vents, together with the timber blocks required on the inside of the vent openings, shall be in accordance with Clause 2.3.3.	The vents in the new magazines will be in accordance with Clause 2.3.3. See comments for Clause 2.3.3 above.	S2223404-B09-A-WALL VENT DETAILS & S2223404-B05-A-DETAILS	

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2.4.6 Lightning Protection	Lightning protection shall be in accordance with Clause 2.1.5.	The lightning protection system will be in accordance with Clause 2.1.5. See comments for Clause 2.1.5 above	23-0434 E001-P2-Legend & Notes, 23-0434 E020-P2-Electrical Details & 23-0434 E500-P2-Lightning Protection Layout	
2.4.7 Lighting	Artificial lighting shall be in accordance with Clause 2.1.4. Where windows are installed, they shall be steel framed and the glazing shall be 6 mm minimum perspex or similar. A 5 mm hinged steel plate shutter with internal bolts shall be fitted to the inside of each window. This shall be 50 mm larger than the window all round and have suitable supports. Windows shall be provided with steel bars, 19 mm diameter at 100 mm centres. Skylights shall be protected by additional steel grid mesh, welded to the security mesh (at all points of contact on the perimeter) and located between the skylight and the mesh. The mesh needs to have a clearance of at least 250 mm on all sides of the skylight. NOTE: A 5 mm grid mesh is suitable for a skylight when laid over the security mesh.	Artificial lighting will be installed in accordance with Clause 2.1.4. See comments above for Clause 2.1.4. The new magazines will not be fitted with windows. The new magazines will also be fitted with 12 x skylights double glazed with reinforced and hardened glass in them. These skylights will have and extra layer of security mesh installed under them that is fully welded to the supporting structure for the skylights to enhance security per this Clause 2.4.7	S2223404-B05-A-DETAILS	
2.4.8 Marking	The magazine shall be marked in accordance with Clause 2.1.3.	The new magazine doors will be marked in accordance with Clause 2.1.3. See comments above for Clause 2.1.3	S2223404-B07-A-MAGAZINE DOOR D1 DETAILS	

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Appendix E

Traffic Impact Assessment, GHD 2024

Tocumwal Magazine Compound Upgrade

Traffic Impact Assessment

Orica Australia Pty Ltd

July 10, 2024

→ **The Power of Commitment**



Project name		Orica Tocumwal Magazine Compound Upgrade					
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1. Introduction

1.1 Overview

GHD Pty Ltd (GHD) has prepared this Traffic Impact Assessment (TIA) on behalf of Orica Australia Pty Ltd (Orica) for the Tocumwal Magazine Compound Upgrade ('the project') near Tocumwal in Southern NSW. The project would include the construction of four new two hundred and fifty tonne high explosive (250 t HE) magazines and a single 10,000,000 capacity detonator (IE) magazine. The same quantity of explosives would be stored, and the operational procedures at the site would remain unchanged.

Existing magazines would either be repurposed or decommissioned upon completion of the four new 250t HE magazines, new detonator magazine and associated infrastructure. Potential repurposing or decommissioning of the old magazines would be undertaken in the future as a separate activity and is not considered in this TIA.

The main construction activities of this project are planned to commence during financial year 2023 – 2024. Construction activities would include the following activities:

– Site clearing
– Establishing hardstands and concrete slabs
– Magazine construction
– Construction of earthen blast mounds in front of three of the proposed 250t HE magazines
– Construction of sealed access roads to each of the four new 250t HE magazines and one detonator magazine, which would diverge from existing access roads on site.

More details on the proposed activity associated with the project are provided in Section 3.1.

1.2 The project

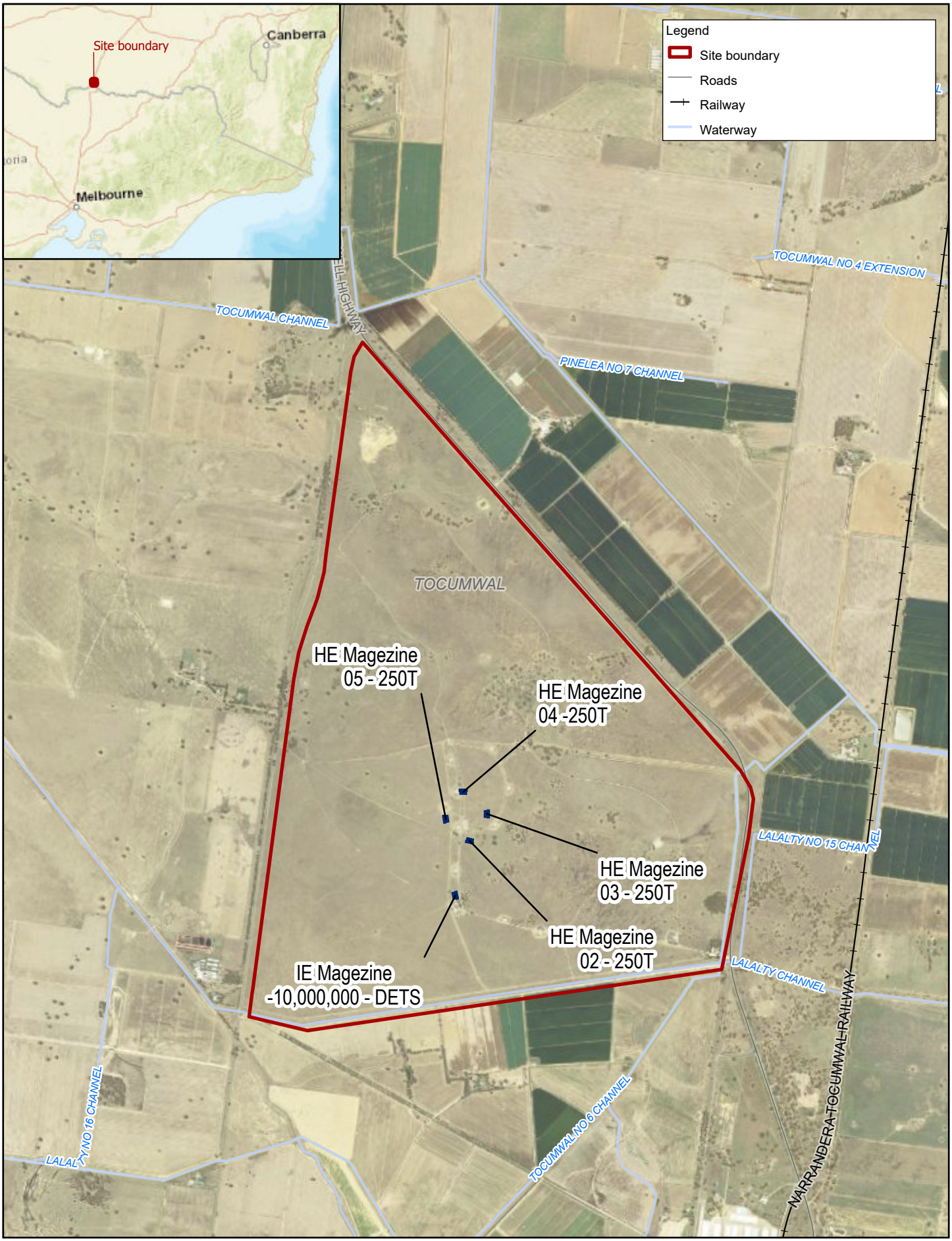
Orica is proposing to redevelop the Tocumwal Magazine Compound ("the project"). The project will take place on the Tocumwal Magazine Compound, located at 431 Newell Highway, approximately 4 km to the north of the township of Tocumwal. The site is situated within the Berrigan LGA on Lot 2, DP 225459 and is currently operated by Orica.

Currently, the existing magazines are not compliant with AS2187 Australian Standards Explosives - Storage, Transport and Use and the facility operates under an exemption from the NSW regulator. The project aims to remove the reliance on the exemption and become fully compliant with the Australian Standards and codes of practice.

The Tocumwal Magazine Compound is a fenced, open grazing property that is approximately 1,800 hectares (ha) in area, with a northern and eastern frontage of 4.7km to the Newell Highway (Figure 1-1). At its closest point, the Murray River is approximately 3.5km south of the project location. The western portion of the lot is bound by Chinamans Road. The closest townships to the Tocumwal Magazine Compound are Tocumwal and Finley which is approximately 4km to the south and 20km to the north respectively.

The site has two entrances from Newell Highway (A39) located at the south-eastern and northern corners of the site. Additionally, Chinamans Road provides two access points to the site from the west.

It is noted that Chinamans Road is only used for emergency access/egress (if required) for the existing magazines. All operational vehicular activity occurs via the access drive at the Newell Highway.



Paper Size ISO A4

0 1,000

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

GHD

Orica Australia Pty Ltd
Orica Tocumwal Magazine Compound Upgrade

Project No. **12597123**
Revision No. **0**
Date **16/04/2024**

Site Location

FIGURE 1.1

\ghdnet\ghd\AU\Newcastle\Projects\22\12597123\GIS\Maps\Deliverables\12597123_OricaTocumwalCompound_20212597123_001_Location

Data source: Waterways - DFSI, 2024; Roads, Railways - DCS, 2024; NSW_Imagery: © Department of Customer Service 2020
World Street Map: Esri, HERE, Garmin, NGA, USGS. Created by: pfernandes

1.3 Secretary's environmental assessment requirements

The Secretary's environmental assessment requirements (SEARs) for the project were issued on 20 December 2023. Table 1-1 highlights the SEARs as they relate to traffic and transport related matters and where they have been addressed in this report.

Table 1-1 Traffic and transport SEARs

SEARs	Where addressed in this report
Traffic and Transport – a quantitative traffic impact assessment prepared in accordance with relevant Roads and Maritime Services and Austroads guidelines, that includes an assessment of the impact of traffic generation on the public road and rail network and measures employed to ensure traffic efficiency and road safety during construction, operation and decommissioning of the project (if applicable).	Whole Document
The potential impacts on the road network associated with the development during the lifetime of the project;	Section 3.4
An assessment of the existing and anticipated additional traffic generation on the surrounding road network, including vehicle types and average and peak traffic volumes;	Section 3.2, Section 3.3 and Section 3.4
Travel and haulage routes along the road network for vehicles to and from the development site including appropriate swept paths for large heavy vehicles or the potential for oversize and over-mass vehicle movements;	Section 3.1. Swept path analyses are presented in Figure 3-3.
Consideration of the cumulative impacts of the potential traffic generation when added to existing traffic volumes upon the surrounding road network shall be undertaken;	Section 3.4
An assessment of the likely transport impacts to the site access route and site access point, particularly in relation to the capacity and condition of the roads;	Section 3.4
Any works/upgrades required within the road network to accommodate the development including concept plans for these works;	Concept plans of the proposed access road upgrades are presented in Figure 3-1 and Figure 3-2.
The measures to be implemented to maintain the standard and safety of the road network, and the procedures to monitor and ensure compliance;	Section 4
A description of the measures that would be implemented to mitigate any transport impacts during construction;	Section 4

Whether a Construction Transport Management Plan and Driver Code of Conduct may be appropriate to outline measures to manage traffic related issues generated by the development.	Was not scoped for this TIA and should be compiled in the planning process.

1.4 State Environmental Planning Policy (Transport and Infrastructure) 2021

The project has been assessed in accordance with *State Environmental Planning Policy (SEPP) Transport and Infrastructure 2021*, clause 2.119 (development with frontage to a classified road).

The objectives of the clause are as follows:

– *To ensure that new development does not compromise the effective and ongoing operation and function of classified roads, and*
– *To prevent or reduce the potential impact of traffic noise and vehicle emission on development adjacent to classified roads.*

The clause specifies that the consent authority must not grant consent to development on land that has a frontage to a classified road unless it is satisfied that:

(a) where practicable and safe, vehicular access to the land is provided by a road other than the classified road, and

It is noted that the magazine compound is an existing development and access/egress is provided from the Newell Highway. Additionally:

– There is no viable alternative access/egress to and from the Newell Highway
– The have been no crashes at the development's access driveway in the previous five years of available data

(b) the safety, efficiency and ongoing operation of the classified road will not be adversely affected by the development as a result of—

(i) the design of the vehicular access to the land, or

(ii) the emission of smoke or dust from the development, or

(iii) the nature, volume or frequency of vehicles using the classified road to gain access to the land, and

It is noted that:

– The project is not expected to increase the operational traffic volumes at the magazine.
– The current access driveway and internal road will be spray sealed as part of the project, supporting improved outcomes, including a reduction in dust emissions.

(c) the development is of a type that is not sensitive to traffic noise or vehicle emissions, or is appropriately located and designed, or includes measures, to ameliorate potential traffic noise or vehicle emissions within the site of the development arising from the adjacent classified road.

See above response, also noting the sealing of the access driveway will reduce dust emissions.

1.5 Purpose of this report

The purpose of this report is to identify the traffic and transport impacts of the proposed activities on the adjoining road network. The report:

– Identifies the traffic and transport facilities in proximity to the subject site.
– Assesses the impacts of the construction and operation of the project.
– Recommends measures to mitigate and manage the potential impacts identified.

1.6 Assumptions and qualifications

This report is based on the following assumptions and qualifications:

– Traffic volumes from the Newell Highway were sourced from publicly available data.
– No traffic surveys or intersection modelling has been undertaken.
– The site will generate negligible additional operational vehicle activity.
– During the construction of the project, up to seven workers would be employed, and up to six heavy vehicles would access/egress the project site per day.

1.7 Limitations

This report has been prepared by GHD for Orica Australia Pty Ltd and may only be used and relied on by Orica Australia Pty Ltd for the purpose agreed between GHD and Orica Australia Pty Ltd as set out in this report.

GHD otherwise disclaims responsibility to any person other than Orica Australia Pty Ltd arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

2. Existing conditions

2.1 Current operation

During construction, the operations at the Tocumwal Magazine Compound would continue as normal to avoid disruptions to service. After the four new 250 t HE magazines and one detonator magazine have been constructed, operations would continue as present with no changes to current operational procedures being proposed.

Currently, the site operates in line with a number of existing procedures, including:

– An operating manual
– Environmental Management Plan (EMP)
– Site Safety Management Plan (SSMP)
– Emergency Response Plan (ERP)
– Site Security Plan
– Fire Risk Management Plan.

These operational procedures would remain in place after the project has been constructed.

2.1.1 Hours of operation

Existing operational hours, which would remain unchanged, as follows:

– Facility operating hours 6:30am to 15:30pm Monday to Friday
– Traffic arrival 24 hours, seven days a week.

2.1.2 Operational workforce

There are currently two to five permanent staff operating the Tocumwal Explosives Reserve at any one time. The operation of the new facility would continue to require the same number of staff after construction has been completed. Currently, from Monday to Thursday, five staff are present on the site (four permanent staff and one permanent part time), and on Fridays, four permanent staff are present on the site.

There is no proposed change to the overall operational workforce at the facility due to the project.

2.2 Existing road network

2.2.1 Road hierarchy

Functional road classification involves the relative balance of mobility and access functions. Transport for NSW (TfNSW) define four levels in a typical functional road hierarchy, ranking from high mobility and low accessibility to high accessibility and low mobility. These road classes are:

– **Arterial Roads** – generally controlled by TfNSW, typically no limit in flow and designed to carry vehicles long distance between regional centres.
– **Sub-Arterial Roads** – can be managed by either TfNSW or local council. Typically, their operating capacity ranges between 10,000 and 20,000 vehicles per day, and their aim is to carry through traffic between specific areas in a subregion or provide connectivity from arterial road routes (regional links).
– **Collector Roads** – provide connectivity between local roads and the arterial road network and typically carry between 2,000 and 10,000 vehicles per day.

– **Local Roads** – provide direct access to properties and the collector road system and typically carry between 500 and 4,000 vehicles per day.

2.2.2 Newell Highway

The Newell Highway is a national highway providing a major road link between Queensland and Victoria, passing through central New South Wales (Figure 2-1). The highway passes through several rural towns, including Dubbo, Parkes, Narrabri and Tocumwal.

The speed limit on most rural sections of the Newell Highway is 110km/h. The majority of the highway provides a single lane of travel in each direction, with overtaking lanes provided in both directions of travel. Along the Newell Highway, there are several major and minor rest areas.



Figure 2-1 431 Newell Highway, looking south

The current access from Newell Highway is unsealed as displayed in Figure 2-2. The project provides an opportunity to upgrade the access driveway, as detailed in Section 3.1.4.



Figure 2-2 Development access road at Newell Highway

2.2.3 Chinamans Road

Chinamans Road is a local rural road, connecting Newell Highway and Tuppal Road (refer Figure 2-3), with a default rural speed limit of 100km/h. There is no on-street parking provided on Chinamans Road.

As stated in Section 1.2, Chinamans Road is only used for emergency access/egress (if required) for the existing magazine.



Figure 2-3 Chinamans Road, looking from Newell Highway

Source: Google Maps modified by GHD

2.3 Crash data review

A review of crash data from the TfNSW Road Centre for Road Safety has been undertaken based on the last five years of data (2017 – 2021) (Figure 2-4).

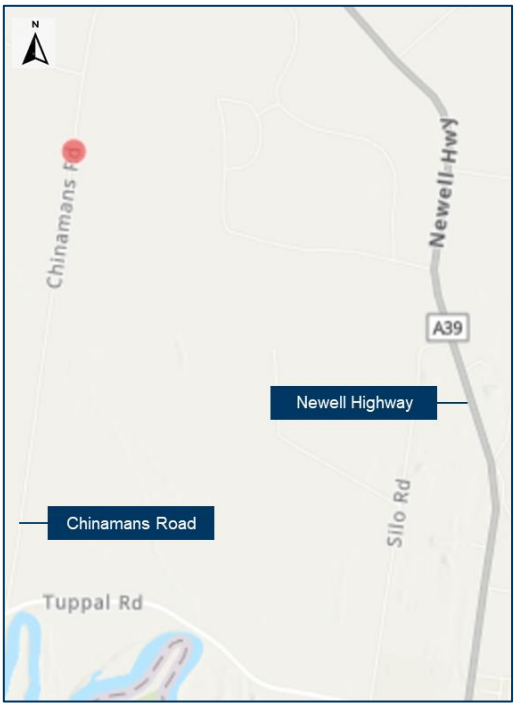


Figure 2-4 Crash data near the project site

Source: Transport for New South Wales modified by GHD

The data indicates that there was one crash recorded on Chinamans Road in proximity to the site in 2018. The crash occurred when a vehicle went off-road and struck an object and resulted in no injuries.

2.4 Active and public transport

With respect to public and active transport:

– There are no active transport facilities in proximity to the project.
– There are school bus routes along Newell Highway travelling from Tocumwal to Finley, which operates on school days.
– The Albury to Echuca Regional Coach Service travels along Newell Highway near the site. The service operates in both directions three times a week.

In summary, there is a minor provision of public transport services in proximity to the project.

2.5 Freight routes

The TfNSW Restricted Access Vehicle (RAV) map indicates that the Newell Highway is authorised to accommodate vehicles up to the size of 26 metre B-doubles (Figure 2-5) and road-trains (including B-triple and AB-triple vehicles) ,as displayed in Figure 2-6.

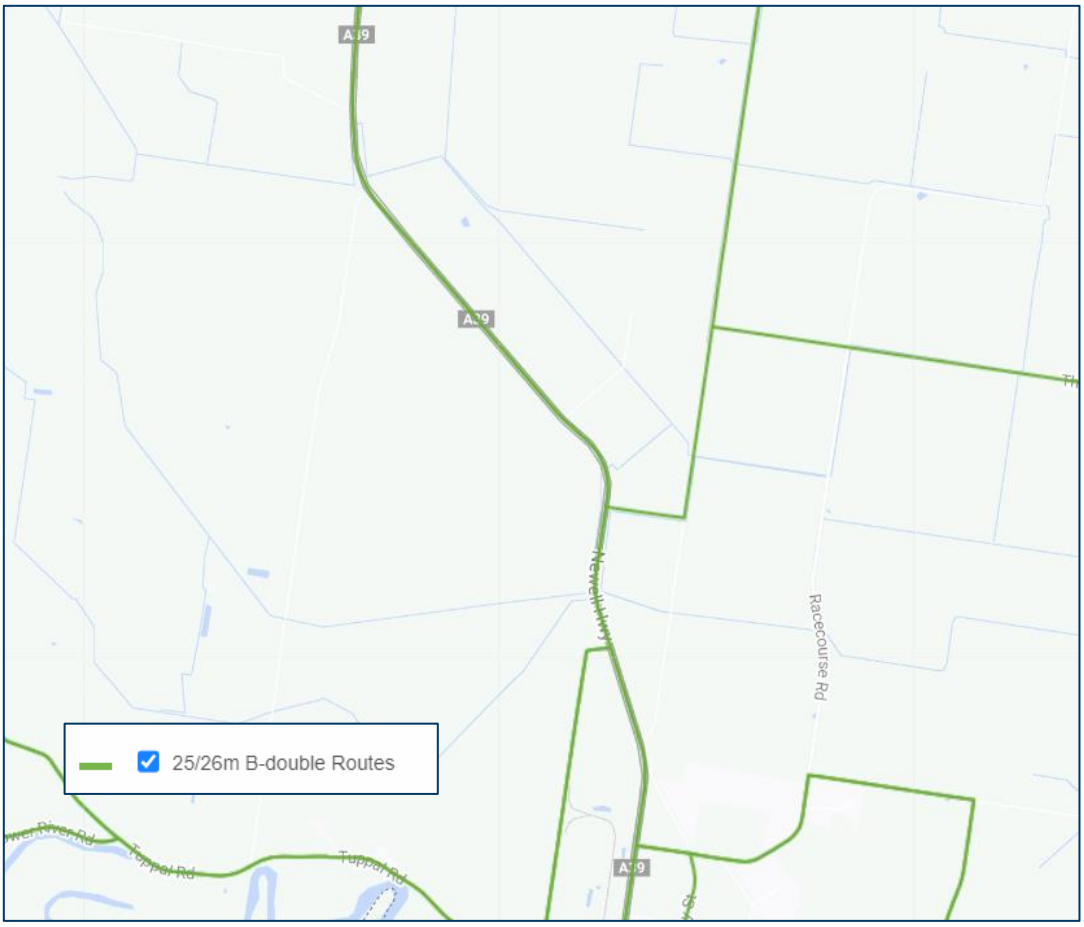


Figure 2-5 Restricted Access Heavy Vehicle Map near Tocumwal – B-doubles

Source: Transport for New South Wales, modified by GHD

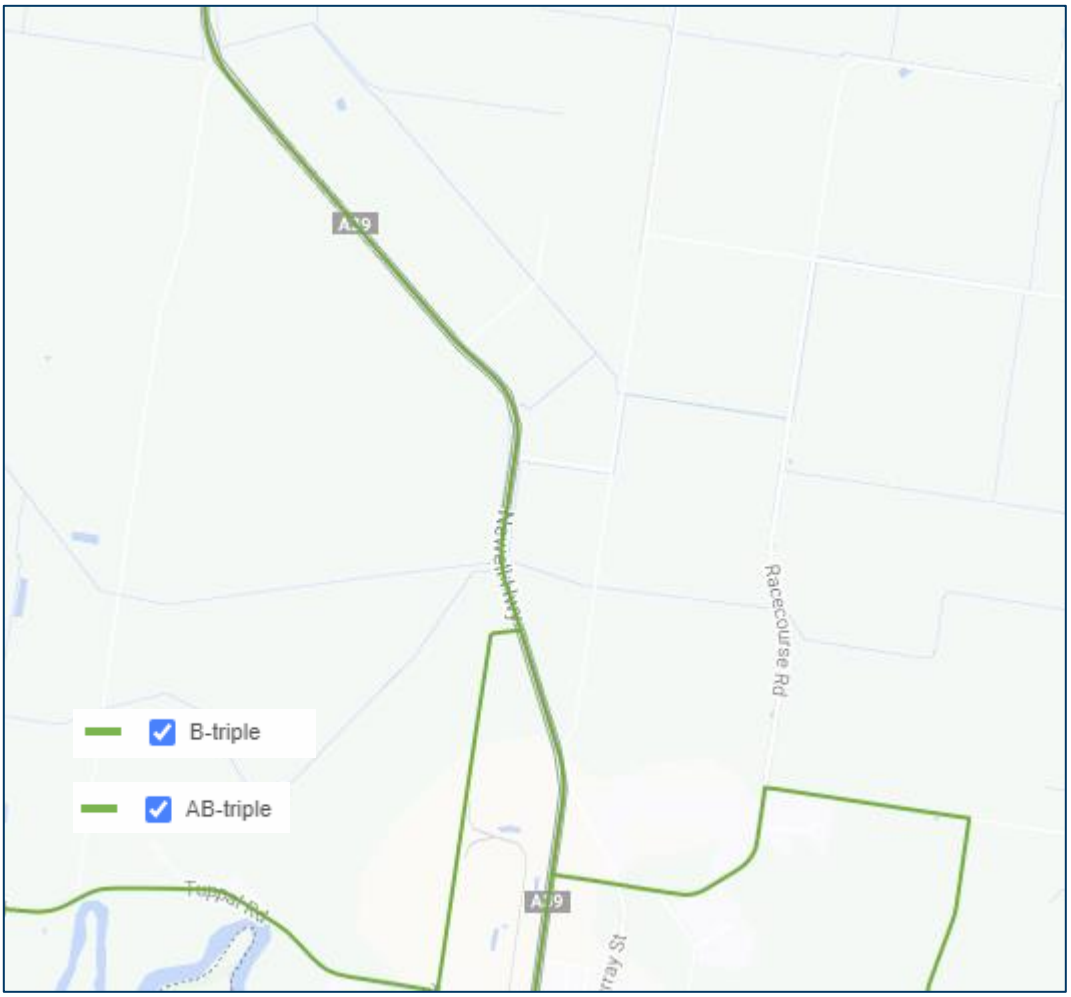


Figure 2-6 Restricted Access Heavy Vehicle Map near Tocumwal – road trains

Source: Transport for New South Wales, modified by GHD

2.6 Traffic data

TfNSW have provided traffic data for Newell Highway, approximately 57km to the north of 431 Newell Highway, Tocumwal, which was collected between 01 January 2021 and 31 December 2022 (Figure 2-7).

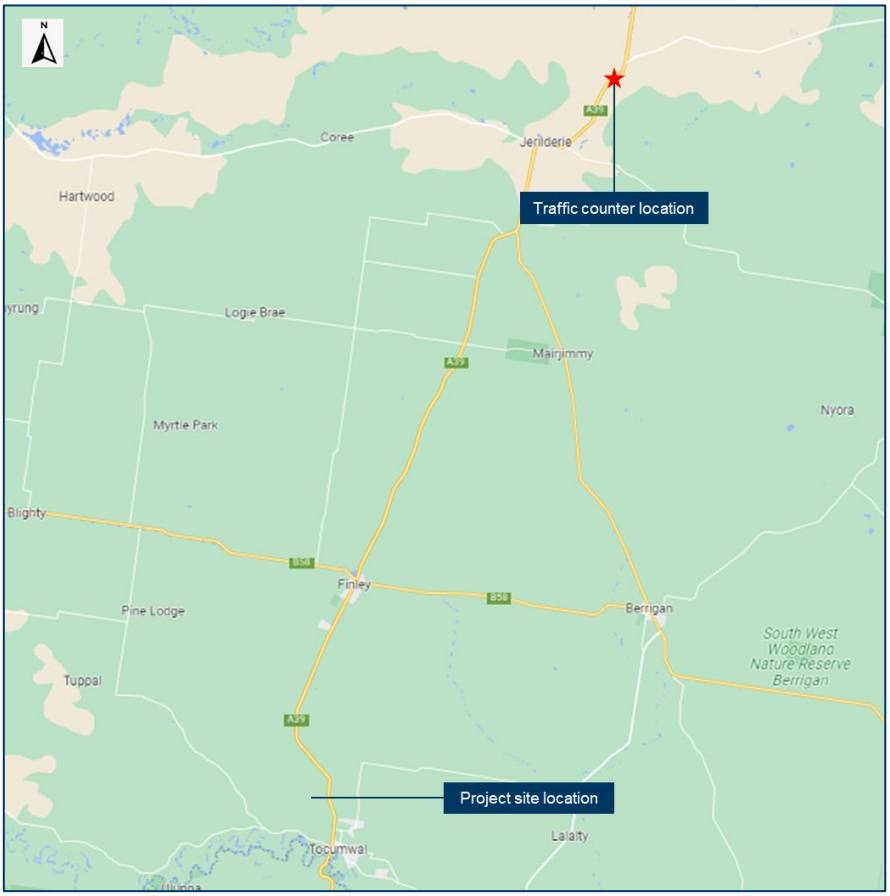


Figure 2-7 Location of Newell Highway traffic counter

Source: Google Maps modified by GHD

The average weekday traffic volumes for 2021 are displayed in Figure 2-8.

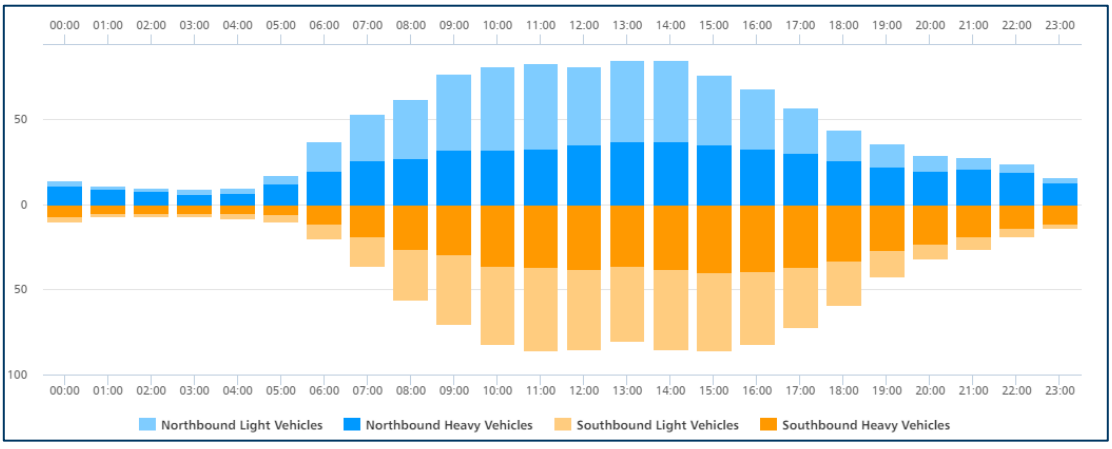


Figure 2-8 Daily traffic volumes on Newell Highway in 2022

Source: Transport for New South Wales modified by GHD

The data indicates that:

– The Newell Highway north of Tocumwal accommodates approximately 1,000 northbound vehicles and 1,000 southbound vehicles per day.
– Heavy vehicles constitute approximately 52 per cent of overall vehicle activity.
– Peak morning activity occurs between 11am–12pm, with 82 northbound vehicles and 85 southbound vehicles.
– Peak afternoon activity occurs between 2pm–3pm, with 84 northbound vehicles and 85 southbound vehicles.

Traffic data is not available for the local roads in proximity to the project site. However, in accordance with their rural location, it is expected that they accommodate negligible traffic volumes.

2.7 Road network performance

The *TfNSW Guide to Traffic Generating Developments* specifies that for rural roads with a speed limit of 100 kilometres per hour, a single travel lane in each direction, level terrain and 15 per cent heavy vehicles have a mid-block capacity (to a LOS D) of 1,410 vehicles per hour (bi-directional traffic).

Accounting for the higher traffic volumes and greater percentage of heavy vehicles at the TfNSW count station, the data in Figure 2-8 indicates that the Newell Highway is operating well within its mid-block capacity.

3. Impact assessment

3.1 Proposed development

3.1.1 Construction activities

The main construction activities of this project are planned to commence during early to mid–2024. A detailed design would be undertaken prior to the beginning of construction. Construction activities are expected to include:

– Earthworks: used to establish the concrete slabs under the four new 250t HE magazines and one detonator magazine.
– Construction of earthen blast mounds: the project would include the construction of earthen blast mounds in front of three of the proposed 250 t HE magazines. These blast mounds would be strategically positioned to minimise risk of knock-on detonation. The construction of these blast mounds would be finalised in a detailed design and presented in the EIS.
– Construction of new access roads: new roads would be built running from the existing entrance to the sites of the new magazines. These roads would be gravel during the construction of the new magazines and would then be sealed prior to normal operations using the new magazines starting.
– Construction of four new two hundred and fifty tonne high explosive (250 t HE) magazines.
– Construction of a single 10,000,000 capacity detonator (IE) magazine.
– A hard stand would be constructed at each new magazine site upon which the concrete slab would be built.

The new magazines would be constructed on concrete slabs which would include an approximately nine-metre-wide apron across the front of the new building to allow parking of B-double trucks for loading and unloading.

3.1.2 Construction hours

The construction activities would be carried out during the following hours, consistent with the recommended standard hours of the *Draft Construction Noise Guideline* (NSW EPA, 2020):

– 7am-6pm Monday to Friday
– 8am-1pm Saturdays
– No work on Sundays or Public Holidays.

3.1.3 Operation activities

During construction, operations at the Tocumwal Explosives Reserve would continue as normal to avoid disruptions to service. After the four new 250 t HE magazines and one detonator magazine have been constructed, operations would continue as present with no changes to current operational procedures being proposed.

As stated previously, there is no proposed change to the overall operational workforce at the facility due to the project.

3.1.4 Access arrangements

With respect to the access to the project site, it is proposed to spray seal the internal access road, including its intersection with the Newell Highway, in accordance with Austroads Guidelines. The proposed internal road upgrades are displayed in Figure 3-1 and the access intersection upgrade is displayed in Figure 3-2.

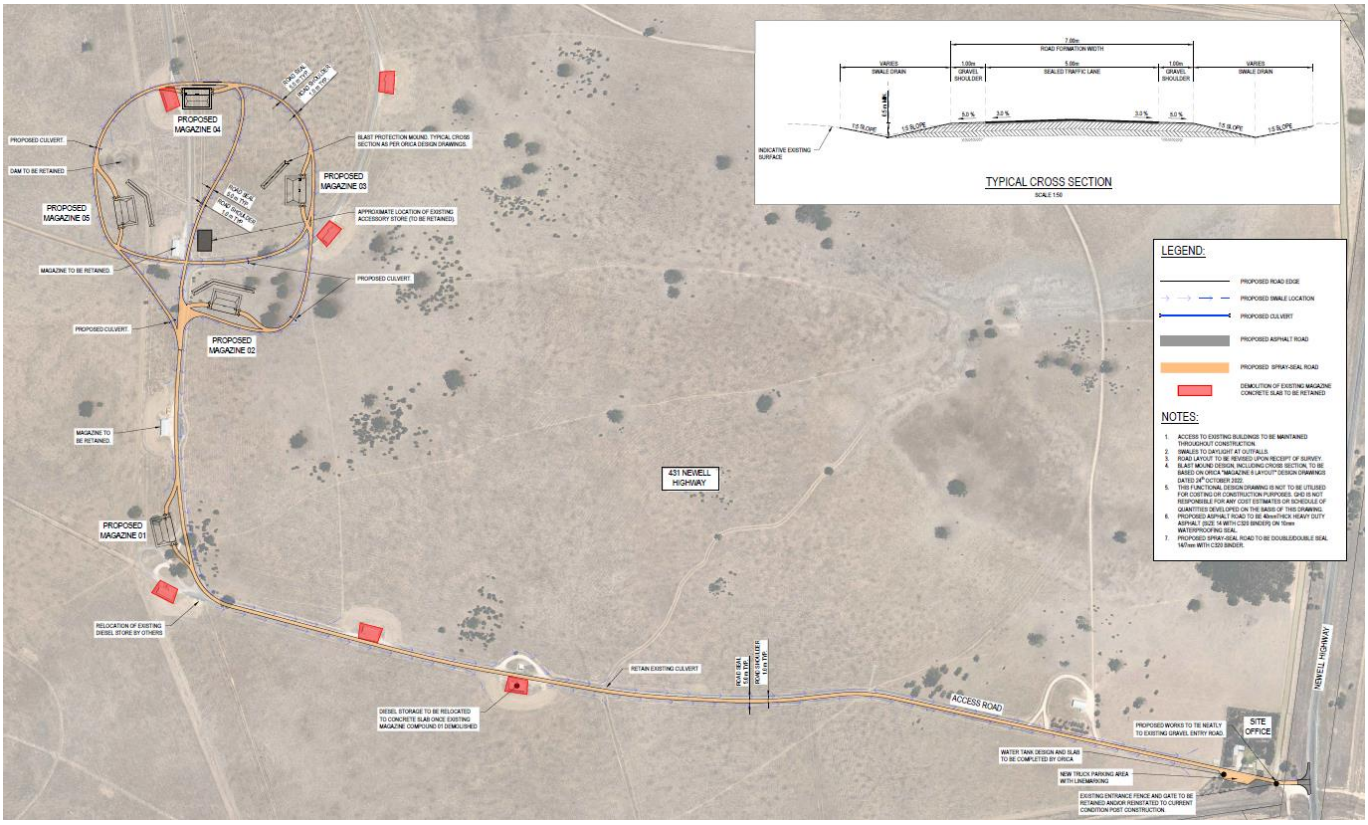


Figure 3-1 Proposed internal road upgrade



Figure 3-2 Proposed access intersection

Swept path analyses showing a 26 metre B-double truck entering and exiting the subject site via the upgraded access intersection are displayed in Figure 3-3.

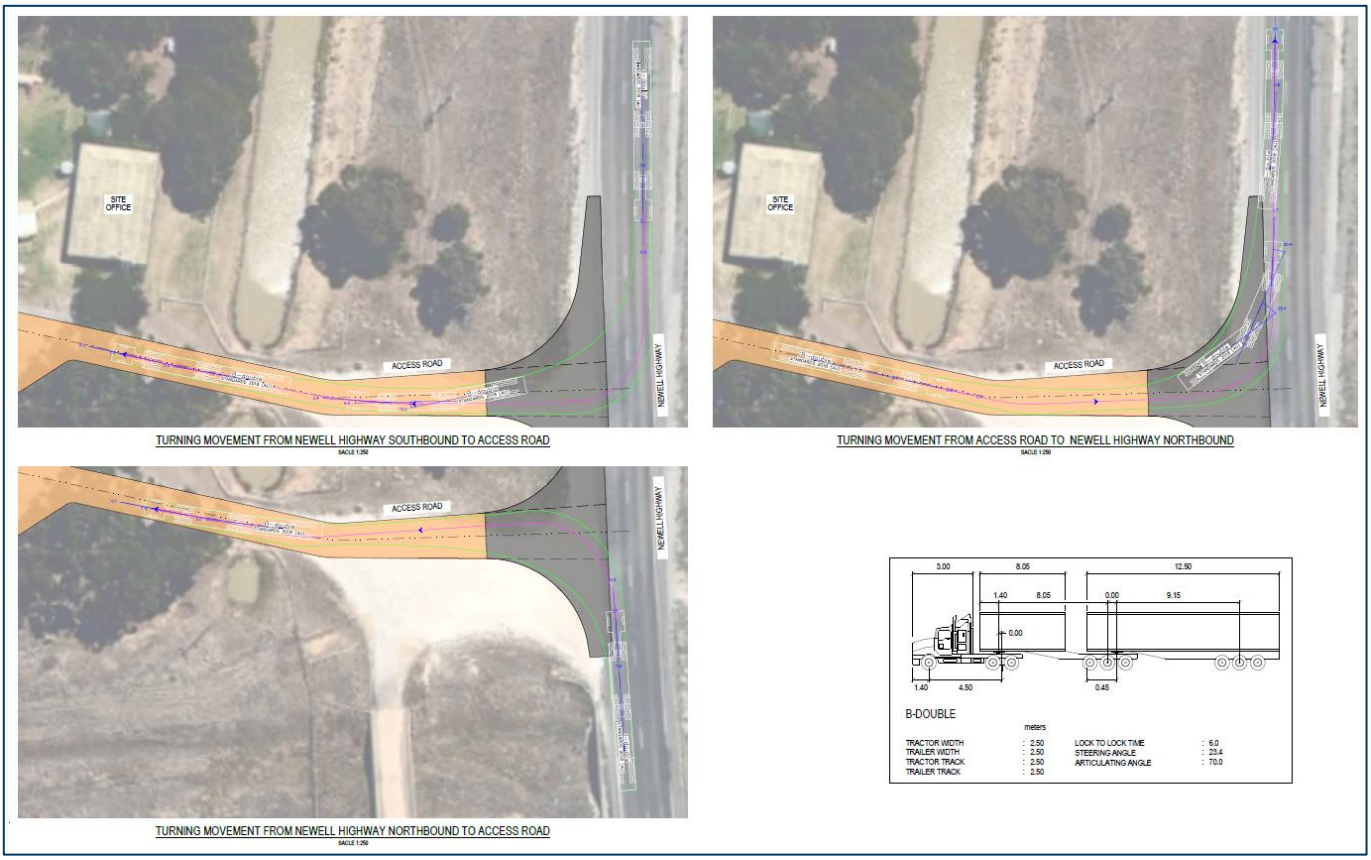


Figure 3-3 Swept path analysis

3.2 Traffic generation

As the number of workers at the site is not expected to change, the traffic generated from operation of the facility would remain the same and as such has not been considered further in this assessment.

The peak hour construction vehicle activity has been undertaken on a first principles basis in accordance with the expected volumes of workers and heavy vehicles as follows:

– Up to ten additional workers are expected at the site during the construction of the project.
– Workers will access the site in the morning and depart the site in the afternoon.
– To be conservative, it has been assumed that two heavy vehicles would access/egress the project site in a single hour during the peak hour.

For the purposes of this assessment, the highest hourly traffic generation for the project under the peak construction scenario is assumed to be up to 14 vehicle trips in total, which will consist of the following:

– AM peak hour:
  - Ten inbound light vehicles
  - Two inbound heavy vehicle movements
  - Two outbound heavy vehicle movements.
– PM peak hour:
  - Ten outbound light vehicles
  - Two inbound heavy vehicle movements
  - Two outbound heavy vehicle movements.

3.3 Traffic distribution

It is assumed all vehicles would access/egress the project site via the Newell Highway. For the purposes of analysis, it has been assumed that 50 per cent of vehicles will access/egress the site from the north and 50 per cent will access/egress the site from the south.

3.4 Site impacts

3.4.1 Impacts to traffic

With respect to the traffic impacts of the project, the following is noted:

– The available information indicates that the roads in proximity to the project site are operating with a good Level of Service during peak periods of road network activity.
– Operational vehicle activity is expected to be negligible.
– The vehicle activity associated with the construction of the project would be minor, up to 14 vehicles in a single hour, at an average of (approximately) one vehicle every four minutes.

Accordingly, the traffic impacts of the project are expected to be negligible and fall within the daily fluctuations of the adjoining arterial road network.

3.4.2 Impacts to public and active transport

As there are no active transport facilities in proximity to the project site, there will be no impact on such facilities.

There are some public transport routes on the Newell Highway, including the Albury to Echuca Regional Coach Service. However, given their infrequent nature as well as the small number of construction vehicles, the impact on public transport services is expected to be negligible.

3.4.3 Impacts to road safety

With respect to impacts on road safety:

– The crash review outlined in Section 2.3 shows there has been one recorded crash in proximity to the project site in the last five years on Chinamans Road.
– Appropriate traffic control measures in the vicinity of the site should be adopted to ensure that the safety of all road users is not impacted by construction-related vehicles travelling to and from the site.
– The construction/operational volumes generated by the project are minor.

Accordingly, the impacts of project construction and operational vehicles on road safety are expected to be negligible.

3.4.4 Impacts to parking

With respect to impacts on parking, the following is noted:

– Due to on-street parking not being permitted on Newell Highway in proximity to the project site, there is not expected to be any impact to on street parking.
– Parking for workers would be provided within the project site.

Accordingly, the impacts on parking associated with the construction and operation of the project are expected to be negligible.

4. Mitigation measures

Mitigation measures proposed to avoid or minimise traffic and transport impacts during construction and operation, of the project are listed in Table 4-1.

Table 4-1 Mitigation measures – traffic and transport

ID	Outcome	Mitigation measure	Timing
T1	Minimise environmental impacts associated with the movement of vehicles.	Rectify any road deposits caused by site vehicles, to maintain the safety of road users. Where possible, offset the construction vehicle activity from peak periods of road network activity.	Construction
T2	Minimise environmental impacts associated with the movement of vehicles.	Induct employees and contractors to raise awareness and understanding of traffic and transport mitigation measures to be implemented during construction.	Construction

5. Conclusion

Orica is proposing to redevelop the Tocumwal Magazine Compound . The site is situated within the Berrigan LGA on Lot 2, DP 225459, Newell Highway, Tocumwal and is currently operated by Orica.

Construction activities include:

– Vegetation clearing
– Earthworks
– construction of earthen blast
– Construction of new access roads
– The construction of four new two hundred and fifty tonne high explosive (250 t HE) magazines.
– The construction of a single 10,000,000 capacity detonator (IE) magazine.

During construction, operations at the Tocumwal Magazine Compound would continue as normal to avoid disruptions to service. After the four new 250 t HE magazines and one detonator magazine have been constructed, operations would continue as present with no changes to current operational procedures being proposed.

For the purposes of this assessment, the highest hourly traffic generation for the project under the peak construction scenario is assumed to be up to 14 vehicle trips in total, which will consist of the following:

– AM peak hour:
  - Ten inbound light vehicles
  - Two inbound heavy vehicle movements
  - Two outbound heavy vehicle movements.
– PM peak hour:
  - Ten outbound light vehicles
  - Two inbound heavy vehicle movements
  - Two outbound heavy vehicle movements.

Additionally:

- The traffic impacts of the project site are expected to be negligible and fall within the daily fluctuations of the adjoining arterial road network.
- There is no active transport in proximity to the project site.
- There are infrequent bus routes in proximity to the site that operate at most once a day. The impact of the construction activity on these services are expected to be negligible.
- The crash review outlined in Section 2.3 shows there has been one crash recorded in proximity to the project site in the last five years that took place on Chinamans Road. The crash resulted in no injuries and occurred as a result of the vehicle hitting an object off-road.
- The impacts of project construction and operational vehicles on road safety are expected to be negligible.
- During construction, car parking for workers will be provided in proximity to the new magazine locations.

In conclusion, the impacts of the construction and operation of the project on the adjoining traffic and transport networks are expected to be negligible.

6. References

Transport for New South Wales (2002) – *Guide to Traffic Generating Developments*

Australian Standard (1998) AS 2187.1 – *Explosives – Storage, transport and use – Storage*

New South Wales Consolidated Regulations (2014) – *Road Rules*


GHD

Appendix F

Bushfire Hazard Assessment, GHD 2024

Bushfire Hazard Assessment

Tocumwal Magazine Storage Upgrade

Orica Australia Pty Ltd

13 May 2024

→ The Power of Commitment



Project name		Orica Tocumwal Magazine Compound Upgrade					
Document title		Bushfire Hazard Assessment | Tocumwal Magazine Storage Upgrade					
Project number		12597123					
File name		12597123_0_REP_Orica-Tocumwal_BFA					
Status Code	**Revision**	**Author**	**Reviewer**		**Approved for issue**		
			Name	**Signature**	**Name**	**Signature**	**Date**
S4	0	E. Chaffey	M. George		S Lawer		13/05/24

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Appendix

Appendix A Site Photographs (April and November 2023)
Appendix B Map of farm dams
Appendix C Aircraft exclusion zone

1. Introduction

Orica Australia Pty Ltd (Orica) proposes to redevelop the Tocumwal Explosives Reserve magazine site ('the project'). The project would bring the Tocumwal site in line with Australian Standard AS2187 Explosives - Storage, Transport and Use.

The project is located at 431 Newell Highway, approximately four kilometres north of the township of Tocumwal. The site is situated within the Berrigan Local Government Area (LGA) on Lot 2, DP 225459 and is operated by Orica. The location of the site is shown in Figure 1. The site is zoned as RU1 Primary Production under *Berrigan Local Environmental Plan 2013*. The Tocumwal Explosives Reserve is a fenced, open grazing property that is approximately 750 hectares in area, with a northern and an eastern frontage of 4.7 km to the Newell Highway.

GHD Pty Ltd (GHD) has prepared a Bushfire Assessment on behalf of Orica for the Tocumwal Magazine Storage Upgrade to address the NSW Department of Planning and Environment (DPE) Secretary's environmental assessment requirements (SEARs). The proposed activity would include the construction of four (4) new two hundred and fifty tonne high explosive (250 t HE) magazines and a single 10,000,000 capacity detonator (IE) magazine in new locations on the site. No change in the quantity of explosives to be stored is proposed. Operational procedures remain generally unchanged post redevelopment. The existing magazine buildings are to be decommissioned or demolished once the new magazines are commissioned.

The project is classified as a State Significant Development under the *Environment Planning and Assessment Act 1979* and is to be assessed via an Environmental Impact Statement (EIS).

1.1 Purpose of this report

The purpose of this report is to document any likely required bushfire mitigation measures that would be applicable for the design and construction of the proposed Tocumwal Explosives Reserve magazine site.

The proposed upgrade works are considered to be hazardous industry due to the storage of explosive materials, and assessment under 8.3.9 of Planning for Bushfire Protection (PBP) (NSWRFS 2019) is required. Consultation with the NSW Rural Fire Service (RFS) took place on 11 December 2023, and 14 February 2024, and the subsequent preparation of a performance-based solution was completed and is included in this report. It is noted that the proposal is not for new development, but upgrade works on an existing site.

1.2 Secretary's environmental assessment requirements

The DPE has issued SEARs for the project. A description of the SEARs requirements relating to bushfire and where they have been addressed in this report is provided in Table 1.

Table 1 SEARs

Requirement	Where addressed in this report
Bush Fire – a bush fire assessment report that addresses the aims and objectives of Planning for Bushfire Protection 2019, and includes:	This assessment has been prepared in accordance with Planning for Bushfire Protection 2019.
– Details of proposed operational access for emergency services personnel.	Section 3.3
– Details of emergency and evacuation arrangements for occupants/visitors.	Section 3.6
– A Bush Fire Emergency Management and Evacuation Plan prepared in accordance with relevant RFS guidance.	Section 3.6

1.3 Scope and limitations

This report: has been prepared by GHD for Orica Australia Pty Ltd and may only be used and relied on by Orica Australia Pty Ltd for the purpose agreed between GHD and Orica Australia Pty Ltd as set out in section 1.1 of this report.

GHD otherwise disclaims responsibility to any person other than Orica Australia Pty Ltd arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report (refer section 1.3 of this report). GHD disclaims liability arising from any of the assumptions being incorrect.

Accessibility of documents

If this report is required to be accessible in any other format, this can be provided by GHD upon request and at an additional cost if necessary.

1.4 Assumptions

Bush Fire Prone Land (BFPL) has been assessed using the NSW RFS BFPL mapping tool (Check if you're in bush fire prone land -NSW Rural Fire Service(RFS)) and the NSW ePlanner Spatial viewer (ePlanning Spatial Viewer (nsw.gov.au)) and has not been independently verified by GHD.
GHD conducted a site inspection and photos from this inspection have been used in this report. GHD has also relied upon publicly available spatial information for the assessment.
The report is based on site layout as presented in the plans provided to GHD on 20 December 2023 and the report relates to the new works only, as outlined in section 1.

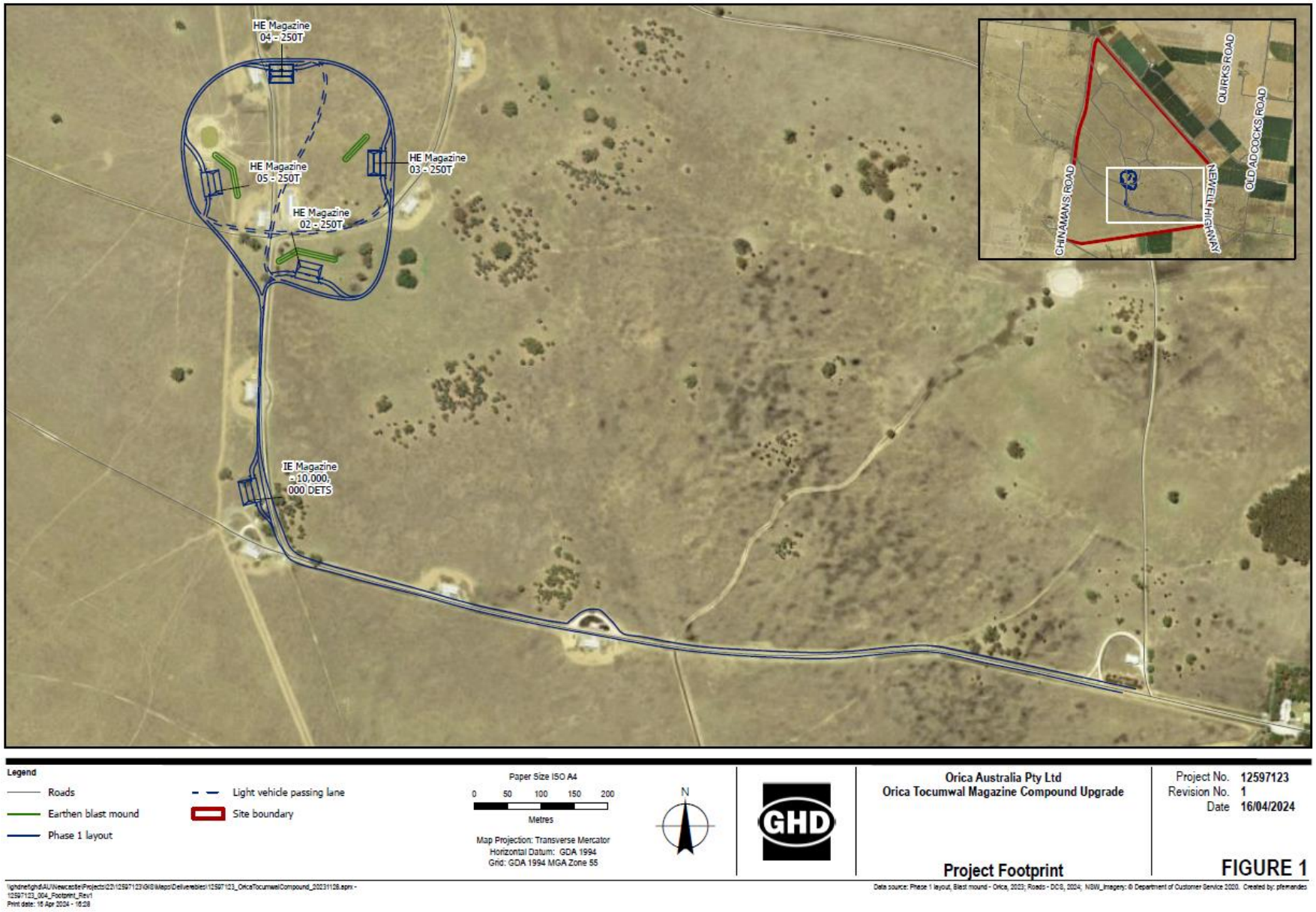


Figure 1 *Proposed location of new magazine storage buildings*

2. Bushfire assessment

2.1 Bushfire prone land classification

The identification of bushfire prone areas is required under Section 10.3 of the *Environmental Planning and Assessment Act 1979*. The site is not designated as bushfire prone (as per Berrigan Council and RFS mapping – see Figure 2). The closest mapped BFPL is located approximately 2km to the south and is associated with the riparian vegetation adjacent the Murray River. Site inspections have confirmed the majority of the site is actively grazed by livestock, however seasonal conditions may affect the level of grass growth and accumulation. On site vegetation may be considered a potential bushfire hazard.

2.2 Fire weather

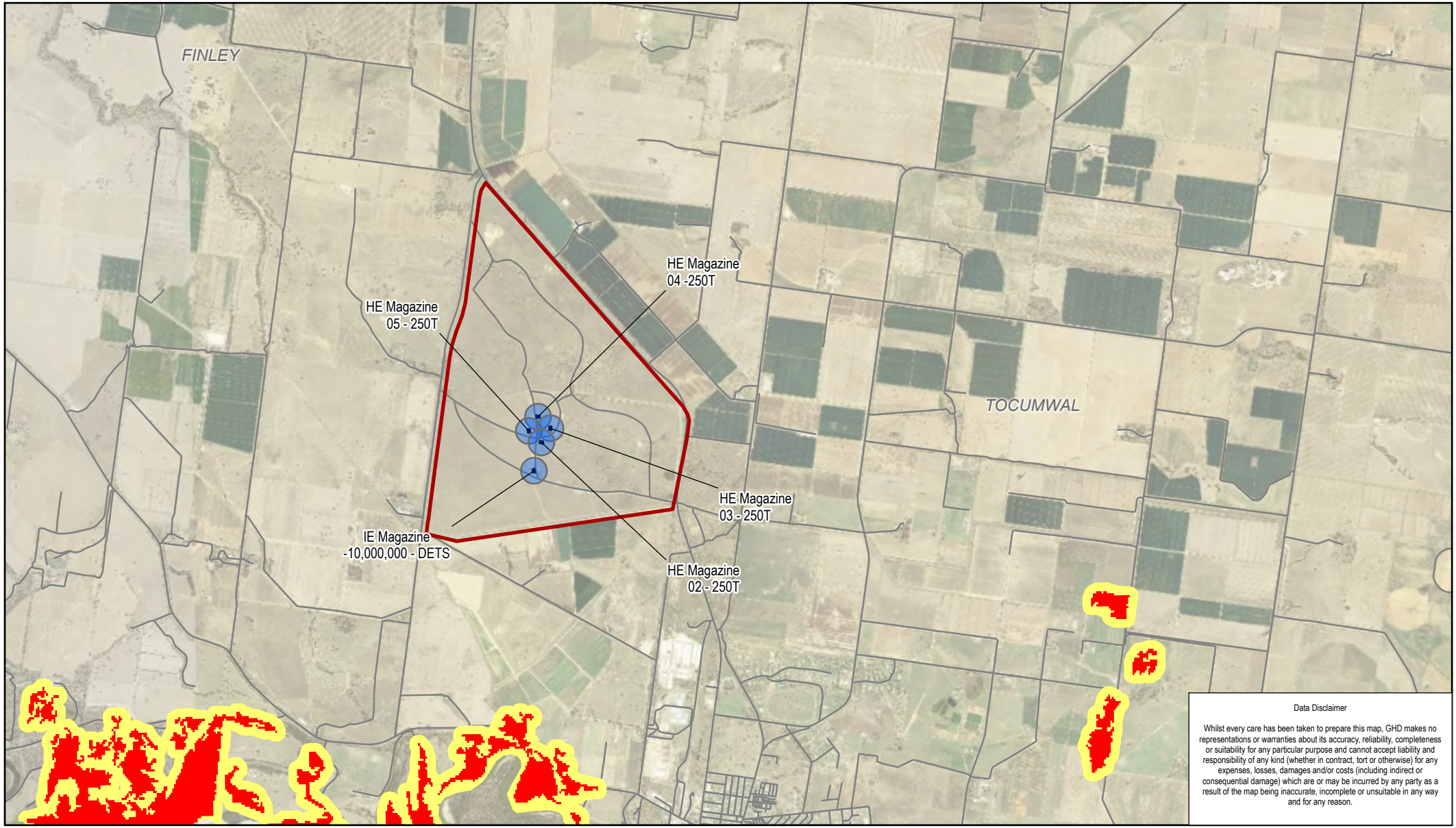
The site falls within the Berrigan LGA within the greater Southern Riverina area for which Fire Danger Index (FDI) of 80 is applicable for bushfire assessment (NSW RFS, 2019).

2.3 Vegetation

A desktop review of the State Vegetation Type Map (DPE 2023) indicates the site is dominated by grasslands Plant Community type (PCT) 44, with remnant islands (<11ha) of grassy woodland throughout. An ecological field assessment was carried out by OzArk Environment and Heritage in 2023. The ecological assessment indicates that the site is dominated by PCT 45 Plains Grass grasslands. There are small areas of freshwater wetlands and inland riverine wetlands located centrally on the western boundary of the site. Remnant “islands” of woodland occur within these grasslands, dominated either by River Red Gum (*Eucalyptus camaldulensis*) or by Yellow Box (*E. melliodora*). River Red Gum woodlands have been classified as PCT 9 River Red Gum - wallaby grass tall woodland wetland on the outer River Red Gum zone mainly in the Riverina Bioregion. Yellow Box woodlands have been classified as PCT 74 Yellow Box - River Red Gum tall grassy riverine woodland of NSW South Western Slopes Bioregion and Riverina Bioregion.

The predominant vegetation class formation from PBP is given in Table 2 and mapping is presented in Figure 3. Photographs of the site and surrounding vegetation are presented in Attachment 1. The site is generally maintained to a low fuel condition by livestock grazing, ploughing, and slashing adjacent roadways, magazines, and key fence lines.

The site visit confirmed there is substantial adjoining grassland vegetation (associated with agricultural cropping and grazing activities) in the surrounding landscape. Much of the adjoining land is subject to flood irrigation, with water supplied by a series of open irrigation channels.



Legend

- Road
- 150m Assessment Buffer
- Site boundary
- Bushfire Prone Land
- Vegetation Category 1
- Vegetation Buffer

Paper Size ISO A4

0 500 1,000 1,500 2,000

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

GHD

Orica Australia Pty Ltd
Orica Tocumwal Magazine Compound Upgrade

Project No. **12597123**
Revision No. **0**
Date **24/04/2024**

Bushfire Prone Land

FIGURE 2

\
\ghdnet\ghd\AU\Newcastle\Projects\22\12597123\GIS\Maps\Deliverables\12597123_OricaTocumwa
Print date: 24 Apr 2024 - 13:02

Data source: NSW_Imagery: © Department of Customer Service 2020. Phase 1 layout, Blast mound - Orica, 2023, Bushfire Prone Land - NSW Government - 2023, Site Boundary , Buffer Zone - GHD - 2023.
Created by: pfernandes

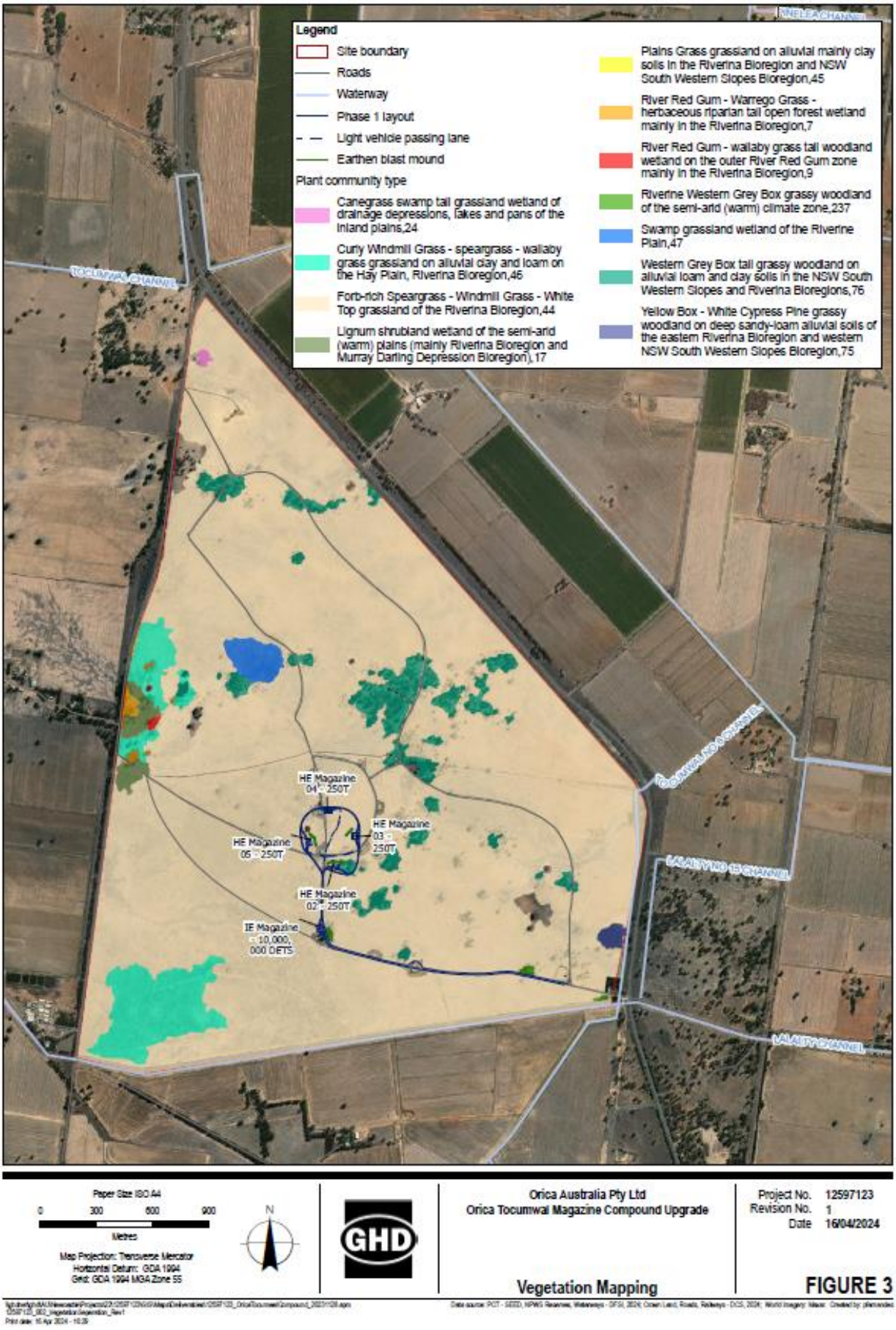


Figure 3 Vegetation within the project site (Source: NSW SEED database)

2.4 Effective slope

Effective slope was assessed using contour mapping from Nearmaps and confirmed by site assessment (refer Figure 4 and Table 2). The site can broadly be characterised as flat, with the main geographic feature surrounding the site being irrigation channels.

3. Bushfire protection measures

A suitable package of Bushfire Protection Measures (BPM) is proposed in Table 2, commensurate with the assessed level of risk associated with hazardous industry, and commercial and industrial development as outlined in 8.3.9 and 8.3.10 of PBP.

3.1 Asset protection zones (APZ) and bushfire attack level (BAL) assessment

To achieve deemed-to-satisfy acceptable solutions for Asset Protection Zones (APZ's) and building construction (Bushfire Attack Levels (BALs)) for hazardous industry development, structures are to be positioned, and vegetation managed such that the building can achieve a radiant heat exposure not exceeding 10kW/m2.

APZs provide protection from exposure, defendable space and hazard separation. APZs have been applied to meet the Special Fire Protection Purpose (SFPP) objectives of PBP. APZs are established between a building and vegetation hazard, and their calculation is based on vegetation and slope in accordance with Appendix 1 of the PBP. Deemed-to-satisfy APZs, determined in accordance with Table A1.12.1 of PBP for SFPP developments, are presented in Table 2. The required APZ for each vegetation type is shown in Figure 5 with the specifications for management detailed in Section 3.1.1.

3.1.1 PBP requirements for Asset Protection Zones

Vegetation management, including landscaping, within the subject site is to achieve the specifications of an Inner Protection Area (IPA) as described by PBP and outlined below:

Trees

- canopy cover should be less than 15% (at maturity);
- trees (at maturity) should not touch or overhang the building / structure;
- lower limbs should be removed up to a height of 2 m above ground;
- canopies should be separated by 2 to 5 m; and
- preference should be given to smooth barked and evergreen trees.

Shrubs

- create large discontinuities or gaps in the vegetation to slow down or break the progress of fire towards buildings/ structures;
- shrubs should not be located under trees;
- shrubs should not form more than 10% ground cover; and
- clumps of shrubs should be separated from exposed windows and doors by a distance of at least twice the height of the vegetation.

Grass

- should be kept mown (as a guide grass should be kept to no more than 100 mm in height); and
- leaves and vegetation debris should be removed.

3.2 Consultation and coordination with relevant authorities

Initial consultation with NSW RFS was completed over the phone on 19 December 2023 (confirmed in email received 26 March 2024), Steve Mckinnon, Development Assessment & Planning Coordinator of NSW RFS confirmed that the proposed application of APZ setbacks in accordance with Table A1.12.1 of PBP was a suitable approach. NSW RFS also confirmed the location of the stored water access point at / near the administration / entrance was a suitable approach, subject to practical accessibility to the access point for Category 1 appliances as described in Appendix 3 of PBP.

3.2.1 Firefighting aircraft exclusion zone

During the development of the State Significant Development (SSD) application for the replacement magazines project at the Orica Tocumwal Explosives Reserve, the Fire Services of NSW, namely the NSW Fire and Rescue Service (NSWFR) and the RFS, requested to be advised by Orica about the potential impacts of an under threat magazine creating a danger zone above that magazine for aerial firefighting apparatus such as fixed wing and rotary wing aircraft (Attachment 3).

Orica, in consultation with RFS and locally based operational RFS staff on 14 February 2024 concluded that if there was an emergency where a fire was directly involving the explosives magazines and evacuation occurred, recommended exclusion distances as explained below should be applied.

– Within the Quantity-Distance assessment there is a category of Protected Works – Class A (PWA). In the above emergency situation, Orica would classify aircraft in the 50% PWA category. This 50% PWA category allows between 20-500 vehicles to pass a potential explosion source per 24h period. To incorporate an additional safety factor, given that aircraft have the potential to fall from the sky, we recommend 100% PWA is used. This distance is equivalent to the allowable distance for between 500-10,000 vehicles per day to pass a Potential Explosion Source (PES). At this distance, the possibility of shrapnel or debris is small. The pressure wave at this distance may be noticeable, but it is not likely to cause major damage to the aircraft (or vehicle). It is expected that turbulence would be greater than the impact of the overpressure at this distance. The possibility of EMP (electromagnetic pulse) impact is literally nil as this is expected to diminish at very close distances to the PES (in the range of 50-100 m or less).

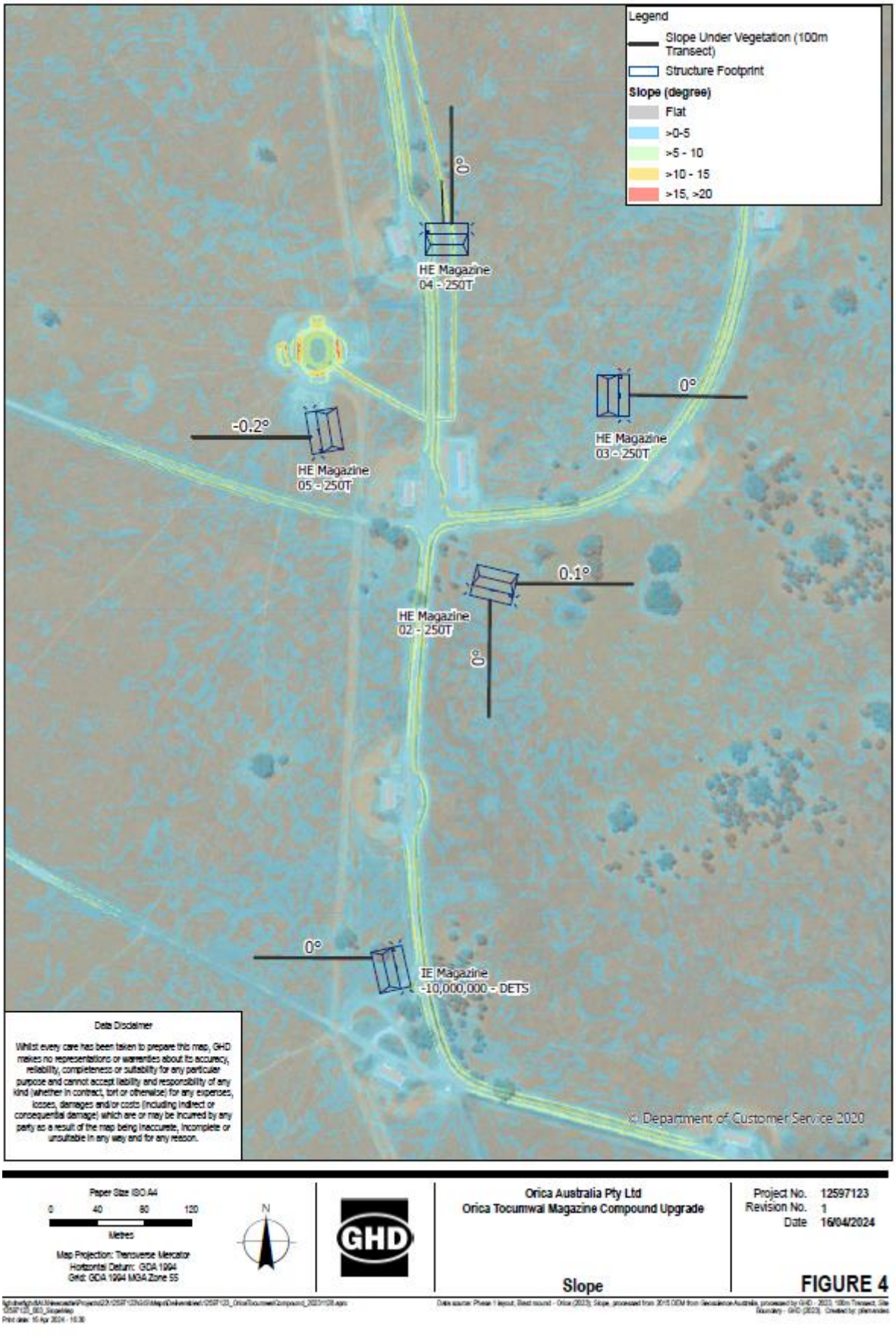


Figure 4 *Slope adjacent new magazine sites*

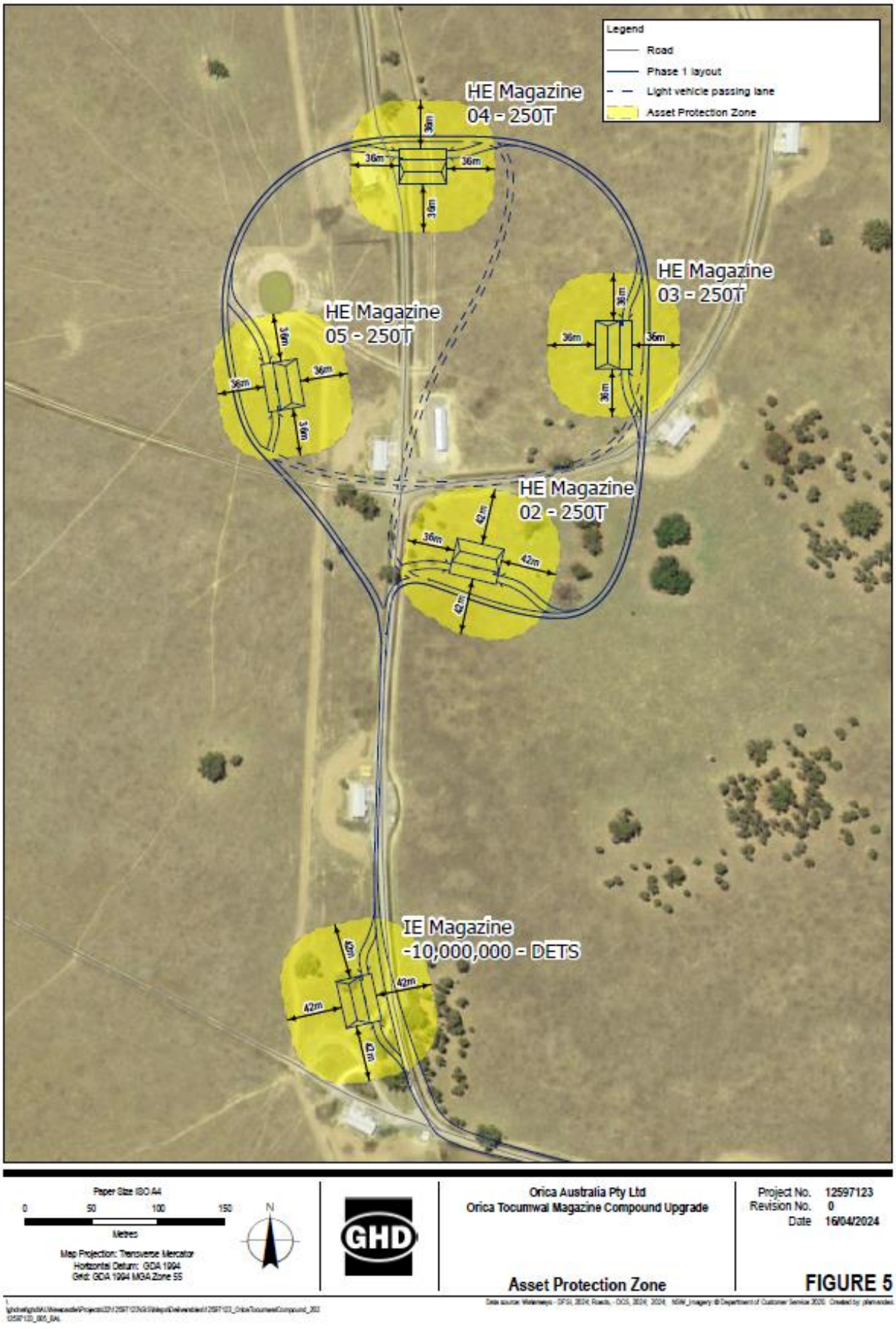


Figure 5 Proposed new magazines and APZs

Table 2 Determination of setbacks (APZs) for the proposal

Magazine	Direction	Nearest BF prone vegetation	Effective slope class	Required APZ (10kW/m^2)	Comments
HE 2	North	Woodland	Flat	42m	
	East	Woodland	Flat	42m	The internal access road will form part of the required APZ
	South	Grassland	Flat	42m	The internal access road will form part of the required APZ
	West	Grassland	Flat	36m	The internal access road will form part of the required APZ
HE 3	North	Grassland	Flat	36m	The internal access road will form part of the required APZ
	East	Grassland	Flat	36m	The internal access road will form part of the required APZ
	South	Grassland	Flat	36m	The internal access road will form part of the required APZ
	West	Grassland	Flat	36m	
HE 4	North	Grassland	Flat	36m	The internal access road will form part of the required APZ
	East	Grassland	Flat	36m	The internal access road will form part of the required APZ
	South	Grassland	Flat	36m	
	West	Grassland	Flat	36m	The internal access road will form part of the required APZ
HE 5	North	Grassland	Flat	36m	
	East	Grassland	Flat	36m	
	South	Grassland	Flat	36m	
	West	Grassland	Flat	36m	The internal access road will form part of the required APZ
IE (1)	North	Woodland	Flat	42m	The internal access road will form part of the required APZ
	East	Woodland	Flat	42m	The internal access road will form part of the required APZ
	South	Woodland	Flat	42m	The internal access road will form part of the required APZ
	West	Woodland	Flat	42m	

3.3 Access and egress

Internal access roads are proposed to link the existing site entrance to each of the new magazines. These roads will be gravel during the construction of the new magazines and would then be sealed prior to commissioning of the new magazines.

There is a single main access point to the site via the Newell Highway (existing dual lane, sealed public road). There is an alternative gated access to the west of the site via Chinamans Road, a sealed single lane road. The existing internal road network and onsite roadways are trafficable year-round and are sufficient for emergency vehicle access and site personnel egress.

There are currently between two to five permanent staff operating the Tocumwal Explosives Reserve during standard working hours. The operation of the new facility would continue to require the same number of staff after construction has been completed. As the proposed development will not result in additional personnel onsite the proposed upgrades to the internal road network will be sufficient to achieve the access/egress objectives of Planning for Bushfire Protection.

3.4 Water supply

No reticulated water is present on site. Water is supplied to the site via bore water. Channel water for example from the adjoining Tocumwal No. 6 Channel or the Lalalty Canal may also be used for fire suppression purposes. Orica proposes to install a single large 50,000 litre tank, immediately south west of the existing administration building (at the main entrance to the site) as water supply for firefighting purposes.

Three farm dams are located within and adjoining the site and may provide water for fire suppression purposes (refer Attachment 2). Dam 1, west of proposed magazines has a capacity of approximately 1,446m^3; Dam 2 within close proximity to HE Magazine 05, is approximately 2,556m^3 in capacity, and Dam 3 on the northeastern boundary of the site is approximately 2,900 m^3 in capacity (Source: Orica Tocumwal Emergency Management Plan, 2023, Revision 16).

Fire extinguishers are located in each magazine building, amenities and vehicles.

3.5 Utilities

Orica Pty Ltd proposes to power each magazine with a solar power system. Additionally, it is planned to connect the security system from each magazine back to the administration building using a data radio network powered by the solar power system. It is recommended the installation and location of electrical services limits the possibility of ignition of surrounding bush land or the fabric of the buildings. Where practicable, electrical transmission lines are underground; where overhead, electrical transmission lines are proposed as follow:

– lines are installed with short pole spacing (30m), unless crossing gullies, gorges or riparian areas; and
– no part of a tree is closer to a power line than the distance set out in accordance with the specifications in ISSC3 Guideline for Managing Vegetation Near Power Lines.

The site is not serviced by reticulated gas.

3.6 Emergency management, evacuation and bushfire plans

Emergency management arrangements are described in the site EMP which would be updated to cater for the site redevelopment. The EMP notes that Fire and Rescue NSW is the primary party for incident response and control. NSW RFS may also respond.

4. Summary

- The proposal site is not mapped as BFPL but has exposure to woodland and grassland vegetation which is currently grazed by livestock.
- The site has existing, functional magazine storage structures with existing APZs serviced by all-weather access tracks. Access tracks would be sealed as part of the redevelopment.
- As the proposed development is considered a hazardous industry, appropriate APZs will be required for each new magazine to achieve BAL10 APZ specifications (from Table A1.12.1). These are required to be between 36m (grassland) and 42m (woodland) width.
- RFS has confirmed the application of 10kw APZ for storage facilities was a suitable approach.
- RFS has confirmed the proposed location of a static water supply of 50,000 litre tank in the vicinity of the existing administration building is a suitable approach (subject to practical accessibility to the access point for Category 1 fire appliances as detailed in Appendix 3 of PBP.

5. References

Australian Standard (AS) AS3959:2018 – Construction of buildings in bushfire prone areas. Standards Australia.

New South Wales Rural Fire Service (2005). Standards for Asset Protection Zones. NSW Government. **https://www.rfs.nsw.gov.au/__data/assets/pdf_file/0010/13321/Standards-for-Asset-Protection-Zones.pdf**

New South Wales Rural Fire Service (2019). Planning for Bushfire Protection – A guide for councils, planners, fire authorities and developers. NSW Government.

New South Wales Rural Fire Service (2023). Check if you are in bush fire prone land. NSW Government. **https://www.rfs.nsw.gov.au/plan-and-prepare/building-in-a-bush-fire-area/planning-for-bush-fireprotection/bush-fire-prone-land/check-bfpl**

New South Wales Government (2023). ePlanning Spatial Viewer. NSW Government. **https://www.planningportal.nsw.gov.au/spatialviewer/#/find-a-property/address**

Orica Australia Pty Ltd (2024). Fire Fighting Aircraft Exclusion Zones Above Explosive Storage Magazines.

Orica Australia Pty Ltd (2023) Orica Tocumwal Emergency Management Plan, Revision 16.

OzArk Environment and Heritage (2023) Ecological Field Assessment Tocumwal Magazine.

Appendix A

Site Photographs (April and November 2023)

Attachment 1 – Site photographs (April and November 2023)



View southwest existing magazines and graded access road



View east along access road towards site entrance



Grassland and open woodland



Existing magazine with ploughed/slashed APZ



View south west from Chinamans Road – alternative access



View west – main site access from Newell Highway

Appendix B

Map of farm dams

Attachment 2 – Map of farm dams

(Source: Orica Tocumwal Emergency Plan 2023 Rev16)



Appendix C

Aircraft exclusion zone

Advisory Notice

NSW Fire Services

Fire Fighting Aircraft

Exclusion Zones Above Explosives Storage Magazines

Rev	Status	Date	Created by	Checked/Passed by	Approved by
0	Issued for Fire Brigade Use	5-3-24	Peter Fuller	Michael Butler	Frank O'Grady

Table of Contents

1. BACKGROUND 2

1.1 TOCUMWAL EXPLOSIVES RESERVE MAGAZINES REPLACEMENT PROJECT 2
1.2 DOCUMENT PURPOSE 2
1.3 ADVICE 2
1.4 SUMMARY 3

1. Background

1.1 Tocumwal Explosives Reserve Magazines Replacement Project

During the development of the State Significant Development (SSD) application for the replacement magazines project at the Orica Tocumwal Explosives Reserve the Fire Services of New South Wales (NSW), namely the NSW Fire and Rescue Service (NSWFR) and the NSW Rural Fire Service (RFS) asked to be advised by Orica about the potential impacts of an under threat magazine creating a danger zone above that magazine for aerial fire fighting apparatus such as fixed wing and rotary wing aircraft.

1.2 Document Purpose

The purpose of this advisory notice is to provide both fire services with some explanatory text and guidance in how to deal with a magazine that is being directly threatened by a fire and what to do regarding procedures for any aerial fire fighting resources in the area of the threatened magazine.

1.3 Advice

Under normal circumstances, due to the very low number of aircraft that are in the vicinity of the storage for very short periods, Orica would not include them in a Quantity-Distance assessment (QD) conducted for the explosives storage facility. Runways or airports are classified differently and are included in QD. More information can be provided on this if required. Note: the QD assessment determines what safety distances apply for the maximum quantity of explosives being stored. Any magazine or storage with explosives in it will be referred to as a potential explosion source (PES).

If there was an emergency where a fire was directly involving the explosives magazines and evacuation occurred, we would recommend the exclusion distances as explained below:

Within the QD assessment there is a category of Protected Works – Class A (PWA). In the above emergency situation, Orica would classify aircraft in the 50% PWA category. This 50% PWA category allows between 20-500 vehicles to pass a PES per 24h period. To incorporate an additional safety factor, given that aircraft have the potential to fall from the sky, we recommend 100% PWA is used. This distance is equivalent to the allowable distance for between 500-10,000 vehicles per day to pass a PES. At this distance, the possibility of shrapnel or debris is small. The pressure wave at this distance may be noticeable, but it is not likely to cause major damage to the aircraft (or vehicle). It is expected that turbulence would be greater than the impact of the overpressure at this distance. The possibility of EMP (electro magnetic pulse) impact is literally nil as this is expected to diminish at very close distances to the PES (in the range of 50-100m or less).

The simplest way to convert the QD distance to a 3D exclusion shape would be to make it a half-sphere shape around the PES and use the PWA distance as the height and radius. This exclusion zone would be conservative, but also the easiest to calculate and potentially to implement.

It is more difficult to determine exclusion distances where there is a fire away from the magazines. Orica has a strict " do not fight a fire, and evacuate" policy for any fire within the "red zone". The red zone is 40m from any PES. Whilst a fire between the PWA distance and the Red Zone distance could be fought, it would depend on the circumstances. The assessment of the appropriate response, including the suitability of different fire-fighting methods, would need to be determined by the fire authority and Orica is able to provide 24 hr specialist advice in this situation.

Orica site leaders will always be working with the rural fire service if there is an emergency and can assist with any questions or concerns that may come up in an emergency scenario.

1.4 Summary

Orica is unable to provide direct instructions to the NSW fire services about the management of their aerial fire fighting assets.
However, if a Orica magazine is ever directly threatened by a fire that will encroach within the 40 metre red zone of a explosives storage magazine, Orica suggests that aerial fire fighting assets be directed not to approach the magazine.
Orica further suggests that if the fire is burning outside of the red zone it would be safe to utilise fire fighting aircraft to aid in extinguishing the fire.
If the situation ever arose that a fire was getting close to an Orica magazine there will be trained Orica personnel in attendance at the event who can be approached for further advice.



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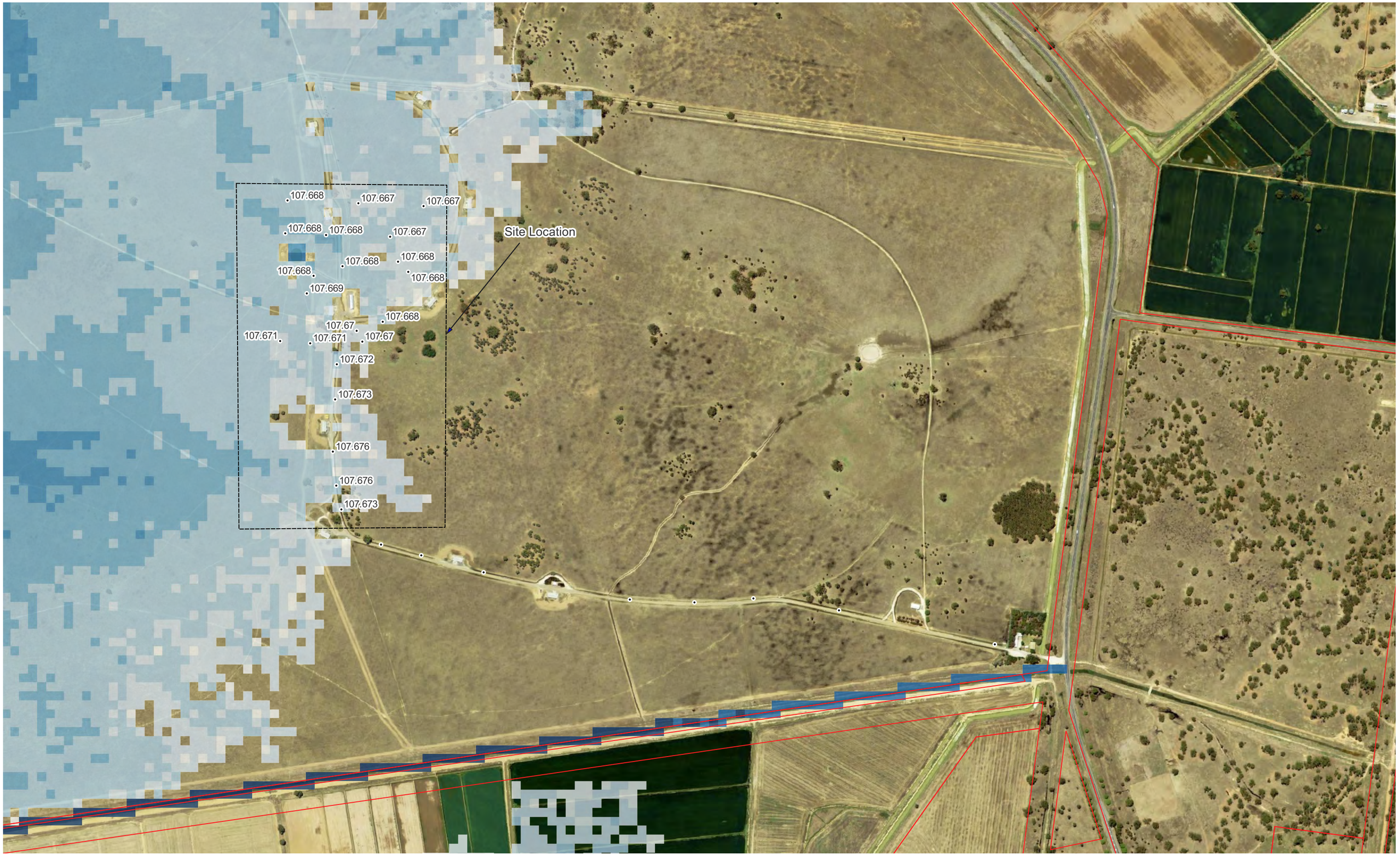
The Power of Commitment

Appendix G

Aboriginal Cultural Heritage Assessment Report, OzArk Environment and Heritage, 2024

Appendix H

Flood Mapping (GHD, 2024)



Scale 7500

Paper Size A3

N

Map projection: Transverse Mecator
Horizontal datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

LEGEND

- Flood Level (mAHD)

Flood Depth (m)
- 0.015
- 0.1
- 0.3
- 0.5
- 1
- 2
- >2

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Orica Tocumwal Magazine Compound Upgrade

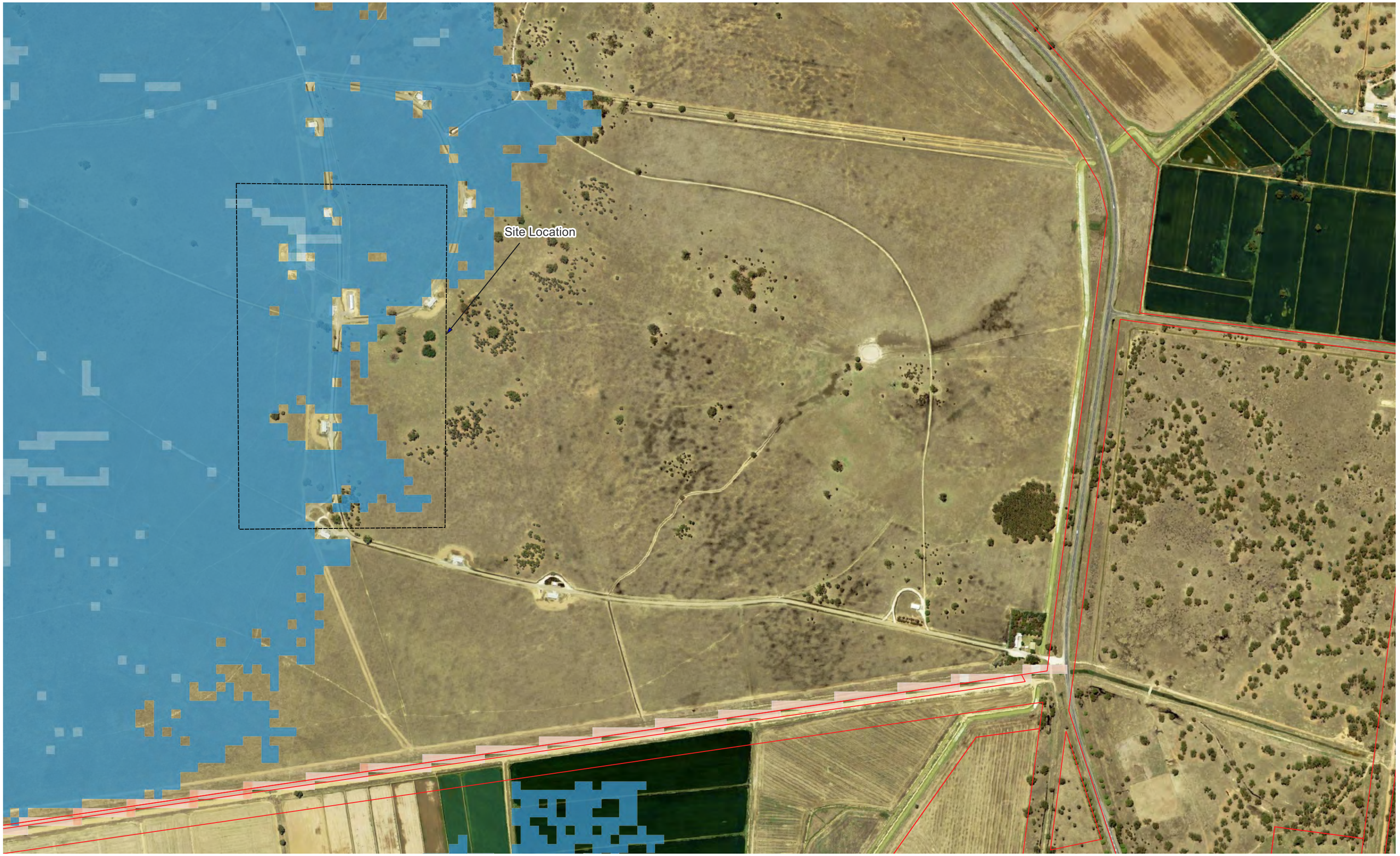
Existing Conditions
1% AEP Flood Depth and Level - Existing

Job Number 12597123
Revision
Date June 2024

Figure L01

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Scale 7500

Paper Size A3

N

Map projection: Transverse Mecator
Horizontal datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

LEGEND

Peak Velocity (m/s)
- <0.1
- 0.1-0.2
- 0.2-0.3
- 0.3-0.4
- 0.4-0.5
- 0.5-1.0
- 1.0-2.0
- 2.0-3.0
- 3.0-5.0
- >5.0

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Orica Tocumwal Magazine Compound Upgrade

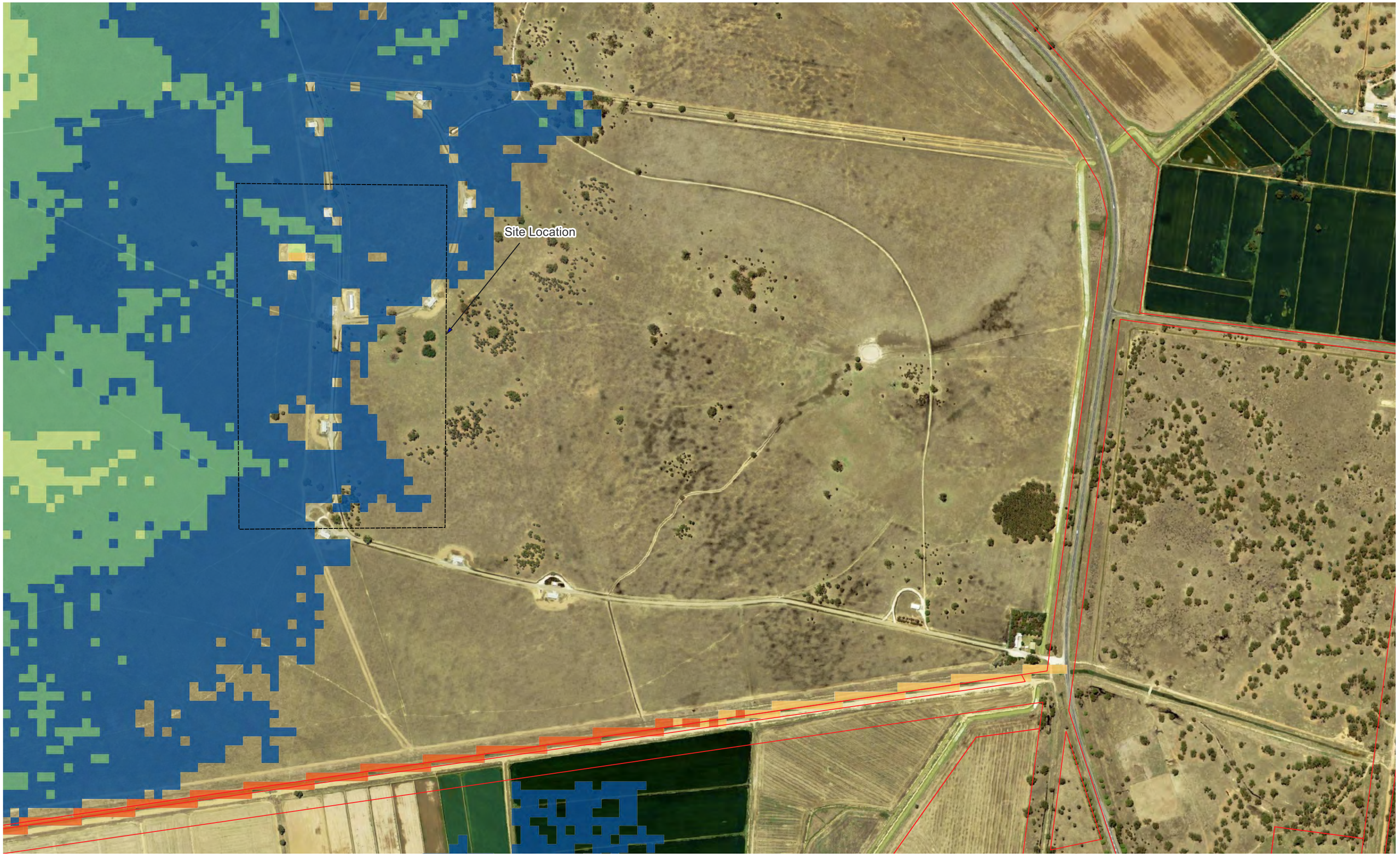
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Date June 2024

Figure L02

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Scale 7500

Paper Size A3

N

Map projection: Transverse Mecator
Horizontal datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

LEGEND
Flood Hazard
- H1 - Relatively benign flow conditions. No vulnerability constraints.
- H2 - Unsafe for small vehicles.
- H3 - Unsafe for all vehicles, children and the elderly.
- H4 - Unsafe for all people and all vehicles.
- H5 - Unsafe for all people and all vehicles. Buildings require special engineering design and construction.
- H6 - Unconditionally dangerous. Not suitable for any type of development or evacuation access. All building types considered vulnerable to failure.

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Orica Tocumwal Magazine Compound Upgrade

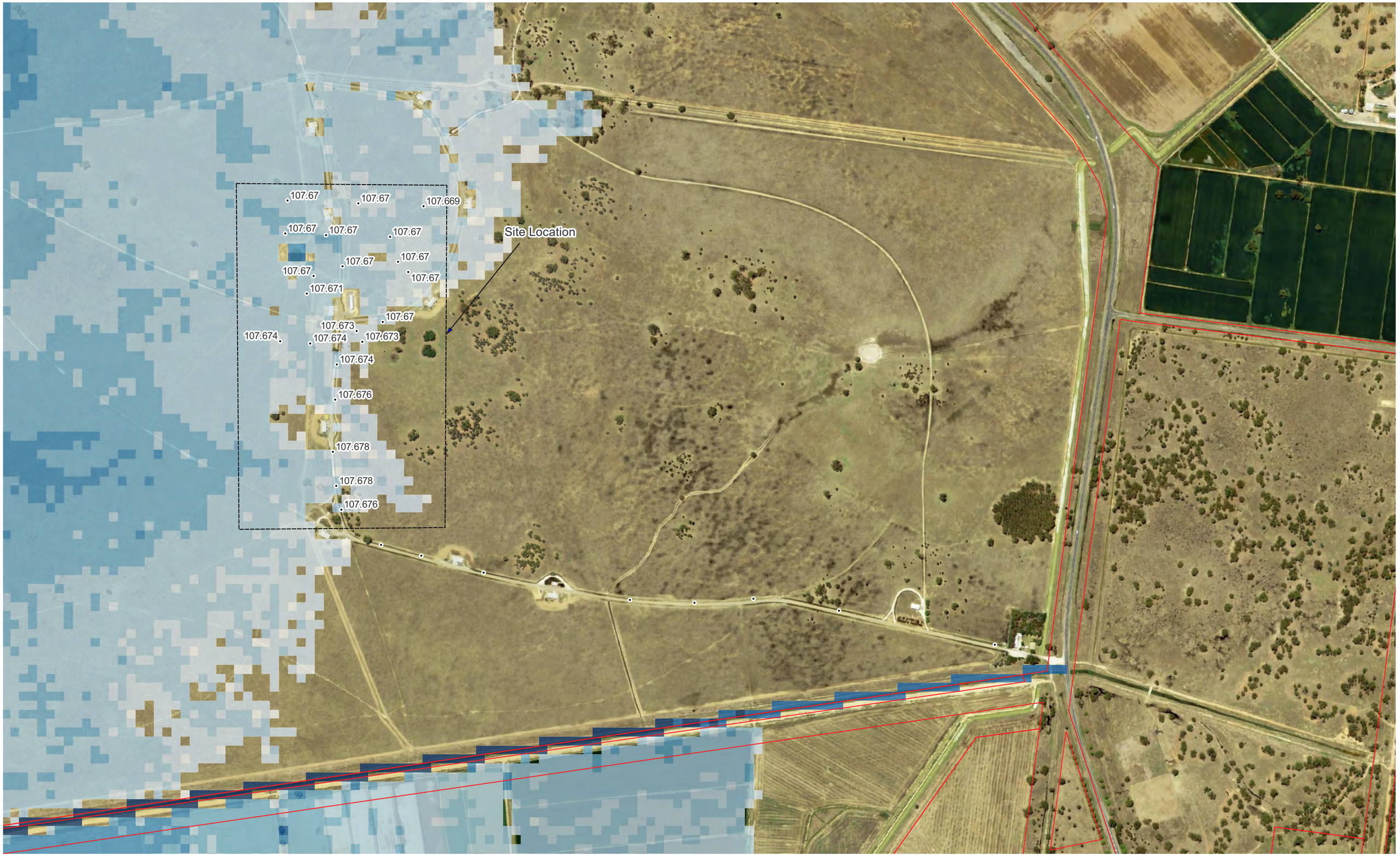
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Job Number	12597123
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Date	June 2024

Figure L03

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Scale 7500

Paper Size A3

N

Map projection: Transverse Mecator
Horizontal datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

LEGEND

- Flood Level (mAHD)

Flood Depth (m)
- 0.015
- 0.1
- 0.3
- 0.5
- 1
- 2
- >2

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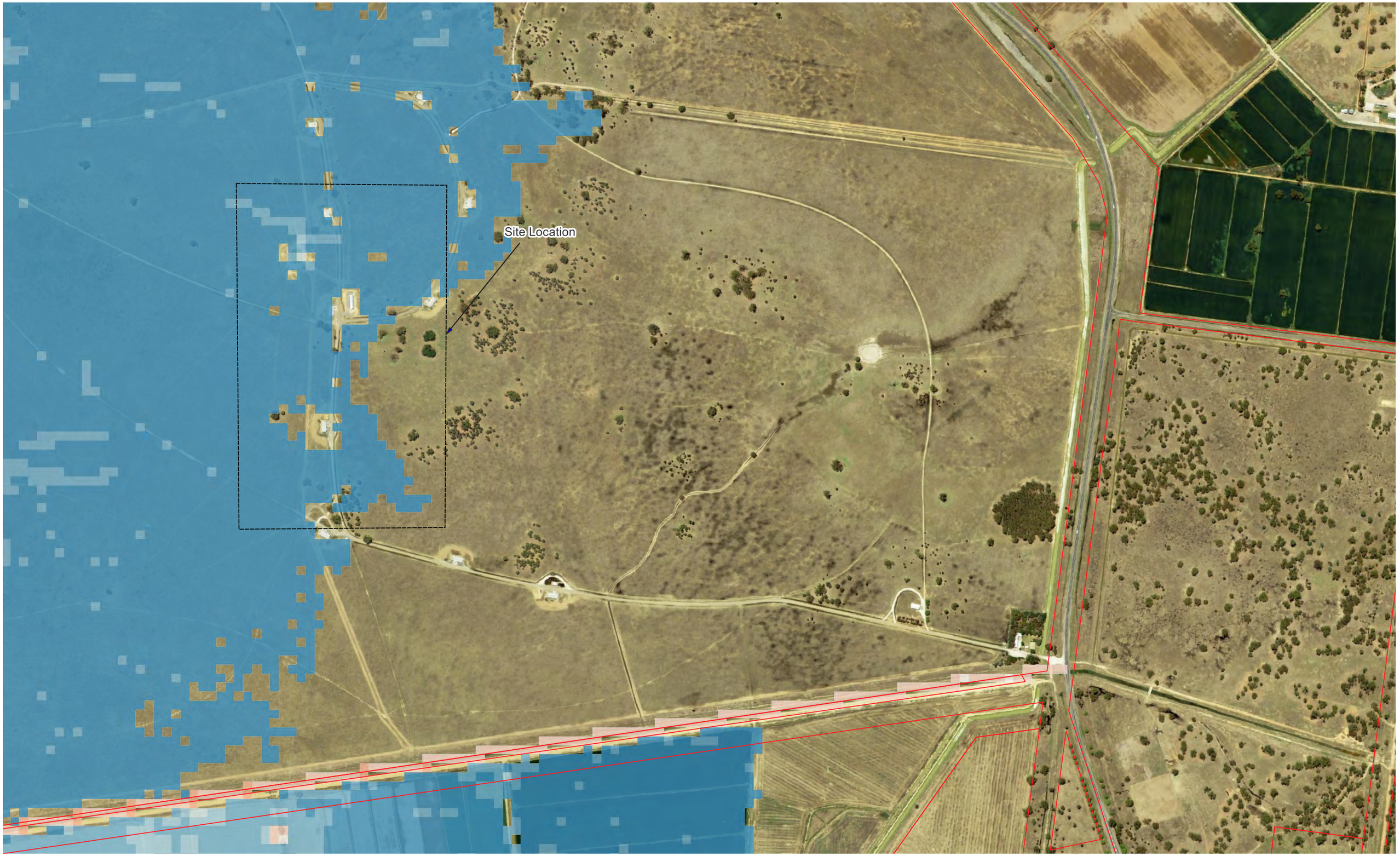
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Figure L04

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Scale 7500

Paper Size A3

N

Map projection: Transverse Mecator
Horizontal datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

LEGEND

Peak Velocity (m/s)
- <0.1
- 0.1-0.2
- 0.2-0.3
- 0.3-0.4
- 0.4-0.5
- 0.5-1.0
- 1.0-2.0
- 2.0-3.0
- 3.0-5.0
- >5.0

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Existing Conditions
0.5% AEP Peak Velocity - Existing

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Figure L05

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Site Location

Scale 7500

Paper Size A3

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Map projection: Transverse Mecator
Horizontal datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

LEGEND
Flood Hazard
- H1 - Relatively benign flow conditions. No vulnerability constraints.
- H2 - Unsafe for small vehicles.
- H3 - Unsafe for all vehicles, children and the elderly.
- H4 - Unsafe for all people and all vehicles.
- H5 - Unsafe for all people and all vehicles. Buildings require special engineering design and construction.
- H6 - Unconditionally dangerous. Not suitable for any type of development or evacuation access. All building types considered vulnerable to failure.

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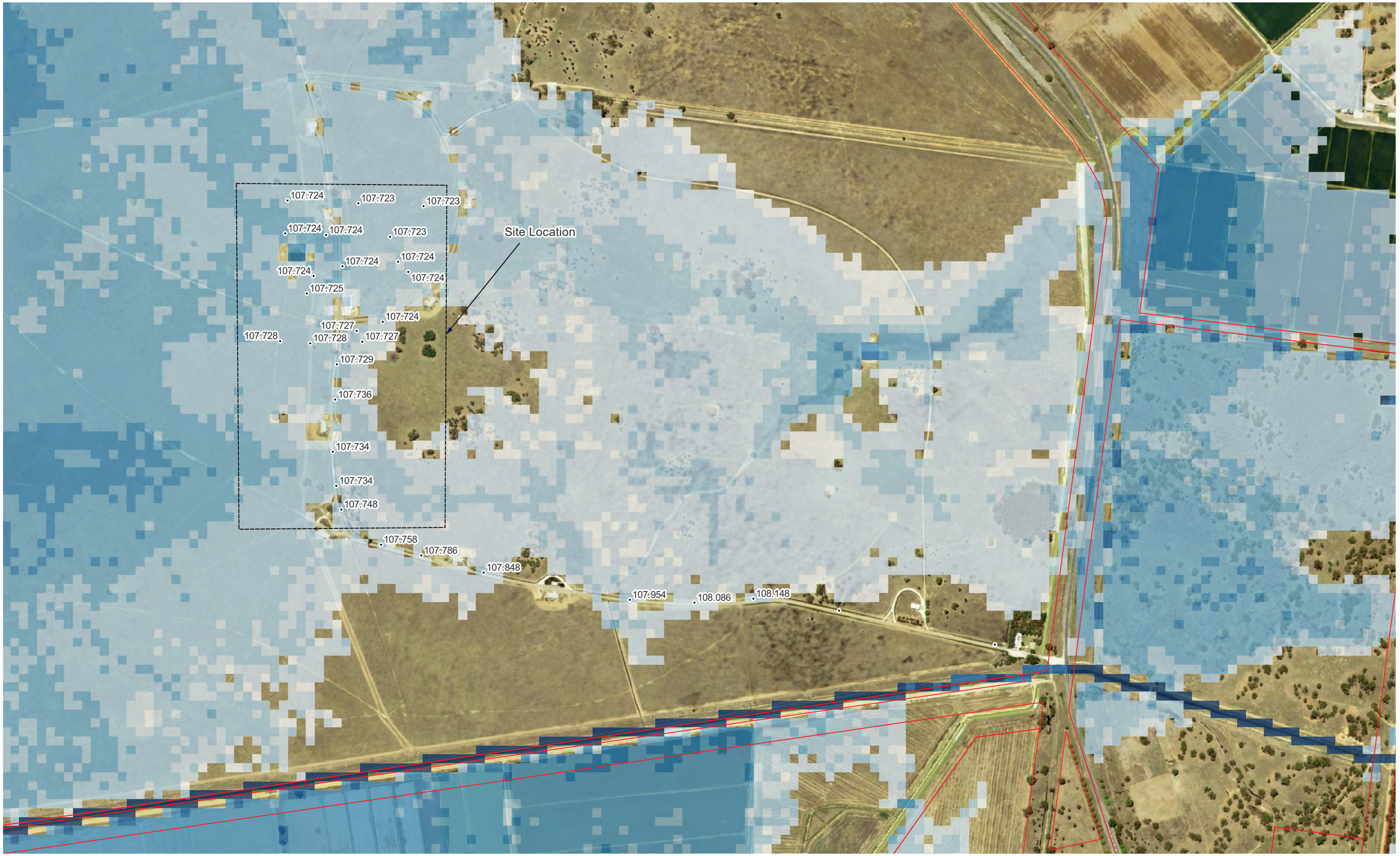
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Date	June 2024

Figure L06

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Scale 7500

Paper Size A3

N

Map projection: Transverse Mecator
Horizontal datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

LEGEND

- Flood Level (mAHD)

Flood Depth (m)

- 0.015
- 0.1
- 0.3
- 0.5
- 1
- 2
- >2

Orica Australia Pty Ltd
Orica Tocumwal Magazine Compound Upgrade

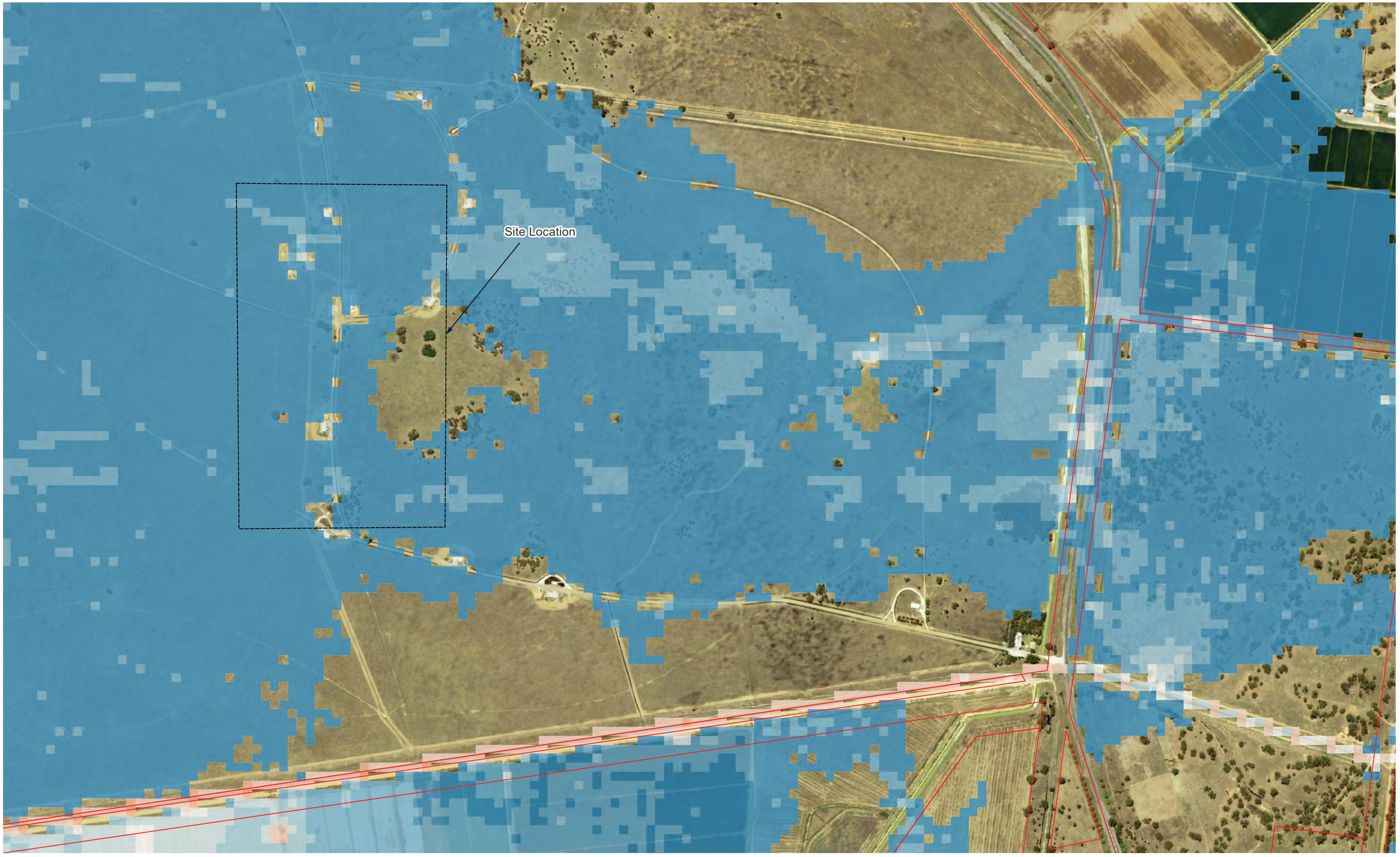
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Figure L07

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Scale 7500

Paper Size A3

N

Map projection: Transverse Mecator
Horizontal datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

LEGEND

Peak Velocity (m/s)
- <0.1
- 0.1-0.2
- 0.2-0.3
- 0.3-0.4
- 0.4-0.5
- 0.5-1.0
- 1.0-2.0
- 2.0-3.0
- 3.0-5.0
- >5.0

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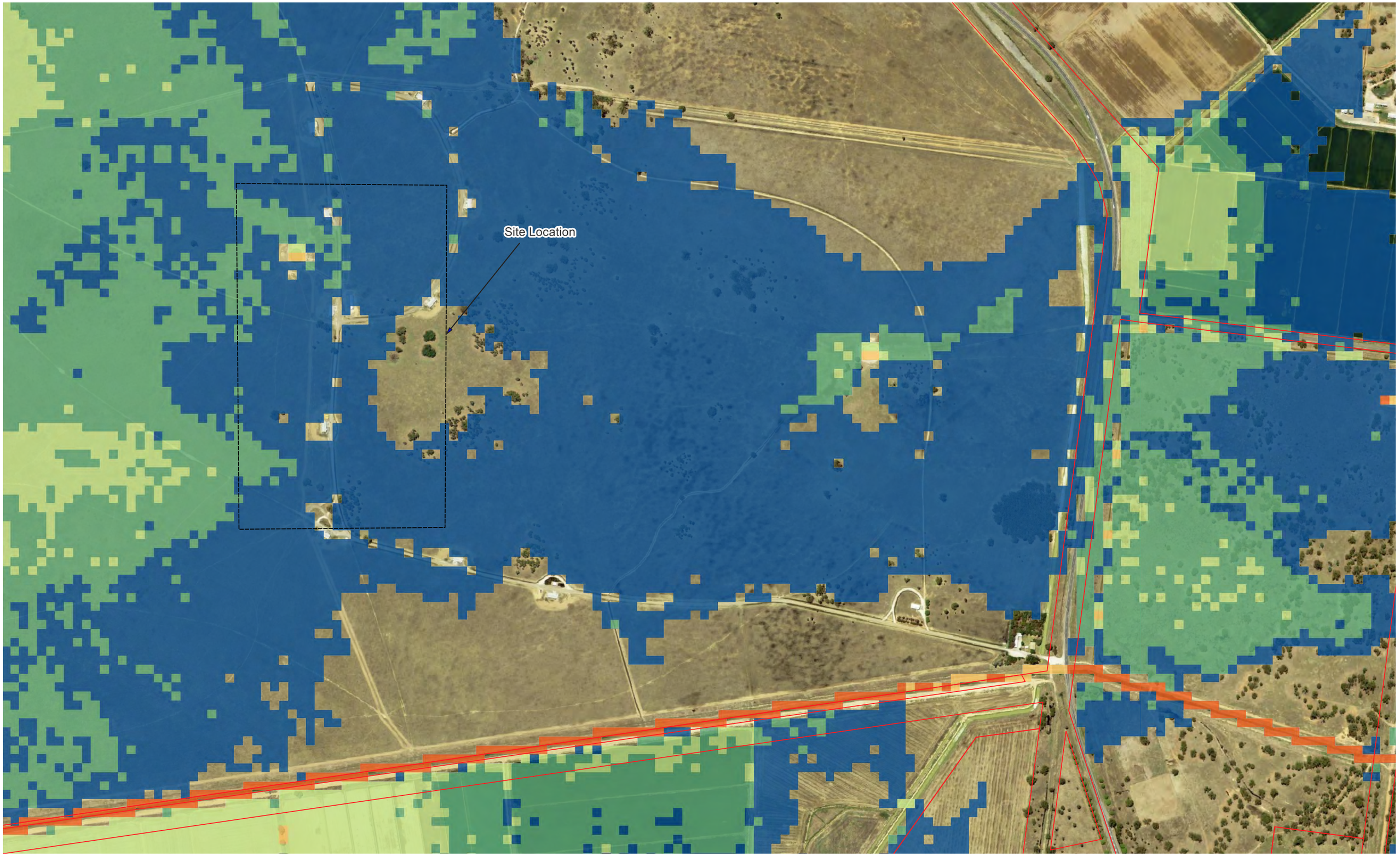
Existing Conditions
0.2% AEP Peak Velocity - Existing

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Figure L08

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Scale 7500

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N

Map projection: Transverse Mecator
Horizontal datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

LEGEND
Flood Hazard
- H1 - Relatively benign flow conditions. No vulnerability constraints.
- H2 - Unsafe for small vehicles.
- H3 - Unsafe for all vehicles, children and the elderly.
- H4 - Unsafe for all people and all vehicles.
- H5 - Unsafe for all people and all vehicles. Buildings require special engineering design and construction.
- H6 - Unconditionally dangerous. Not suitable for any type of development or evacuation access. All building types considered vulnerable to failure.

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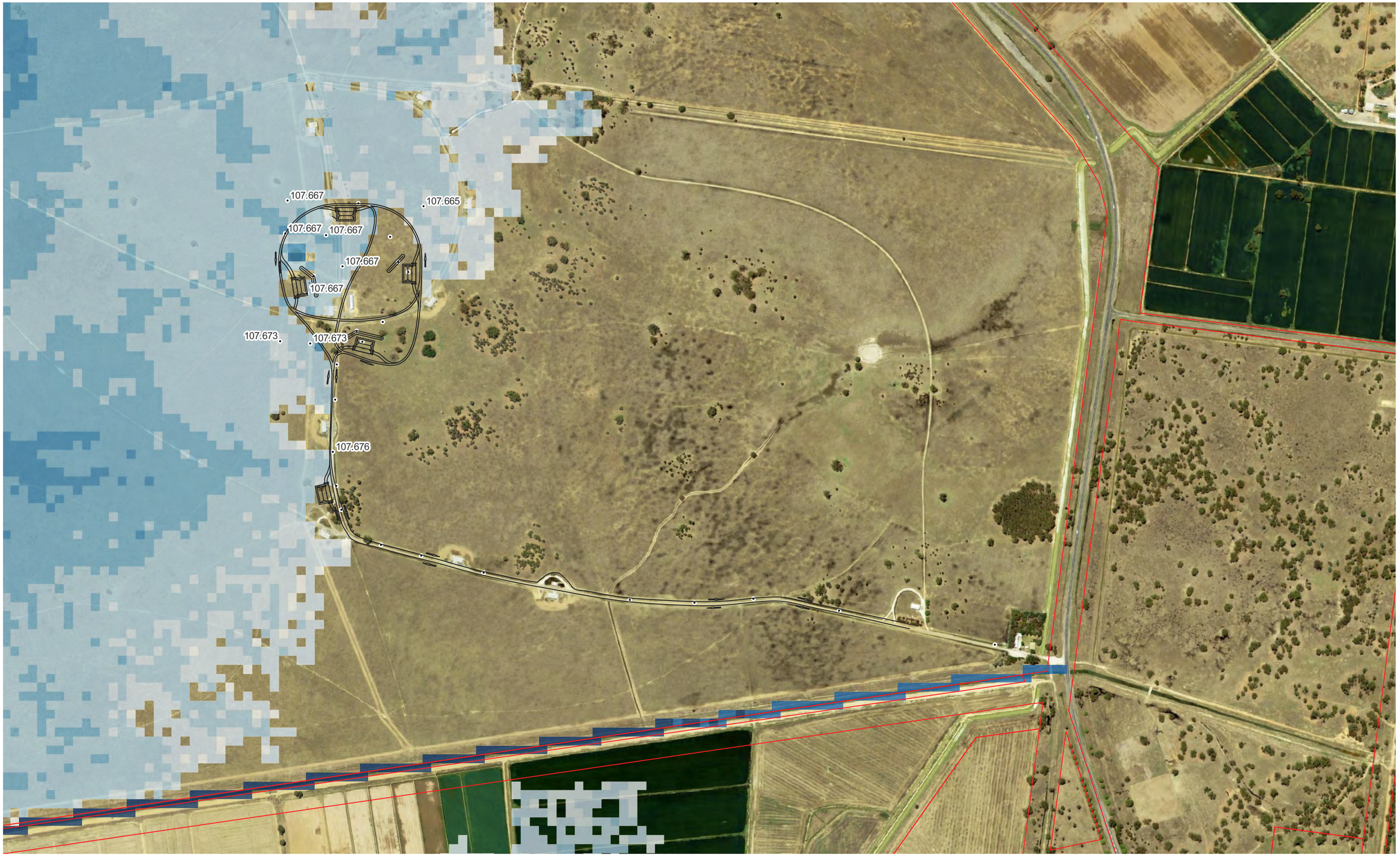
Existing Conditions
0.2% AEP Flood Hazard - Existing

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Figure L09

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Scale 7500

Paper Size A3

N

Map projection: Transverse Mecator
Horizontal datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

LEGEND

- Flood Level (mAHD)

Flood Depth (m)
- 0.015
- 0.1
- 0.3
- 0.5
- 1
- 2
- >2

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Design Conditions
1% AEP Flood Depth and Level - Design

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Figure L10

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Paper Size A3

N

Map projection: Transverse Mecator
Horizontal datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

LEGEND

Peak Velocity (m/s)

- <0.1
- 0.1-0.2
- 0.2-0.3
- 0.3-0.4
- 0.4-0.5
- 0.5-1.0
- 1.0-2.0
- 2.0-3.0
- 3.0-5.0
- >5.0

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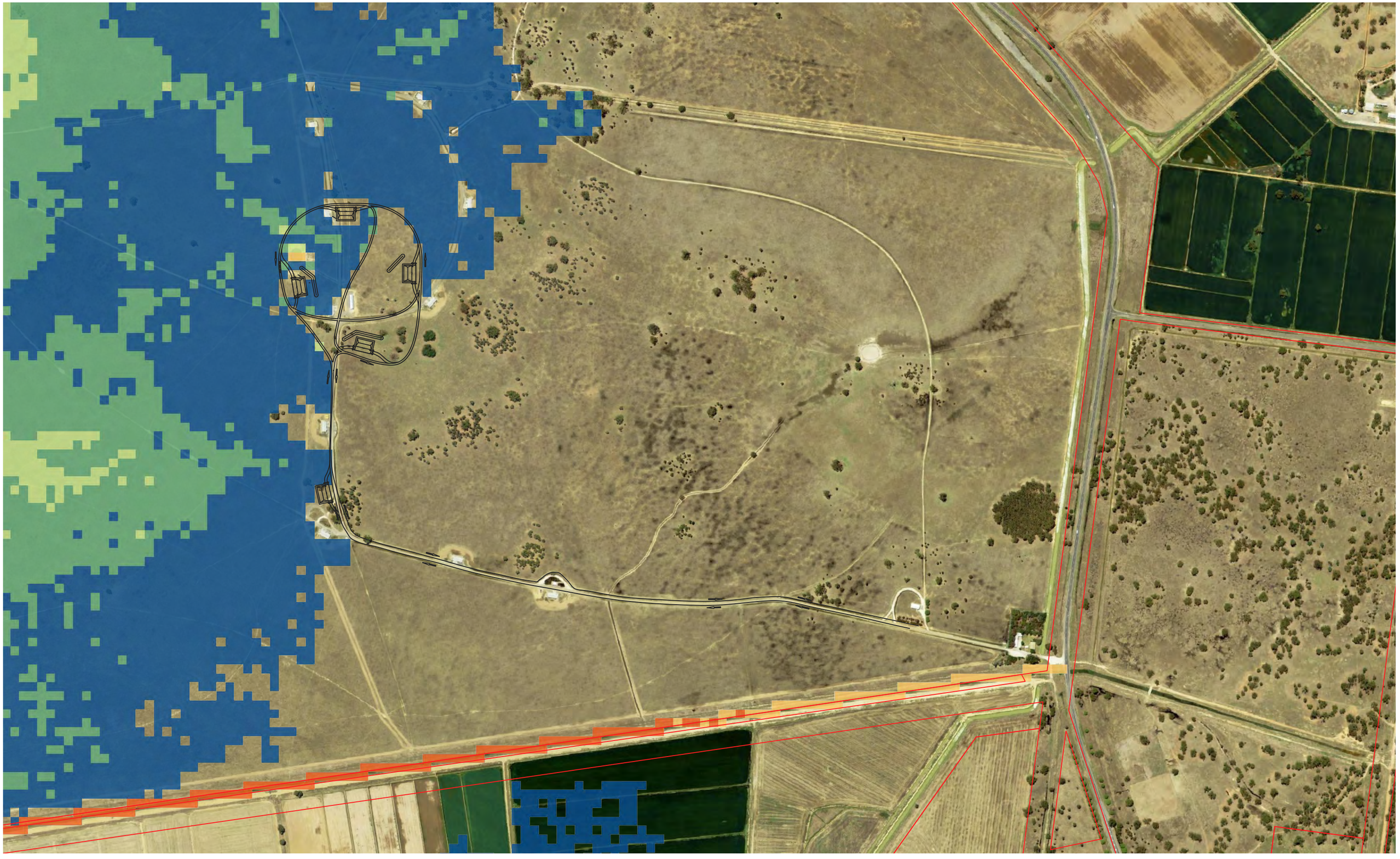
Design Conditions
1% AEP Peak Velocity - Design

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Revision
Date June 2024

Figure L11

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Scale 7500

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N

Map projection: Transverse Mecator
Horizontal datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

LEGEND
Flood Hazard

- H1 - Relatively benign flow conditions. No vulnerability constraints.
- H2 - Unsafe for small vehicles.
- H3 - Unsafe for all vehicles, children and the elderly.
- H4 - Unsafe for all people and all vehicles.
- H5 - Unsafe for all people and all vehicles. Buildings require special engineering design and construction.
- H6 - Unconditionally dangerous. Not suitable for any type of development or evacuation access. All building types considered vulnerable to failure.

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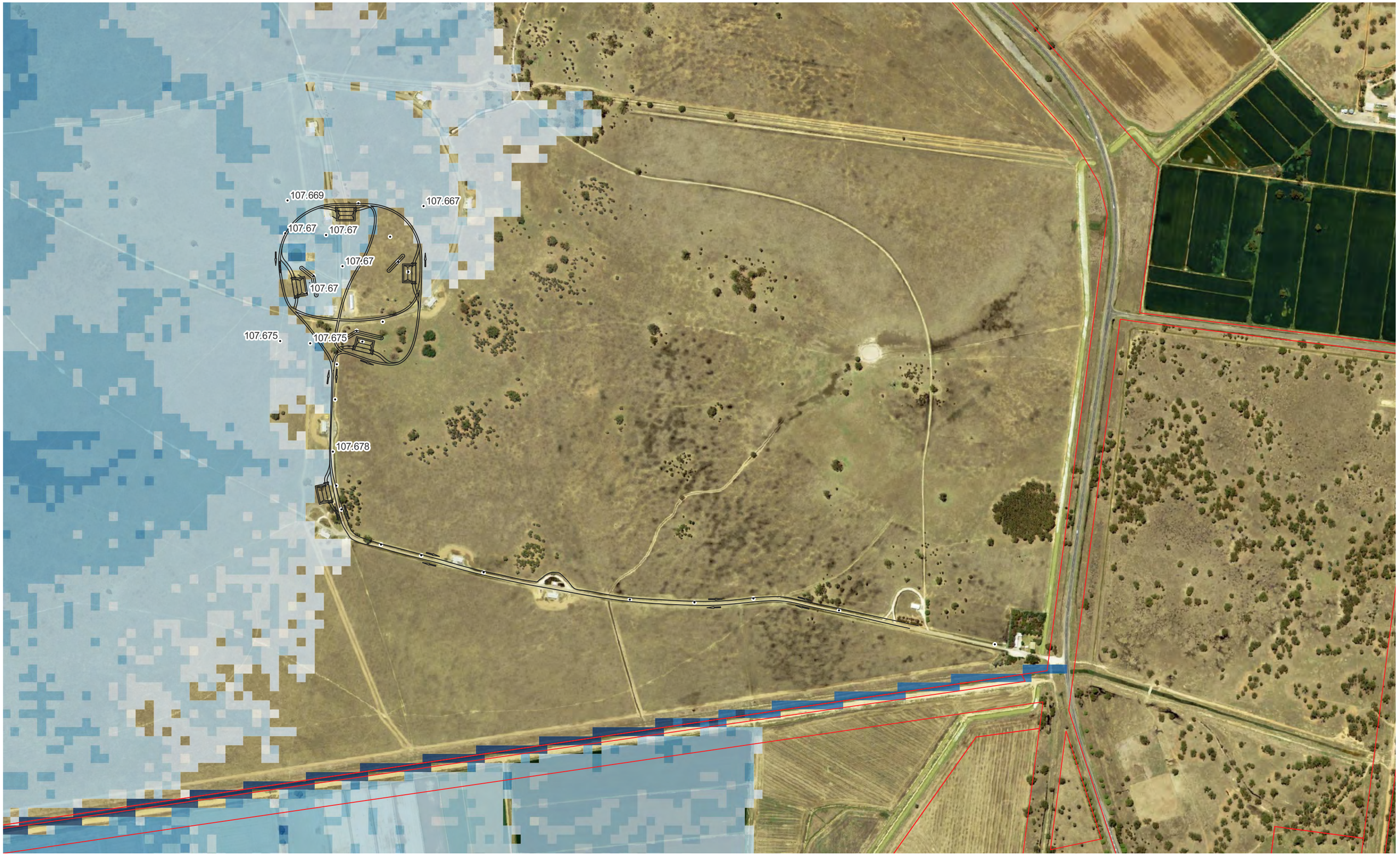
Design Conditions
1% AEP Flood Hazard - Design

Job Number	12597123
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Figure L12

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N

Map projection: Transverse Mecator
Horizontal datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

LEGEND

- Flood Level (mAHD)

Flood Depth (m)
- 0.015
- 0.1
- 0.3
- 0.5
- 1
- 2
- >2

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Design Conditions
0.5% AEP Flood Depth and Level - Design

Job Number 12597123
Revision
Date June 2024

Figure L13

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N

Map projection: Transverse Mecator
Horizontal datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

LEGEND

Peak Velocity (m/s)
- <0.1
- 0.1-0.2
- 0.2-0.3
- 0.3-0.4
- 0.4-0.5
- 0.5-1.0
- 1.0-2.0
- 2.0-3.0
- 3.0-5.0
- >5.0

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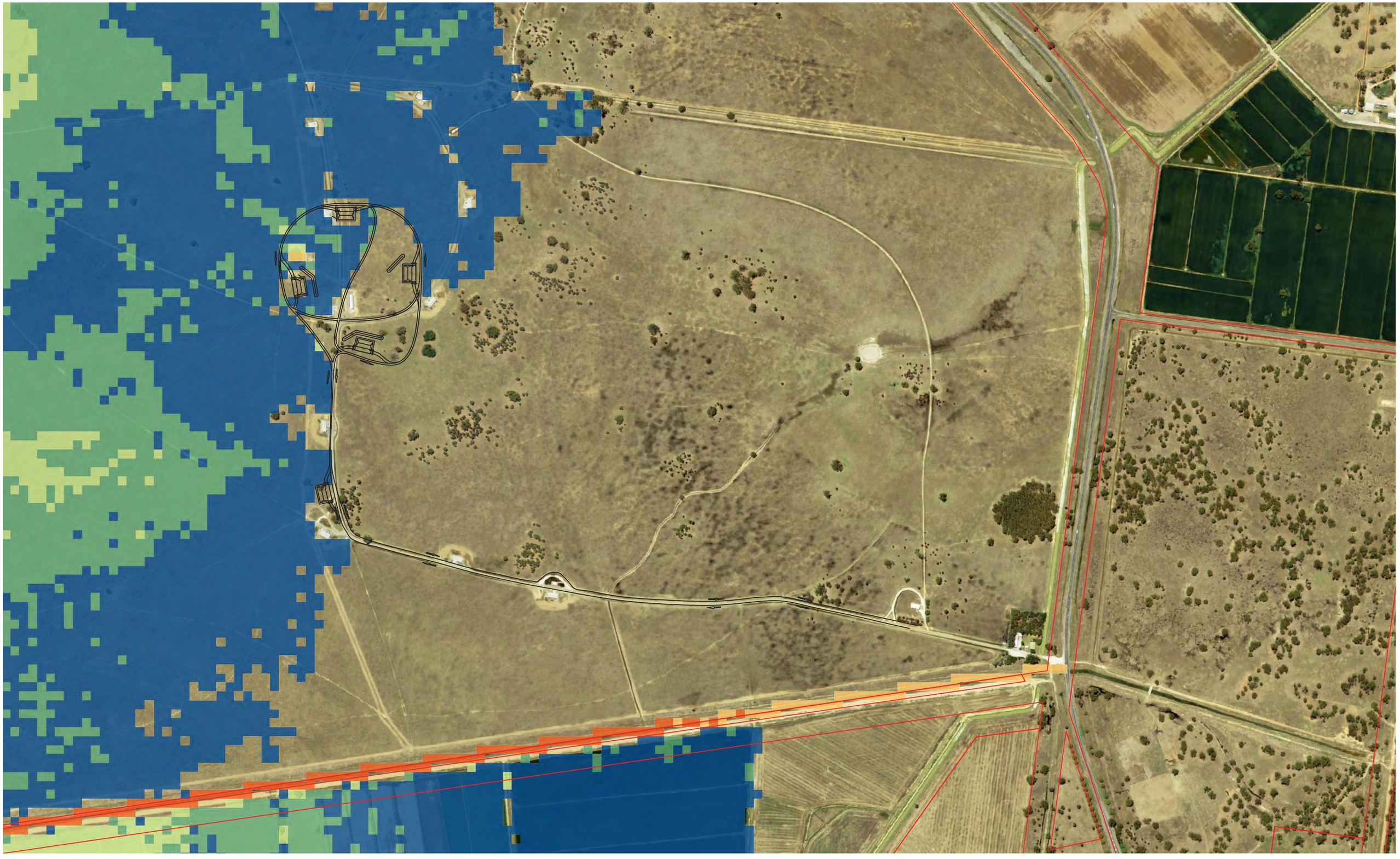
Design Conditions
0.5% AEP Peak Velocity - Design

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Figure L14

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N

Map projection: Transverse Mecator
Horizontal datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

LEGEND
Flood Hazard
- H1 - Relatively benign flow conditions. No vulnerability constraints.
- H2 - Unsafe for small vehicles.
- H3 - Unsafe for all vehicles, children and the elderly.
- H4 - Unsafe for all people and all vehicles.
- H5 - Unsafe for all people and all vehicles. Buildings require special engineering design and construction.
- H6 - Unconditionally dangerous. Not suitable for any type of development or evacuation access. All building types considered vulnerable to failure.

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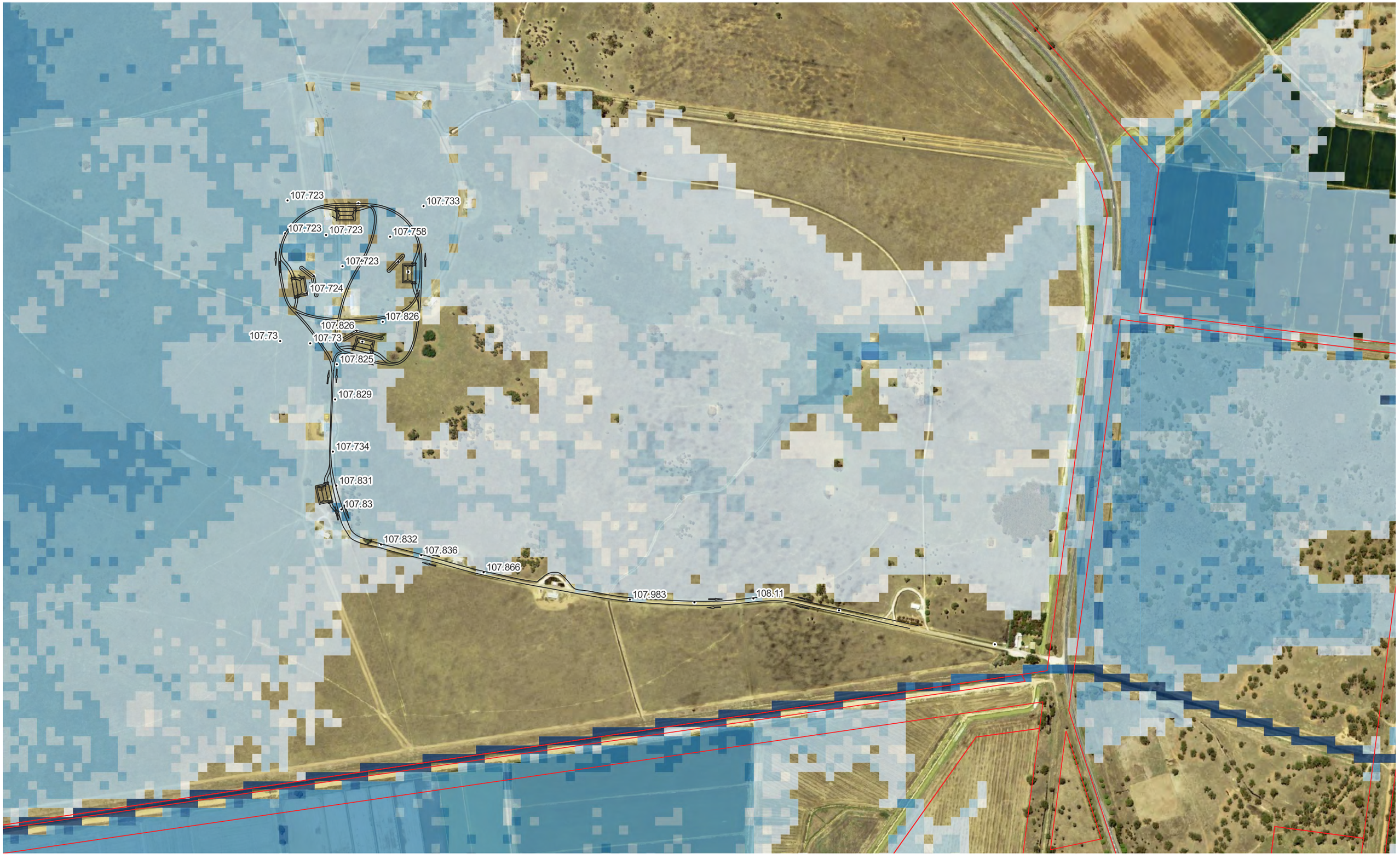
Design Conditions
0.5% AEP Flood Hazard - Design

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Figure L15

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Scale 7500

Paper Size A3

N

Map projection: Transverse Mecator
Horizontal datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

LEGEND

- Flood Level (mAHD)

Flood Depth (m)
- 0.015
- 0.1
- 0.3
- 0.5
- 1
- 2
- >2

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Design Conditions
0.2% AEP Flood Depth and Level - Design

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Figure L16

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Scale 7500

Paper Size A3

N

Map projection: Transverse Mecator
Horizontal datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

LEGEND

Peak Velocity (m/s)
- <0.1
- 0.1-0.2
- 0.2-0.3
- 0.3-0.4
- 0.4-0.5
- 0.5-1.0
- 1.0-2.0
- 2.0-3.0
- 3.0-5.0
- >5.0

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Design Conditions
0.2% AEP Peak Velocity - Design

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Figure L17

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Scale 7500

Paper Size A3

N

Map projection: Transverse Mecator
Horizontal datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

LEGEND
Flood Hazard
- H1 - Relatively benign flow conditions. No vulnerability constraints.
- H2 - Unsafe for small vehicles.
- H3 - Unsafe for all vehicles, children and the elderly.
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- H6 - Unconditionally dangerous. Not suitable for any type of development or evacuation access. All building types considered vulnerable to failure.

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Design Conditions
0.2% AEP Flood Hazard - Design

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Figure L18

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Scale 7500

Paper Size A3

N

Map projection: Transverse Mecator
Horizontal datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

LEGEND

Flood Afflux (m)
- na
- < -2.0
- -2.0 to -1.0
- -1.0 to -0.5
- -0.5 to -0.1
- -0.1 to -0.05
- -0.05 to -0.01
- -0.01 to 0
- 0 to 0.01
- 0.01 to 0.05
- 0.05 to 0.1
- 0.1 to 0.5
- 0.5 to 1.0
- 1.0 to 2.0
- 2.0 to 5.0
- grt 5.0

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Design Conditions
1% AEP Flood Impact

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Figure L19

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Scale 7500

Paper Size A3

N

Map projection: Transverse Mecator
Horizontal datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

LEGEND

Flood Afflux (m)
- na
- < -2.0
- -2.0 to -1.0
- -1.0 to -0.5
- -0.5 to -0.1
- -0.1 to -0.05
- -0.05 to -0.01
- -0.01 to 0
- 0 to 0.01
- 0.01 to 0.05
- 0.05 to 0.1
- 0.1 to 0.5
- 0.5 to 1.0
- 1.0 to 2.0
- 2.0 to 5.0
- grt 5.0

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Design Conditions
0.5% AEP Flood Impact

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Figure L20

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Scale 7500

Paper Size A3

N

Map projection: Transverse Mecator
Horizontal datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

LEGEND

Flood Afflux (m)
- na
- < -2.0
- -2.0 to -1.0
- -1.0 to -0.5
- -0.5 to -0.1
- -0.1 to -0.05
- -0.05 to -0.01
- -0.01 to 0
- 0 to 0.01
- 0.01 to 0.05
- 0.05 to 0.1
- 0.1 to 0.5
- 0.5 to 1.0
- 1.0 to 2.0
- 2.0 to 5.0
- grt 5.0

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Design Conditions
0.2% AEP Flood Impact

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Figure L21

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Appendix I

Preliminary Site Investigation, GHD 2024

Preliminary Site Investigation

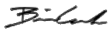
Orica Tocumwal Magazine Compound Upgrade

Orica Australia Pty Ltd

13 September 2024

→ The Power of Commitment



Project name		Orica Tocumwal Magazine Compound Upgrade					
Document title		Preliminary Site Investigation | Orica Tocumwal Magazine Compound Upgrade					
Project number		12597123					
File name							
Status Code	**Revision**	**Author**	**Reviewer**		**Approved for issue**		
			Name	**Signature**	**Name**	**Signature**	**Date**
S4	0	M. Veciana	B. Cork		S. Lawer		13/09/24

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Executive summary

Orica Australia Pty Ltd (Orica) is proposing to redevelop the Tocumwal Explosives Reserve magazines ("the project") to bring the storage of explosives at the Tocumwal site (Lot 2, DP 225459, 431 Newell Highway, Tocumwal, NSW, 2714) in line with *AS2187 Australian Standards Explosives - Storage, Transport and Use*. To achieve this, Orica proposes to build four new 250 tonne (t)HE magazines and a new detonator magazine in new locations on the existing site. Earthen blast mounds are proposed in front of three of the proposed 250t HE magazines to prevent sympathetic detonation. Construction activities for the project will include site clearing, establishing hardstands and concrete slabs, magazine construction and construction of sealed access roads to each of the magazines.

As part of the Environmental Impact Statement (EIS) for the project, GHD has been engaged to undertake a preliminary site investigation (PSI) for potential soil and groundwater contamination.

The scope of work for the PSI comprised:

– A site history review including a review of current and historical aerial photographs, a review of EPA notices under the *Contaminated Land Management Act 1997* and other publicly available information.
– A review of previous investigations pertaining to the site including the project area, and any other information held by Orica.
– A review of geology, hydrology, hydrogeology and topography information for the site including the project area.
– Completion of a site inspection of the site and project area to identify areas of potential contamination, documenting and mapping important features, and confirming features identified in the desktop review.
– Preparation of this report with reference to the *Guideline for Consultants Reporting on Contaminated Sites* (NSW EPA, 2020).

Key information from the desktop review from searches of publicly available databases and information provided by Orica included the following:

– The site has been used for storage and distribution of explosives since at least 1943, with the existing magazines constructed in 1956.
– The immediate surrounding area is mainly used for agricultural production.
– No NSW EPA contaminated land records/notices were reported for the site.
– No previous contaminated soil or groundwater reports were provided for the site.
– Historical mining (thorium and uranium) and exploration (petroleum) titles were identified for the site; however, no obvious evidence of mining or petroleum exploration was observed on-site from the aerial photo review.
– Based on information provided by Orica and site inspections conducted by GHD, the following potential sources of contamination were noted:

  <u>Within the project area:</u>

  - Explosives currently stored onsite.
  - Leaks and spills associated with use of the diesel above ground storage tank (AST).
  - Leaks and spills during vehicle use and maintenance activities.
  - Potential contamination associated with materials sourced from the former sand mine area used in the earthen blast mounds outside of Magazine 6.
  - Contamination associated with the potential use of pesticides and fertilizers onsite.

  <u>On-site but outside of the project area:</u>

  - Containment cell which was used as a remediation site for contaminated soils resulting from an offsite detonator disposal area.
  - Areas of historical burning of explosives located within the fenced area of the containment cell.
  - Operation of the former sand mine/quarry in the northern portion of the site.
  - Disposal of uncontrolled wastes in the former sand mine area (timber, scrap metal, etc).

- Potential asbestos contamination from demolition of former site buildings.
- Fill and imported materials from unknown sources used in the containment cell and sand mine.

The assessment identified that there is a low potential for contamination to be present within the project area.

– The potential impacts of contamination to human health and the environmental during construction and future operation of the project is considered to be low with the only potentially complete source-pathway-receptor linkages during construction of the project relate to soil potentially impacted from spills from storage, spillage or leakage of fuels / oils in the vicinity of the diesel AST.
– During operation of the proposal, it is understood that all fuels and explosive materials will be stored undercover in buildings to prevent any unintended runoff of hazardous materials occurring. Given that this will occur under the implementation of Construction Environmental Management Plans (CEMPs) and Soil and Water Management Plans (SWMPs), the operation of the project is not anticipated to result in soil or groundwater contamination.

To mitigate potential exposure to soil or groundwater contamination it is recommended that:

– The soil in the vicinity of the diesel AST be further assessed if it is to be disturbed.
– The CEMP for the project includes an ‘unexpected finds protocol’, to manage any potential impacts associated with the disturbance of potentially contaminated soils (if encountered) during works of the project. The CEMP is to include actions to cease work on discovery, test suspected contaminated material, and safely store, treat, and dispose of the material as relevant.

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1. Introduction

Orica Australia Pty Ltd (Orica) is proposing to redevelop the Tocumwal Explosives Reserve magazines ("the project") to bring the storage of explosives at the Tocumwal site (Lot 2, DP 225459, 431 Newell Highway, Tocumwal, NSW, 2714) in line with *AS2187 Australian Standards Explosives - Storage, Transport and Use*. To achieve this, Orica proposes to build four new 250 tonne (t)HE magazines and a new detonator magazine in new locations on the existing site. Earthen blast mounds are proposed in front of three of the proposed 250t HE magazines to prevent sympathetic detonation. Construction activities for the project will include site clearing, establishing hardstands and concrete slabs, magazine construction and construction of sealed access roads to each of the magazines.

As part of the Environmental Impact Statement (EIS) for the project, GHD has been engaged to undertake a preliminary site investigation (PSI) for potential soil and groundwater contamination.

The Secretary of the Department of Planning and Environment's environmental assessment requirements (SEARs) for the project state that the EIS must include a site contamination assessment in accordance with the *Managing Land Contamination Planning Guidelines: SEPP 55 – Remediation of Land* (DUAP, 1998), including:

– Characterisation of the nature and extent of any contamination on the site and surrounding area.
– A Remedial Action Plan, if required.

1.1 Objectives

The objectives of this PSI were to:

– Undertake a contamination assessment to address the requirements of the SEARs for the project
– Assess the potential risk to human health and/or the environment from potential soil or groundwater contamination that may exist as a result of past and/or present site uses of the project area.
– Assess the potential impacts on soil and groundwater (via contamination) of the project.
– Provide recommendations as to the requirement for further investigation, remediation and/or management of potential soil or groundwater contamination (if identified) in the project area.

This PSI was undertaken to inform the EIS and is to be read in conjunction with that report.

1.2 Scope of work

The scope of work completed during this PSI included:

– A site history review including a review of current and historical aerial photographs, a review of EPA notices under the *Contaminated Land Management Act 1997* and other publicly available information.
– A review of previous investigations pertaining to the site including the project area, and any other information held by Orica.
– A review of geology, hydrology, hydrogeology and topography information for the site including the project area.
– Inspection of the site and project area to identify areas of potential contamination, documenting and mapping important features, and confirming features identified in the desktop review.
– Preparation of this report with reference to the *Guideline for Consultants Reporting on Contaminated Sites* (NSW EPA, 2020).

The assessment was limited to a review of desktop information and site inspection and did not include sampling of soils, groundwater, sediments or surface water. Planning certificates and historical titles were not included in this review.

2. Site information

2.1 Site identification

A summary of identification details for the site are provided in Table 2.1. The site location is shown on Figure 1 in Appendix A. The 'project area' is within the site and includes the area around each proposed magazine and access road where development is proposed.

Table 2.1 Site identification summary

Information	Details
Street address/location	431 Newell Highway, Tocumwal, NSW, 2714
Lot and deposited plan (DP) number	Lot 2, DP 225459
Site area	750 hectares (ha)
Local Government Area (LGA)	Berrigan Shire
Land Use Zoning	RU1 Primary Production under Berrigan Local Environment Plan (LEP) 2013
Current site use	The site is currently used as a storage and distribution facility for explosives for the mining and quarrying sector. A portion of the site is also currently used as grazing land for sheep and cattle under a leasing agreement.
Proposed Land Use	The site will continue to operate under its current land use but the existing magazines will be redeveloped to be compliant with *AS2187 Australian Standards Explosives – Storage, Transport and Use*.
Surrounding land use	North – Newell Highway (adjacent), agricultural lands South – Lalalty Channel (adjacent), agricultural lands East – Tocumwal No. 6 Canal Drain (southeast boundary), Newell Highway (eastern boundary, agricultural land West – rural / residential and agricultural land

2.2 Site observations

A GHD environmental scientist completed a site inspection on 20 April 2023. The main features observed at the Site during the walkover are summarised in Table 2.2 with reference to Figure 1 as presented Appendix A and photograph log provided in Appendix B.

Table 2.2 Site inspection summary

Item	Site conditions
Site access and conditions	The site has two entrances from Newell Highway (A39) located at the southeastern and northern corners of the site complex. Located at the southeastern corner of the site are the office buildings which were constructed in 2020 (Photograph 1). The current ten magazines onsite are accessible via internal gravel access roads (Photograph 2). The site is fenced, flat land with open cleared areas and patches of woodland. A portion of the site is being used for sheep and cattle grazing (Photograph 3).

Item	Site conditions
Site buildings and infrastructure	Based on the site inspection conducted and information from the Scoping Report (GHD, 2023), the site currently contains: – Office and amenities that accommodates five personnel. The new site office was constructed in 2020 (Photograph 4). – Ten licensed explosives magazines, consisting of nine magazines that hold Division 1.1D products and one magazine that holds Division 1.1B, 1.4B and 1.4S products. The existing magazines are corrugated steel sheet clad buildings and surrounded with security fencing (Photograph 5). – Earthen blast mounds that are located outside the Magazine 6 security fence (Photograph 6). – Sheds and shipping containers for storage and blasting accessories and repacking detonators. – A maintenance and general storage shed. – A self-bunded 2000 L diesel aboveground storage tank (AST) located between Magazine 2 and 3 (Photograph 7 and 8). – A sand-mine disposal area with general inert waste. This area can also hold water. – A fenced containment cell area. – Three primary farm dams (Dams 1 to 3) and two informal dams/depressions (Dams 4 to 5) on-site which receive rainfall runoff. – A forklift parking area near Magazine 5. The current site lay-out is presented in Figure 1 of Appendix A.
Ground surface and site drainage	The site is generally flat and unsealed with drainage from east to the west across the site. Localised water logging in one of the site drainage lines was observed (Photograph 12). Surface water flows on the site are controlled by small changes in relief and the irrigation channel (Lalalty Drainage Channel) that traverses the southern portion of the site. The irrigation channel is connected to the nearby farm dams and directs small surface flows to these dams.
Potential sources of contamination	Potential sources of contamination at the site include: *Within the project area:* – Explosives currently stored onsite. – Leaks and spills associated with use of the diesel AST. – Leaks and spills during vehicle use and maintenance activities. – Potential contamination associated with materials sourced from the former sand mine area used in the earthen blast mounds outside of Magazine 6. *On-site but outside the project area:* – Containment cell which was used as a disposal site for contaminated soils resulting from remediation of an offsite detonator disposal area (Photographs 9 to 11). Based on the PSI report (JBS&G 2016) (Section 3.4.1), approximately 195 m^3 of contaminated soil was disposed in the cell between 2001 to 2008. – Historical burning grounds of explosives from a former offsite manufacturing facility located within the fenced area of the containment cell. – Former sand mine in the northern portion of the site which was historically used for local road construction. – Fill and imported materials from unknown sources used in the containment cell and sand mine. – Dumping of uncontrolled wastes in the former sand mine area (timber, scrap metal, etc). – Potential asbestos in the soils in the vicinity of the site offices that may have resulted from demolition of the old office buildings that were confirmed to contain asbestos. – Potential use of pesticides and fertilizers onsite.

2.3 Environmental setting

Table 2.3 provides an overview of the environmental setting of the site based on existing information.

Table 2.3 Site environmental setting

Setting	Site conditions
Topography	The topography of the land at the Tocumwal Explosives Reserve is flat, with elevation varying between 107 to 109 metres Australian Height datum (mAHD) with small changes in relief. (Six Maps, NSW Government, https://maps.six.nsw.gov.au/, accessed 29 November 2023).
Hydrology	Several surface water features are located near the site. Primarily these are manmade channels and canals that form the drainage network of surrounding agricultural land. This network includes: – The Lalalty Channel which is a large irrigation channel and runs along the southern boundary of the project area. – Tocumwal No. 6 Canal Drain located on the southeast boundary of the project area. – The Murray River which is approximately 3.5 km south from the project area. – Five small farm dams within the lot boundary (see Figure 1, Appendix A). Dams 2 and 4 are positioned closest to the proposed magazines. The majority of the site is unsealed with a proportion of the surface water expected to infiltrate into the ground surface while any on-site surface flows are controlled by small changes in relief and irrigation channels that traverse the site. The irrigation channels direct surface flows to the nearby on-site farm dams.
Geology and soils	Reference to the NSW Surface Geology Maps (MinView, NSW Statewide Seamless Geology) indicates that the subsurface geology at the project site by Cenozoic alluvial floodplain deposits (Cz_af) which are composed of silt, very fine to medium-grained lithic to quartz rich sand, clay. Reference to the NSW Australian Soils Classification (MinView, NSW Statewide Seamless Geology) shows that soils in the vicinity of the project site include Red and Brown Sub-plastic Chromosols (CH). Reference to the Acid Sulphate Risk Maps (arcgis.com) shows that the site is not mapped as containing acid sulphate soils (ASS). An examination of the online NSW Naturally Occurring Asbestos (NOA) map (Naturally Occurring Asbestos in NSW (arcgis.com)) shows that the project is not within an area listed as having potential for naturally occurring asbestos.

<table>
<tr><th>Setting</th><th>Site conditions</th></tr>
<tr><td>Hydrogeology and groundwater bore search</td><td>
An examination of the online WaterNSW online database identified 15 registered groundwater bores within 1 km of the project boundary (https://realtimedata.waternsw.com.au/) which are summarised below. One well (GW273107) was reported as a monitoring bore installed by the Office of Water and is used to monitor water levels in the deeper aquifer (approximately 100 meters below ground level (mbgl)) (JBS&G, 2016).

Review of the Australian Groundwater Explorer (BoM, 2018) showed that out of the identified 15 bores, only nine were listed as functional and the rest were listed as status “unknown”. For the functional wells, water bore uses were recorded as domestic, stock, monitoring and farming. Bore depths ranged from 20 mbgl to 131 mbgl. Where detailed, groundwater depths varied between 11 mbgl and 35 mbgl.

For the on-site wells, GW504902 is currently reported as functioning, while GW505624 had an unknown status. Based on the PSI report (JBS&G, 2016), GW505624 was installed as a replacement bore for GW504902.

Based on GHD’s understanding of the environmental setting of the site, regional groundwater is expected to flow to the south towards the Murray River.

Based on the bore usage information reviewed as part of the groundwater bore search, it is possible that groundwater within the area could be used for either drinking water, stock or irrigation purposes.

Bore details (where available) are summarised below and with details presented in Appendix C.
<table>
<tr><th>Bore ID</th><th>Location</th><th>Standing Water level (mbgl)</th><th>Final depth (mbgl)</th><th>Intended Purpose</th><th>Status</th></tr>
<tr><td>GW504902</td><td>Onsite – Site Office</td><td>12</td><td>40</td><td>Domestic</td><td>Functioning</td></tr>
<tr><td>GW505624</td><td>Onsite – Site Office</td><td>14</td><td>41</td><td>Stock, domestic</td><td>Unknown</td></tr>
<tr><td>GW505753</td><td>Offsite -South</td><td>18</td><td>66</td><td>Irrigation</td><td>Unknown</td></tr>
<tr><td>GW034602</td><td>Offsite -South</td><td></td><td>20.7</td><td>Domestic</td><td>Unknown</td></tr>
<tr><td>GW504065</td><td>Offsite -South</td><td>27</td><td>61</td><td>Stock, domestic</td><td>Functioning</td></tr>
<tr><td>GW502436</td><td>Offsite -South</td><td>20</td><td>42</td><td>Stock, domestic</td><td>Unknown</td></tr>
<tr><td>GW504216</td><td>Offsite - West</td><td>12</td><td>38</td><td>Stock</td><td>Functioning</td></tr>
<tr><td>GW505965</td><td>Offsite - West</td><td>-</td><td>114</td><td>Irrigation</td><td>Unknown</td></tr>
<tr><td>GW061544</td><td>Offsite - West</td><td>-</td><td>28</td><td>Stock, domestic</td><td>Unknown</td></tr>
<tr><td>GW505522</td><td>Offsite - West</td><td>15</td><td>42</td><td>Stock, domestic</td><td>Functioning</td></tr>
<tr><td>GW504683</td><td>Offsite - West</td><td>11</td><td>36</td><td>Stock, domestic</td><td>Functioning</td></tr>
<tr><td>GW273107</td><td>Offsite - North</td><td>35.1</td><td>131</td><td>Monitoring bore</td><td>Functional</td></tr>
<tr><td>GW504972</td><td>Offsite - North</td><td>-</td><td>30</td><td>Stock, domestic, farming</td><td>Functioning</td></tr>
<tr><td>GW504638</td><td>Offsite -East</td><td>-</td><td>20</td><td>Domestic</td><td>Functioning</td></tr>
<tr><td>GW012744</td><td>Offsite-East</td><td>-</td><td>33.5</td><td>Stock, domestic</td><td>Functioning</td></tr>
</table>
</td></tr>
</table>

3. Desktop information

3.1 Historical aerial photographs

A selection of historical aerial photographs were examined in order to assess past activities and land uses at the site. Photographs were examined from the years 1967, 1975, 1990 and 1995 as obtained from the NSW Historical Imagery, 2010 as obtained from NearMaps and 2022 as obtained from Google Earth and are presented in Appendix D. A summary of the review is provided below:

Table 3.1 Review of historical aerial photographs

Photograph	Site observations
1967 Black and white	The site office and Magazines 1 to 10 are already visible. Two of the three main farm dams which includes Dam 1 (east of Magazine 10) and Dam 2 (between Magazines 5 and 6) are also observed. Two other smaller farm dams which include Dam 4 (north of Magazine 8) and Dam 5 (in the western portion of the site) are also visible. A cleared area of land is evident in the northeast portion of the site which corresponds to the location of the former sand mine. Internal access tracks connecting the magazines are evident including an access track located at the southwest portion of the site. A structure similar to the existing magazines is located southwest of Magazine 3 and may be one of former brick magazines . Scattered vegetation within the site can be observed. The Newell Highway is located directly east of the site and Tocumwal No. 6 Canal Drain is located on the southeast boundary. Chinaman's Lane is located adjacent to the west and Lalalty Channel located adjacent to the site to the south. The rural/residential properties to the west and north east of the site are also visible.
1975 Black and white	There are no significant changes in the existing infrastructure with the site and its surroundings from the previous aerial photograph with the exception of the demolition/removal of the structure which appeared to be similar to the existing magazines that was located southwest of Magazine 3. Some rectangular patches of ground are observed across the access track in the southern portion of the site which may be the locations of the previous brick magazines that were present onsite prior to the construction of the now existing Magazines 1 to 10. The rural residential property to the south of the site is also visible.
1990 Black and white	There are no significant changes with the existing onsite infrastructure, however, the internal access roads in the southwest portion of the site are now less prominent. Other changes include observation of a vegetated patch of land north of the site office and farm buildings located towards the southwest of the site.
1995 Colour	Dam 3, the third main dam on site, is now evident, located in the northern portion of the site. The accessory store and the associated access roads located west of the site office are now visible. Some developments north of the office are also evident.
2010 Colour	The site access tracks appear more visible in this photograph. Rectangular patches of ground are also evident across the access roads. These patches were noted in the 1975 aerial. The fenced area of the containment cell located north of Magazine 8 is now visible which correlates with the date of construction (2001-2008). The diesel AST located east of Magazine 3 is apparent.
2023 Colour	There are no significant changes with the existing onsite infrastructure with the exception that the external mounds north and south of Magazine 6 are visible as is the forklift parking east of Magazine 5. Some of the access tracks are less obvious.

Based on the review of historical aerial photographs, the site has been used for storage and distribution of explosives since at least 1967 with the existing ten magazines and site office onsite already constructed at that time. The former sand mine was also apparent in 1967. By 1975, the access roads in the southwest portion of the site (which appeared to also previously contain magazines) appeared to have been disused. Since 1975 there appeared to be no significant changes to the site and surrounding area with the exception of the construction of the accessory store by 1995 and the construction of the containment cell and the addition of the diesel AST by 2010. The forklift parking area east of Magazine 5 and the external mounds north and south of Magazine 6 were apparent by 2023.

3.2 NSW Environment Protection Authority listings

A search of the datasets maintained by NSW EPA including notices under the *Contaminated Land Management Act 1997* (CLM Act) and Protection of the Environment Operations Act 1997 (POEO Act) Environment Protection License Register was carried out within a 1 km radius from the site boundaries. No sites or notices were identified for the site or within the 1 km search radius as summarised in Table 3.2, hence impact from NSW EPA listed sites is unlikely.

Table 3.2 NSW EPA dataset search

	Details of EPA notices
List of NSW contaminated sites notified to EPA	Nil notices.
Contaminated land record of notices	None.
POEO licence register	None.
Other delicenced, surrendered, or revoked licensed activities	Nil notices.

3.3 Other information

Other information resulting from searches of publicly available databases is summarised in Table 3.3. In summary, given the distance and direction of the landfill (800m downgradient) it is unlikely to have caused soil or groundwater contamination at the site. Historical mining or mining exploration may have caused soil or groundwater contamination if inadequate environmental controls were used.

Table 3.3 Public database search

<table>
<tr><th></th><th colspan="5">Details of EPA notices</th></tr>
<tr><td>Former Gas Works</td><td colspan="5">Nil records.</td></tr>
<tr><td rowspan="4">Waste Management Facilities</td><td colspan="5">A search to the Waste Management Facilities Database (Department of Agriculture, Water and Environment (DAWE)) showed that there are currently two existing waste management facilities within the 3 km radius from the site as summarised below:</td></tr>
<tr><td>Organisation</td><td>Address</td><td>Type</td><td>Status</td><td>Distance from study area</td></tr>
<tr><td>Tocumwal Landfill</td><td>Newell Highway, Tocumwal, NSW, 2714</td><td>Landfill - putrescible</td><td>Operational</td><td>800 m SE</td></tr>
<tr><td>Tocumwal Landfill Transfer Station</td><td>Newell Highway, Tocumwal, NSW, 2714</td><td>Transfer station</td><td>Operational</td><td>800 m SE</td></tr>
<tr><td>Liquid Fuel Facilities</td><td colspan="5">Nil records.</td></tr>
<tr><td>Investigation or Management for Per- and Poly-Fluoroalkyl Substances</td><td colspan="5">Nil records.</td></tr>
</table>

	Details of EPA notices		
Current Mining or Exploration Titles or Applications	A search to the NSW Exploration and Mining Title Maps (MinView, NSW Statewide Seamless Geology) showed that there are currently no existing mining and exploration titles within the 1 km radius from the project site. Historical mining and exploration titles that have been issued in the area (including the project area) are summarised below.		
	Organisation	**Resource**	**Year Ended**
	Mines Administration Pty Limited	Group 11 (Thorium, uranium)	1973
	Applegate Exploration, LLC, Pannonian International Ltd	Petroleum	2004

3.4 Review of previous reports

A number of previous investigations have been conducted on-site and within the surrounding area. The following reports were reviewed as part of this PSI:

– JBS&G 2016, Orica Pty Ltd Tocumwal Phase 1, 431 Newell Highway, Tocumwal, NSW, 2174, 22 August 2016, 52015/104831 Rev 0.

– Orica 2022, Tocumwal Explosive Magazine Environmental Management Plan Version 2, Issued 7th February 2022.

A summary of the previous investigation reports reviewed is provided in the following sections. It should be noted that only information pertinent to possible contamination present on-site was included.

3.4.1 Tocumwal Phase 1 (JBS&G, 2016)

In 2016, JBS&G was engaged by Orica to complete a Phase 1 Environmental Site Assessment (ESA). The scope of works included a review of historical activities at the site and limited sampling including soils, asbestos fragments and bore (tap) water.

According to the report, prior to 1943, the site was composed of 16 privately owned properties. By 1943, the Commonwealth resumed a large portion of the land in Tocumwal including the site. The site was then used by the Australian Army to store ordnance in a number of small brick magazines. In 1956, the Imperial Chemical Industries (ICI) of Australia occupied the site and demolished the brick magazines and constructed larger magazines made from corrugated iron. These magazines are currently present onsite. A residential type building was also constructed and was used as the site office. The site was then purchased by the ICI and New Zealand Limited (now Orica) in 1966. At the time of writing (2016), the site was used for storage and distribution of explosives and had a lease agreement for cattle and sheep grazing.

Between 2000 to 2008, Orica undertook remediation activities on an offsite location, whereby detonators were disposed of on private property. The detonators were buried and burned which resulted in a combination of both fired and un-fired detonators. The remediation activity resulted in excavation of approximately 195 m^3 of contaminated soil which was transported to and disposed of in a containment cell constructed within the subject site (see Figure 1, Appendix A).

JBS&G, 2016 reported that the containment cell was clay lined and a 0.5 m layer of ‘clean soil’ was placed on top of the material once the cell was filled. Ten tonnes of lime was added to the soil that was placed in the cell to aid in the degradation of contaminants associated with the detonators such as lead azide and pentaerythritol tetranitrate (PETN). It was also reported that the area around the containment cell was historically used as a burning ground to dispose of explosives from a former offsite manufacturing facility. The location of the containment cell was fenced and vegetated with trees and grasses.

The Phase 1 assessment also reported that a former sand mine was located in the northwest portion of the site which was used for disposal of inert wastes such as timber and metallic wastes including corrugated iron, fencing wire and steel fence posts, at the time of writing (2016). The sand/gravel pit was formerly leased to the local roads authority as a compound during the construction of the Newell Highway. The report did not specify the time of lease although it can be assumed to be prior to 1965 based on the review of the historical aerial photographs conducted during this PSI (Section 3.1).

Based on the results of the desktop review, JBS&G, 2016 identified several Areas of Environmental Concern (AEC) which included the following:

– Burial of soil containing fired and unfired detonators.
– Historical burning of explosives.
– Former presence of asbestos in site structures (since demolished).
– Storage of diesel in AST.
– Disposal of inert wastes in the former sand mine.
– Historical and current storage of explosives.

A limited sampling program was conducted targeting the identified moderate to high risk AEC which included the containment cell area, carport structure and onsite groundwater bore. The limited sampling program included:

– Collection of 13 surface soil samples in the area of the containment cell and historical burning grounds and analysis for explosives, ammonia, nitrate and heavy metals.
– Collection of two surface soil samples analysed for asbestos in the location of the former carport where asbestos cladding was previously located.
– Collection of one water sample from the drinking water tap of the site office drinking bore and analysed for explosives, ammonia, nitrate and heavy metals.

Results of the limited sampling are summarised below:

– No soil samples exceeded the adopted assessment criteria relevant to the protection of human health.
– One soil sample recorded a zinc concentration of 120 mg/kg which exceeded the ecological investigation level (EIL) for zinc of 100 mg/kg. However, this was not considered significant due to the reported concentration below the criteria for the other samples analysed.
– No asbestos was detected in any of the samples collected.
– The concentrations of heavy metals, ammonia and nitrate in the water sample were less than the criteria specified in the Australian Drinking Water Guidelines (ADWG 2011).
– No explosive compounds were detected above the laboratory limit of reporting (LOR) in the tap water, however it was noted that a number of the LORs were higher that the USEPA Region IX criteria for tap water, making it impossible to definitively conclude that explosives were not present in the water. It was considered that the potential for elevated levels of explosives was very low.

Overall the limited sampling program did not identify any significant contamination associated with the identified moderate and high risks AECs at the site, however, the completion of a detailed Phase 2 Environmental Site Assessment was recommended should land use be altered (including changes to the current agricultural use).

3.4.2 Tocumwal Environmental Management Plan (Orica, 2022)

The Land Impact Register of the Environmental Management Plan (EMP) had documented that hydrocarbon impacted soil in the diesel unloading area with an approximate area of 10m^2 was excavated to a maximum depth of 0.1m. According to the register, the investigation results did not show any impact below 0.1m. The contaminated soil was excavated and disposed of as hazardous waste with Waste Tracking Certification (WTC) and regulator approval (Document WTC 128634). It is noted however, that the results were not available for review.

4. Preliminary conceptual site model

A preliminary conceptual site model (CSM) was developed for the project area to evaluate the risk posed by the potential contamination sources to the identified receptors and whether further investigation, remediation or management are required to manage that risk.

4.1 Potential contaminant sources

Based on the results of the desktop assessment and site inspection, the following potential contamination sources on the site were identified:

Within the project area:

– Storage of explosives onsite.
– Leaks and spills during use of the diesel AST.
– Leaks and spills during vehicle use and maintenance activities.
– Potential contamination associated with materials sourced from the former sand mine area used in the earthen blast mounds outside of Magazine 6.
– Potential use of herbicides and pesticides onsite.

Onsite but outside the project area:

– Containment cell which was used as a remediation site for contaminated soils resulting from an offsite detonator disposal area.
– Historical burning of explosives within the fenced area of the containment cell.
– Uncontrolled disposal of wastes in the former sand mine.
– Potential asbestos in the soils within the vicinity of the demolished site offices.
– Fill and imported materials from unknown sources used in the containment cell and sand mine.

The potential for contamination to be present within the project area is discussed in Table 4.1. In summary, the only potential source of soil or groundwater contamination is from fuels stored on-site including the diesel AST.

Table 4.1 Potential for contamination

Source	Rationale/detail	Potential contaminants	Potential for contamination within the project area
Within the project area			
Former and existing magazines	Contamination associated to storage of ordnance	Explosives, heavy metals, ammonia, nitrate	Low The current explosives are stored within the magazines and are currently managed as per the site EMP.
Storage, spillage or leakage of fuels / oils	Use of diesel AST and vehicles onsite	TRH, BTEXN, PAHs, heavy metals	Moderate Some staining on the concrete pad was observed during the inspection in the vicinity of the diesel AST. In addition, historical records noted a spill in the diesel area in 2010, which indicates that such incident could potentially occur onsite. It is noted that the contaminated soil was reported to had been removed and disposed offsite.
Potential contamination associated with materials sourced from the former sand mine	Use of materials from the former sand mine in the earthen blast mounds	Asbestos, heavy metals, TRH, BTEX, PAHs, OCPs, OPPs, PCBs	Low No visible contamination was noted in the earthen blast mounds located in the project area.

Source	Rationale/detail	Potential contaminants	Potential for contamination within the project area
Potential use of herbicides, pesticides	Use of pesticides or herbicides on the site or adjacent properties	Arsenic, OCPs and OPPs	Low The site is currently used for sheep and cattle grazing.
Onsite but outside the project area			
Containment cell	Contamination associated with the buried soils containing detonators from an offsite remediation activity	Explosives, heavy metals, ammonia, nitrate	Low The containment cell is not located within the project area, The closest Magazine is located 400 m south of the cell. The containment cell was also reported to have been clay lined, thus, there is low potential for leaching. Access to the containment cell area is also restricted with fencing. In addition, previous sampling and analysis of the surface soils (2016) did not detect any contaminant concentrations above adopted criteria.
Historical incineration of detonators	Contamination in soil associated with the incineration of explosives	Explosives, heavy metals, ammonia, nitrate	Low The burn areas are not located within the project area with the closest Magazine located 400 m south. Access to the burn areas (containment cell area) is restricted with fencing.
Uncontrolled waste disposal in former sand mine/quarry	Contamination of soils, groundwater or surface water from disposal of wastes	Heavy metals, ammonia, nitrogen compounds, TRH, BTEXN, PAHs, PFAS, OCPs, OPPs, PCBs	Low The sand mine is not located within the project area, with the nearest magazine located 1.8 km southeast.
Asbestos from building materials in areas of demolished buildings	Potential contamination of the soils within the vicinity of the old site offices	Asbestos	Low The former site office buildings were demolished in 2020 and are outside the project area. A previous investigation in 2016 near the carport also did not identify any asbestos in the surface soils.
Potential use of imported fill materials	Use of imported fill materials from unknown sources during operation of the sand mine and construction of the containment cell	Asbestos, heavy metals, TRH, BTEX, PAHs, OCPs, OPPs, PCBs	Low The areas such as the containment cell and sand mine where imported fill could had been potentially use is outside the project site. In addition, previous sampling and analysis of the surface soils (2016) did not detect any contaminant concentrations above adopted criteria.

– Heavy metals (As, Cd, Cr, Cu, Hg, Pb, Ni and Zn)
– BTEXN – benzene, toluene, ethylbenzene, toluene and naphthalene
– OCPs and OPPs - organochlorine and organophosphate pesticides
TRH – total recoverable hydrocarbons
PCBs – polychlorinated biphenyls
PFAS - per- and polyfluoroalkyl substances

4.2 Potential contaminant exposure pathways

Construction activities for the project will include site clearing, establishing hardstands and concrete slabs, magazine construction and construction of sealed access roads to each of the magazines.

The primary pathways by which current and future receptors could be exposed to the potential sources of contamination are considered to be:

– Direct contact (including ingestion) with potentially contaminated soil, surface water or groundwater.
– Inhalation of potential contaminants in soil, if disturbed (particularly asbestos if present).
– Lateral migration of potential contaminants via surface water run-off to impact surface water.
– Vertical and horizontal migration of potential contaminants within the groundwater.

4.3 Potential receptors

When evaluating potential adverse health/environmental effects from exposure to a contaminated site, all potentially exposed populations should be considered. For the site, the key populations or receptors of interest are considered to include:

– **Human health receptors**
  - Current and future workers, visitors and contractors at Orica including those accessing the site and project area under Orica work permits.
  - Current agricultural leaseholders.
  - Intrusive maintenance or construction workers during the construction phase of the project.
  - Current and future occupants and visitors of surrounding properties.
  - Potential off-site users of groundwater (consumption or stock watering).

– **Environmental receptors**
  - Flora and fauna within the Orica site and surrounding land and waterways.
  - Drainage lines and dams throughout the site and surrounding area.
  - Groundwater beneath and downgradient of the site.

4.4 Preliminary conceptual site model

Table 3.1 summarises the potential for complete source-pathway-receptor linkages for the project area based on the results of the desktop review and site inspection. In summary, the only potentially complete source-pathway-receptor linkages relate to soil potentially impacted from spills from storage, spillage or leakage of fuels / oils.

During operation of the proposal, it is understood that all fuels and explosive materials will be stored undercover in buildings to prevent any unintended runoff of hazardous materials occurring. Additionally, it is noted that the risk of handling these materials is typical of works of this nature and well understood control measures, such as bunding, safely storing hazardous materials, and visual inspections of the works area and waterways, are commonly employed during implementation of Construction Environmental Management Plans (CEMPs) and Soil and Water Management Plans (SWMPs) which are stipulated as required mitigation measures provided in the EIS. On this basis, with the specified required mitigation and plans and on the basis that these materials will be stored undercover, the operation of the project is not anticipated to result in soil or groundwater contamination.

Table 4.2 Conceptual site model for the project area

Potential Source within the project area, as discussed in Section 4.1	Pathway	Receptor	Potential for completeness
Contaminated soils from storage, spillage or leakage of fuels / oils	Volatilisation to indoor and outdoor air and subsequent inhalation	On-site workers and visitors	Unlikely given location of potential spills.
		Current agricultural leaseholders	
		Intrusive maintenance or construction workers during the construction phase of the project	Possible if intrusive works are undertaken in the vicinity of the AST or former spills.
	Direct contact, including ingestion	On-site workers and visitors	Possible in the vicinity of the AST or former spills.
		Intrusive maintenance workers	
		Ecological receptors e.g., invertebrates and vegetation	
	Surface water runoff	Drainage lines and dams throughout the site and surrounding area	Possible in the vicinity of the AST or former spills.
	Vertical leaching through soil profile	Groundwater beneath the site	Unlikely, given the depth to groundwater (>10m).

5. Conclusion

With respect to the objectives described in Section 1.2 of this report and subject to the limitations described in Section 7:

– The only potentially complete source-pathway-receptor linkages during construction of the project relate to soil potentially impacted from spills from storage, spillage or leakage of fuels / oils in the vicinity of the diesel AST.
– During operation of the proposal, it is understood that all fuels and explosive materials will be stored undercover in buildings to prevent any unintended runoff of hazardous materials occurring. Given that this will occur under the implementation of CEMPs and SWMPs, the operation of the project is not anticipated to result in soil or groundwater contamination.

To mitigate potential exposure to soil or groundwater contamination it is recommended that:

– The soil in the vicinity of the diesel AST be further assessed if it is to be disturbed.
– The CEMP for the project includes an ‘unexpected finds protocol’, to manage any potential impacts associated with the disturbance of potentially contaminated soils (if encountered) during works of the project. The CEMP is to include actions to cease work on discovery, test suspected contaminated material, and safely store, treat, and dispose of the material as relevant.

6. References

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7. Limitations

This preliminary site investigation (“Report”) has been prepared by GHD Pty Ltd (“GHD”) for use by Orica for the purpose as stated in Section 1.1 of the report.

GHD otherwise disclaims responsibility to any person other than Orica arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

To the maximum extent permitted by law, all implied warranties and conditions in relation to the services provided by GHD and the Report are excluded unless they are expressly stated to apply in this Report.

The services undertaken by GHD in connection with preparing this Report:

– Were limited to those specifically detailed in Section 1.2 of this Report.
– Were undertaken in accordance with current profession practice and by reference to relevant environmental regulatory authority and industry standards, guidelines and assessment criteria in existence as at the date of this Report.

The opinions, conclusions and any recommendations in this Report are based on assumptions made by GHD when undertaking the services mentioned above and preparing the Report (“Assumptions”), as specified throughout this Report. GHD expressly disclaims responsibility for any error in, or omission from, this Report arising from or in connection with any of the Assumptions being incorrect except where GHD has been negligent in the adoption of those Assumptions.

GHD has prepared this Report on the basis of information provided by Orica and others (including Government authorities), which GHD has not independently verified or checked (“Unverified Information”) beyond the agreed scope of work. GHD expressly disclaims responsibility in connection with the Unverified Information, including (but not limited to) errors in, or omissions from, the Report, which were caused or contributed to by errors in, or omissions from, the Unverified Information.

Subject to the paragraphs in this section of the Report, the opinions, conclusions and any recommendations in this Report are based on conditions encountered and information reviewed at the time of preparation of this Report and are relevant until such times as the site conditions or relevant legislations changes, at which time, GHD expressly disclaims responsibility for any error in, or omission from, this Report arising from or in connection with those opinions, conclusions and any recommendations.

Site conditions (including the presence of hazardous substances and/or site contamination) may change after the date of this Report. GHD expressly disclaims responsibility:

– Arising from, or in connection with, any change to the site conditions
– To update this Report if the site conditions change

Except as otherwise expressly stated in this Report GHD makes no warranty or representation as to the presence or otherwise of asbestos and/or asbestos containing materials (“ACM”) on the site. If fill material has been imported on to the site at any time, or if any buildings constructed prior to 1970 have been demolished on the site or material from such buildings disposed of on the site, the site may contain asbestos or ACM.

Except as otherwise expressly stated in this Report, GHD makes no warranty, statement or representation of any kind concerning the suitability of the site for any purpose or the permissibility of any use, development or re-development of the site.

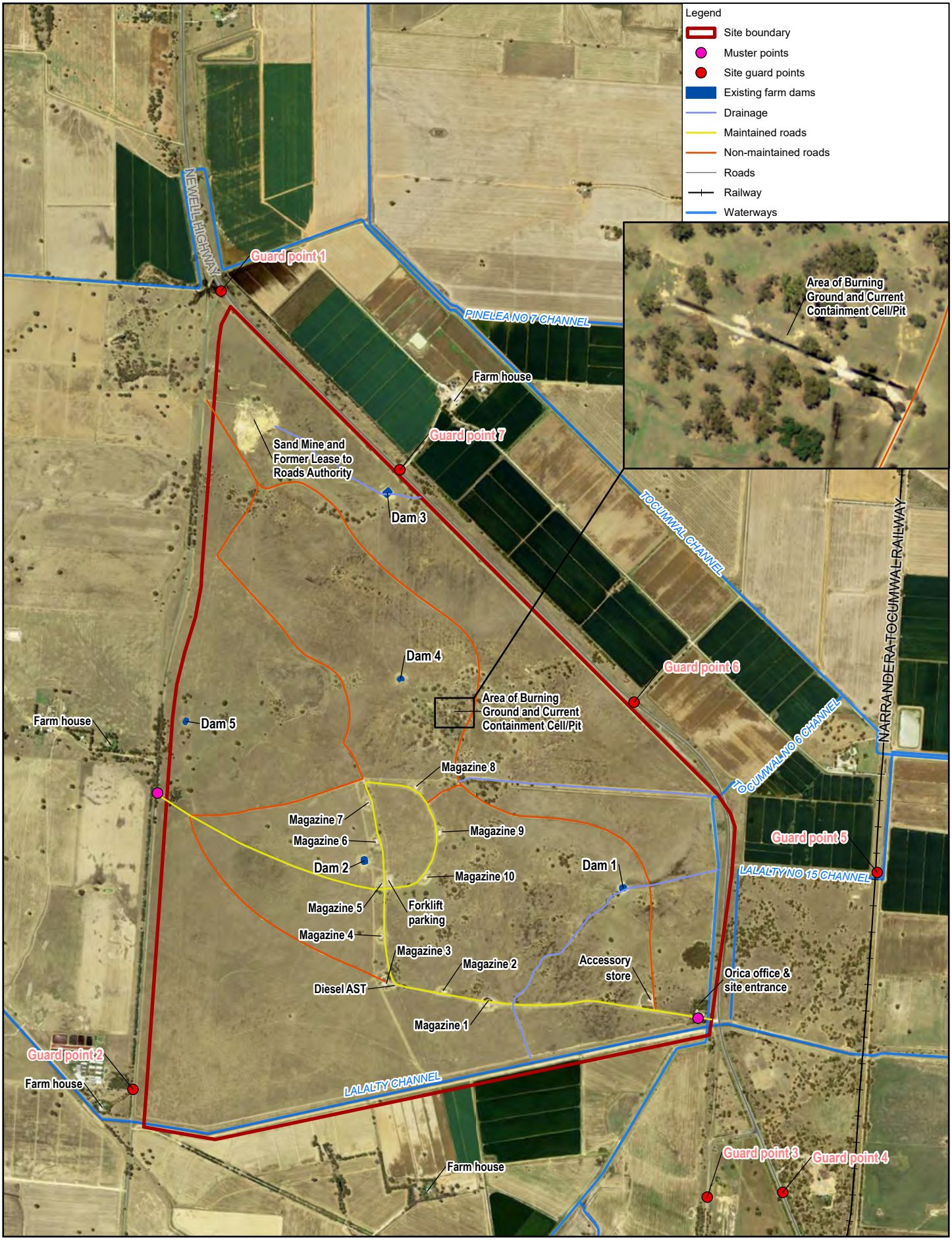
These Disclaimers should be read in conjunction with the entire Report and no excerpts are taken to be representative of the findings of this Report.

To the extent of any inconsistency between this Disclaimer and the terms of any service agreement between Orica and GHD pursuant to which this Report was prepared, the terms of the service agreement will prevail.

Appendix

Appendix A

Figures



Paper Size ISO A4

0 500 1,000

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

Orica Australia Pty Ltd
Orica Tocumwal Magazine Compound Upgrade

Project No. **12597123**
Revision No. **A**
Date **13/12/2023**

Existing site layout

FIGURE 1

\\ghdnet\ghd\AU\Newcastle\Projects\22\12597123\GIS\Maps\Deliverables\12597123_OricaTocumwalCompound.aprx
12597123_009_ExistingSiteLayout
Print date: 13 Dec 2023 - 08:39

Data source: Waterways - DFSI, 2023; Roads, - DCS, 2023; Zoning - DPIE, 2023; NSW_Imagery: © Department of Customer Service 2020. Created by: rvillalon

Appendix B

Photographic Log



Photograph 1 - Southeast corner site access from Newell Highway.



Photograph 2 - Internal gravel access looped track within the site.



Photograph 3 - Portions of the site are used for grazing.



Photograph 4 - Site office and other amenities (constructed in 2020).



Photograph 5 - Existing magazines surrounded by security fencing.



Photograph 6 - Earthen blast mounds located in the vicinity of Magazine 6.



Photograph 7 - Onsite self-bunded 2000 L diesel above ground storage tank (AST).



Photograph 8 - Onsite diesel AST with some staining on the concrete pad.



Photograph 9 - Location of containment cell with buried wastes which was also used as a burning ground.



Photograph 10 – The fenced containment cell, vegetated with trees and grasses.



Photograph 11 - Bare patches of land within the containment cell location.



Photograph 12 - Localised surface water ponding was noted in some areas.

	
Photograph 13 - Newell Highway.	***Photograph 14 - Lalalty Drainage Channel to the south of the site.***

Appendix C

Water NSW Groundwater Search Results

WaterNSW
Work Summary

GW504902

Licence:		**Licence Status:**	
		Authorised Purpose(s):	
		Intended Purpose(s):	DOMESTIC
Work Type:	Bore		
Work Status:	Supply Obtained		
Construct.Method:			
Owner Type:	Private		
Commenced Date:		**Final Depth:**	40.00 m
Completion Date:	01/01/1958	**Drilled Depth:**	40.00 m
Contractor Name:			
Driller:	Unkown Unknown		
Assistant Driller:			
Property:		**Standing Water Level (m):**	12.000
GWMA:		**Salinity Description:**	Good
GW Zone:		**Yield (L/s):**	

Site Details

Site Chosen By:

		County	**Parish**	**Cadastre**
	Form A:	DENISON	TOCUMWAL	2//225459
	Licensed:			
Region:	50 - Murray	**CMA Map:**	8026-S	
River Basin:	409 - MURRAY RIVERINA	**Grid Zone:**		**Scale:**
Area/District:				
Elevation:	0.00 m (A.H.D.)	**Northing:**	6040021.000	**Latitude:** 35°46'30.7"S
Elevation Source:	Unknown	**Easting:**	369401.000	**Longitude:** 145°33'18.3"E
GS Map:	-	**MGA Zone:**	55	**Coordinate Source:** Map Interpre

Remarks

01/01/1958: Form A Remarks:
Entered by Clare Hillier

***** End of GW504902 *****

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WaterNSW
Work Summary

GW505624

Licence:
Licence Status:

Authorised Purpose(s):
Intended Purpose(s): STOCK, DOMESTIC

Work Type: Bore
Work Status: Replacement
Construct.Method: Rotary Mud
Owner Type: Private

Commenced Date:
Completion Date: 07/06/2013

Final Depth: 41.00 m
Drilled Depth: 41.00 m

Contractor Name: STRATHMERTON DRILLING PTY LTD
Driller: Heath Brian Madgwick
Assistant Driller: Brian (Jack) Madgwick

Property:
GWMA:
GW Zone:

Standing Water Level (m): 14.000
Salinity Description:
Yield (L/s): 4.000

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	DENISON	TOCUMWAL	2//225459
Licensed:			

Region: 50 - Murray
River Basin: - Unknown
Area/District:

CMA Map:
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: Unknown

Northing: 6040026.000
Easting: 369343.000

Latitude: 35°46'30.6"S
Longitude: 145°33'16.0"E

GS Map: -

MGA Zone: 55

Coordinate Source: Unknown

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	41.00	200			Rotary Mud
1		Annulus	Waterworn/Rounded	30.00	41.00				
1	1	Casing	P.V.C.	0.00	37.00	135			Suspended in Clamps, Glued, S: 40.00-41.00m
1	1	Opening	Screen	37.00	40.00	135		0	Stainless Steel, Other, A: 1.00mm

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
37.00	40.00	3.00	Unknown	14.00		4.00		01:30:00	500.00

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	34.00	34.00	clay	Clay	
34.00	35.50	1.50	sand	Sand	
35.50	37.00	1.50	clay	Clay	

37.00	40.00	3.00	sand	Sand	
40.00	41.00	1.00	silt	Silt	

Remarks

07/06/2013: Form A Remarks:
Helen Lester: Coordinates are taken from charted licence location.

***** End of GW505624 *****

Warning To Clients: This raw data has been supplied to the NSW Office of Water by drillers, licensees and other sources. The NOW does not verify the accuracy of this data. The data is presented for use by you at your own risk. You should consider verifying this data before relying on it. Professional hydrogeological advice should be sought in interpreting and using this data.

WaterNSW
Work Summary

GW505753

Licence: 50CA513685 **Licence Status:** CURRENT

Authorised Purpose(s): IRRIGATION
Intended Purpose(s): IRRIGATION

Work Type: Bore
Work Status: New Bore
Construct.Method:
Owner Type: Private

Commenced Date:
Completion Date: 04/05/2018
Final Depth: 66.00 m
Drilled Depth: 72.00 m

Contractor Name: Arcon Drilling
Driller: Rhys Henry Johnson
Assistant Driller: Will Johnson

Property: Cairnlea RMB 2383 Chinamans Road TOCUMWAL 2714
GWMA: -
GW Zone: -
Standing Water Level (m): 18.000
Salinity Description:
Yield (L/s): 50.000

Site Details

Site Chosen By: Driller, Client

	County	Parish	Cadastre
Form A:	DENISON	TOCUMWAL	196//752296
Licensed:	DENISON	TOCUMWAL	Whole Lot 196//752296

Region: - (Not set)
River Basin: - Unknown
Area/District:
CMA Map:
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: Unknown
Northing: 6039268.000
Easting: 367585.000
Latitude: 35°46'54.3"S
Longitude: 145°32'05.6"E

GS Map: -
MGA Zone: 55
Coordinate Source: Map Interpre

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	66.00	305			Rotary Mud
1		Hole	Hole	66.00	72.00	125			Rotary Mud
1		Annulus	Waterworn/Rounded	50.00	66.00				Graded, Q:0.650m3, PL:Poured/Shovelled
1		Backfill	Drilled Cuttings	66.00	72.00				
1	0	Casing	Abandoned Casing	0.00	66.00				
1	1	Opening	Slots - Vertical	0.00	0.00			0	
1	1	Casing	Steel Stainless 304	0.00	55.00	219	202		Held in Clamp, Welded - Butt
1	1	Opening	Perforations,Screen - Gauze/Mesh	55.00	66.00	219	207	0	Screen - Wedge Wire, Welded - Butt, A: 1.00mm

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
54.00	66.00	12.00	Unknown	18.00	21.00	50.00		00:04:00	155.00

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	11.00	11.00	sandy clay, brown grey	Sandy Clay	
11.00	12.00	1.00	clayey sand, grey	Clayey Sand	
12.00	23.00	11.00	sand, grey brown, mg	Sand	
23.00	30.00	7.00	clay, grey	Clay	
30.00	36.00	6.00	clayey sand, grey	Clayey Sand	
36.00	44.00	8.00	sand, brown grey, mg	Sand	
44.00	54.00	10.00	clay, brown	Clay	
54.00	66.00	12.00	sand, brown grey, cg	Sand	
66.00	72.00	6.00	clay, brown grey	Clay	
72.00	72.00	0.00	granite, white black, cg, hard	Granite	

Remarks

04/05/2018: Entered by Helen Lester - 30/7/2018

***** End of GW505753 *****

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WaterNSW
Work Summary

GW034602

Licence: 50WA510299 **Licence Status:** CURRENT

Authorised Purpose(s): DOMESTIC
Intended Purpose(s): DOMESTIC

Work Type: Bore
Work Status:
Construct.Method: Rotary
Owner Type: Private

Commenced Date:
Completion Date: 01/02/1972

Final Depth: 20.70 m
Drilled Depth: 20.70 m

Contractor Name: (None)
Driller:
Assistant Driller:

Property: CAIRNLEA Silo Rd TOCUMWAL 2714 NSW
GWMA: 016 - LOWER MURRAY (D/S COROWA)
GW Zone: 001 - MURRAY - CALIVIL RENMARK

Standing Water Level (m):
Salinity Description:
Yield (L/s):

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	DENISON	TOCUMWAL	196
Licensed:	DENISON	TOCUMWAL	Whole Lot 196//752296

Region: 50 - Murray
River Basin: 409 - MURRAY RIVERINA
Area/District:

CMA Map: 8026-S
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: (Unknown)

Northing: 6039146.000
Easting: 368114.000

Latitude: 35°46'58.5"S
Longitude: 145°32'26.6"E

GS Map: -

MGA Zone: 55

Coordinate Source: GD.,ACC.MAP

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1	1	Opening	Perforations	-100.00	2.40	127		1	
1	1	Casing		-0.30	20.70	127			Driven into Hole

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
18.20	20.60	2.40	Unconsolidated	9.10		0.63			

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	6.10	6.10	Clay	Clay	
6.10	12.19	6.09	Clay Sandy	Clay	
12.19	12.80	0.61	Sand	Sand	

12.80	18.29	5.49	Clay	Clay	
18.29	20.73	2.44	Sand Water Supply	Sand	

***** End of GW034602 *****

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WaterNSW
Work Summary

GW504065

Licence: | **Licence Status:**

Authorised Purpose(s):
Intended Purpose(s): STOCK, DOMESTIC

Work Type: Bore
Work Status: Supply Obtained
Construct.Method: Rotary Mud
Owner Type: Private

Commenced Date:
Completion Date: 02/09/2009

Final Depth: 61.00 m
Drilled Depth: 61.00 m

Contractor Name: LLOYD ANGOVE DRILLING
Driller: Lloyd John Angove
Assistant Driller: Vaughn Rafferty

Property:
GWMA:
GW Zone:

Standing Water Level (m): 27.000
Salinity Description:
Yield (L/s): 5.000

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	DENISON	TOCUMWAL	11//1133460
Licensed:			

Region: 50 - Murray
River Basin: 409 - MURRAY RIVERINA
Area/District:

CMA Map: 8026-S
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: Unknown

Northing: 6038870.000
Easting: 366687.000

Latitude: 35°47'06.8"S
Longitude: 145°31'29.6"E

GS Map: -
MGA Zone: 55
Coordinate Source: GIS - Geogra

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	61.00	180			Rotary Mud
1	1	Casing	Pvc Class 12	0.00	59.00	140	116		Seated on Bottom, Riveted and Glued
1	1	Opening	Screen - Round Wire	59.00	61.00	140		0	Stainless Steel 304, Riveted, A: 1.00mm

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
56.00	61.00	5.00	Unknown	27.00		5.00		03:00:00	

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	5.00	5.00	Clay, grey	Clay	
5.00	7.00	2.00	Clay, red	Clay	
7.00	14.00	7.00	Clay, grey	Clay	
14.00	16.00	2.00	Sandy clay, red	Sandy Clay	

16.00	38.00	22.00	Clay, grey	Clay	
38.00	39.00	1.00	Sandy clay, red	Sandy Clay	
39.00	56.00	17.00	Clay, red grey	Clay	
56.00	61.00	5.00	Sand, coarse, red	Sand	

Remarks

02/09/2009: Form A Remarks:
Entered by Clare Hillier

***** End of GW504065 *****

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WaterNSW
Work Summary

GW502436

Licence:
Licence Status:

Authorised Purpose(s):
Intended Purpose(s): STOCK, DOMESTIC

Work Type: Bore
Work Status:
Construct.Method:
Owner Type:

Commenced Date:
Completion Date: 28/01/2004

Final Depth: 42.00 m
Drilled Depth: 42.00 m

Contractor Name: LLOYD ANGOVE DRILLING
Driller: Lloyd John Angove
Assistant Driller:

Property:
GWMA:
GW Zone:

Standing Water Level (m): 20.000
Salinity Description:
Yield (L/s): 2.000

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	DENISON	TOCUMWAL	22 715053
Licensed:			

Region: 50 - Murray
River Basin: - Unknown
Area/District:

CMA Map:
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: Unknown

Northing: 6038618.000
Easting: 366455.000

Latitude: 35°47'14.9"S
Longitude: 145°31'20.2"E

GS Map: -
MGA Zone: 55
Coordinate Source: Unknown

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	42.00	150			Rotary Mud
1		Annulus	(Unknown)	35.00	42.00				
1	1	Casing	Pvc Class 9	0.00	39.00	110	92		Seated on Bottom, Glued
1	1	Opening	Slots - Diagonal,Screen	39.00	42.00	110		0	PVC Class 9, SL: 50.0mm
1	1	Opening	Slots - Diagonal,Screen	39.00	42.00	110		0	PVC Class 9, Glued, A: 1.00mm

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
35.00	42.00	7.00	Unknown	20.00	29.00	2.00		05:00:00	140.00

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	1.00	1.00	brown clay	Clay	

1.00	2.00	1.00	grey brown clay	Invalid Code	
2.00	8.00	6.00	grey clay	Clay	
8.00	10.00	2.00	yellow sandy clay	Invalid Code	
10.00	16.00	6.00	grey clay	Clay	
16.00	22.00	6.00	yellow grey clay	Invalid Code	
22.00	28.00	6.00	yellow brown sandy clay	Invalid Code	
28.00	33.00	5.00	brown sandy clay	Invalid Code	
33.00	35.00	2.00	grey brown clay	Invalid Code	
35.00	37.00	2.00	yellow brown fine sand	Invalid Code	
37.00	42.00	5.00	white coarse sand	Invalid Code	

***** End of GW502436 *****

Warning To Clients: This raw data has been supplied to the NSW Office of Water by drillers, licensees and other sources. The NOW does not verify the accuracy of this data. The data is presented for use by you at your own risk. You should consider verifying this data before relying on it. Professional hydrogeological advice should be sought in interpreting and using this data.

WaterNSW
Work Summary

GW504216

Licence:
Licence Status:

Authorised Purpose(s):
Intended Purpose(s): STOCK

Work Type: Bore
Work Status: Supply Obtained
Construct.Method: Rotary Mud
Owner Type: Private

Commenced Date:
Completion Date: 25/09/2007

Final Depth: 38.00 m
Drilled Depth: 38.00 m

Contractor Name: LLOYD ANGOVE DRILLING
Driller: Lloyd John Angove
Assistant Driller: Rhys JOHNSON

Property:
GWMA:
GW Zone:

Standing Water Level (m): 12.000
Salinity Description:
Yield (L/s): 2.000

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	DENISON	TOCUMWAL	21//715053
Licensed:			

Region: 50 - Murray
River Basin: 409 - MURRAY RIVERINA
Area/District:

CMA Map: 8026-S
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: Unknown

Northing: 6039866.000
Easting: 366257.000

Latitude: 35°46'34.3"S
Longitude: 145°31'13.1"E

GS Map: -
MGA Zone: 55
Coordinate Source: GIS - Geogra

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	38.00	150			Rotary Mud
1	1	Casing	Pvc Class 12	0.00	33.00	115	91		Seated on Bottom, Glued
1	1	Opening	Slots - Diagonal	33.00	38.00	115		0	Casing - Machine Slotted, PVC Class 12, Glued, SL: 50.0mm

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
33.00	38.00	5.00	Unknown	12.00		2.00		02:00:00	

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	6.00	6.00	Clay, brown grey	Clay	
6.00	10.00	4.00	Sand, grey	Sand	
10.00	19.00	9.00	Clay, grey brown	Clay	
19.00	23.00	4.00	Clay, grey	Clay	

23.00	24.00	1.00	Sand, brown	Sand	
24.00	28.00	4.00	Sandy clay, brown grey	Sandy Clay	
28.00	29.00	1.00	Sand, grey	Sand	
29.00	33.00	4.00	Clay, grey brown	Clay	
33.00	37.00	4.00	Sand, grey	Sand	
37.00	38.00	1.00	Clay, grey	Clay	

Remarks

25/09/2007: Form A Remarks:
Entered by Clare Hillier

***** End of GW504216 *****

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WaterNSW
Work Summary

GW061544

Licence:
Licence Status:
Authorised Purpose(s):
Intended Purpose(s): STOCK, DOMESTIC

Work Type: Bore
Work Status:
Construct.Method: Rotary
Owner Type: Private

Commenced Date:
Completion Date: 01/01/1980
Final Depth: 28.00 m
Drilled Depth:

Contractor Name: (None)
Driller:
Assistant Driller:

Property:
GWMA:
GW Zone:
Standing Water Level (m):
Salinity Description:
Yield (L/s):

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	DENISON	TOCUMWAL	119
Licensed:			

Region: 50 - Murray
River Basin: 409 - MURRAY RIVERINA
Area/District:
CMA Map:
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: (Unknown)
Northing: 6040286.000
Easting: 366013.000
Latitude: 35°46'20.5"S
Longitude: 145°31'03.6"E

GS Map: -
MGA Zone: 55
Coordinate Source: GD.,ACC.MAP

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1	1	Casing	P.V.C.	0.00	0.00	102			

*** End of GW061544 ***

Warning To Clients: This raw data has been supplied to the WaterNSW by drillers, licensees and other sources. WaterNSW does not verify the accuracy of this data. The data is presented for use by you at your own risk. You should consider verifying this data before relying on it. Professional hydrogeological advice should be sought in interpreting and using this data.

WaterNSW
Work Summary

GW505522

Licence:
Licence Status:

Authorised Purpose(s):
Intended Purpose(s): STOCK, DOMESTIC

Work Type: Bore
Work Status: Supply Obtained
Construct.Method: Rotary Mud
Owner Type: Private

Commenced Date:
Completion Date: 02/11/2011

Final Depth: 42.00 m
Drilled Depth: 42.00 m

Contractor Name: LLOYD ANGOVE DRILLING
Driller: Lloyd John Angove
Assistant Driller: Barry ANGOVE

Property:
GWMA:
GW Zone:

Standing Water Level (m): 15.000
Salinity Description:
Yield (L/s): 1.000

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	DENISON	TOCUMWAL	198//752296
Licensed:			

Region: 50 - Murray
River Basin: 409 - MURRAY RIVERINA
Area/District:

CMA Map: 8026-S
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: Unknown

Northing: 6041490.000
Easting: 366555.000

Latitude: 35°45'41.7"S
Longitude: 145°31'25.9"E

GS Map: -
MGA Zone: 55
Coordinate Source: GIS - Geogra

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	42.00	180			Rotary Mud
1	1	Casing	Pvc Class 12	0.00	38.00	115	91		Seated on Bottom, Riveted and Glued
1	1	Opening	Slots - Diagonal	38.00	42.00	115		0	Casing - Machine Slotted, PVC Class 12, Riveted and Glued, SL: 50.0mm

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
38.00	42.00	4.00	Unknown	15.00		1.00		03:00:00	

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	1.00	1.00	Clay, dark grey	Clay	
1.00	7.00	6.00	Clay, grey	Clay	
7.00	10.00	3.00	Gravel coarse, yellow grey	Gravel with Clay	
10.00	12.00	2.00	Sand, grey	Sand	

12.00	16.00	4.00	Clay, grey	Clay	
16.00	18.00	2.00	Sand, grey	Sand	
18.00	21.00	3.00	Clay, grey	Clay	
21.00	22.00	1.00	Sandy clay, grey	Sandy Clay	
22.00	38.00	16.00	Clay, grey brown	Clay	
38.00	42.00	4.00	Sand coarse, yellow brown	Sand and clay bands	

Remarks

02/11/2011: Form A Remarks:
Entered by Clare Hillier
Unable to enter gravel pack as type and grade not nominated

***** End of GW505522 *****

Warning To Clients: This raw data has been supplied to the NSW Office of Water by drillers, licensees and other sources. The NOW does not verify the accuracy of this data. The data is presented for use by you at your own risk. You should consider verifying this data before relying on it. Professional hydrogeological advice should be sought in interpreting and using this data.

WaterNSW
Work Summary

GW504683

Licence:		**Licence Status:**	
		Authorised Purpose(s):	
		Intended Purpose(s):	STOCK, DOMESTIC
Work Type:	Bore		
Work Status:	Supply Obtained		
Construct.Method:			
Owner Type:	Private		
Commenced Date:		**Final Depth:**	36.00 m
Completion Date:	01/01/1955	**Drilled Depth:**	36.00 m
Contractor Name:			
Driller:			
Assistant Driller:			
Property:		**Standing Water Level (m):**	11.000
GWMA:		**Salinity Description:**	Good
GW Zone:		**Yield (L/s):**	1.000

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	DENISON	TOCUMWAL	198//752296
Licensed:			

Region:	50 - Murray	**CMA Map:**	8026-S
River Basin:	409 - MURRAY RIVERINA	**Grid Zone:**	**Scale:**
Area/District:			
Elevation:	0.00 m (A.H.D.)	**Northing:**	6041506.000
Elevation Source:	Unknown	**Easting:**	366331.000
GS Map:	-	**MGA Zone:**	55

Latitude: 35°45'41.1"S
Longitude: 145°31'17.0"E
Coordinate Source: Map Interpre

Remarks

01/01/1955: Form A Remarks:
Entered by Clare Hillier
Casing type steel.. Outside diam 15 length 36. Screen from 34m to 36m

***** End of GW504683 *****

Warning To Clients: This raw data has been supplied to the NSW Office of Water by drillers, licensees and other sources. The NOW does not verify the accuracy of this data. The data is presented for use by you at your own risk. You should consider verifying this data before relying on it. Professional hydrogeological advice should be sought in interpreting and using this data.

WaterNSW
Work Summary

GW273107

Licence: | **Licence Status:**

Authorised Purpose(s):
Intended Purpose(s): MONITORING BORE

Work Type: Bore
Work Status: Equipped
Construct.Method: Rotary Mud
Owner Type: NSW Office of Water

Commenced Date:
Completion Date: 24/05/2009

Final Depth: 131.00 m
Drilled Depth: 131.00 m

Contractor Name: DWE GROUNDWATER DRILLING
Driller: Daniel William Orr
Assistant Driller: Dan Whitby

Property:
GWMA:
GW Zone:

Standing Water Level (m): 35.100
Salinity Description:
Yield (L/s): 3.000

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	DENISON	WOPERANA	114//752304
Licensed:			

Region: 50 - Murray
River Basin: 409 - MURRAY RIVERINA
Area/District:

CMA Map: 8026-N
Grid Zone:
Scale:

Elevation: 107.77 m (A.H.D.)
Elevation Source: (unknown)

Northing: 6044432.000
Easting: 367236.000

Latitude: 35°44'06.6"S
Longitude: 145°31'54.8"E

GS Map: -

MGA Zone: 55

Coordinate Source: Surveyed

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	131.00	200			Rotary Mud
1		Annulus	Concrete	0.00	4.00	200	90		PL:Poured/Shovelled
1		Annulus	Waterworn/Rounded	4.00	47.00	200	90		Graded, PL:Poured/Shovelled
1		Annulus	Bentonite	47.00	48.00	200	90		PL:Poured/Shovelled
1		Annulus	Waterworn/Rounded	48.00	86.00	200	90		Graded, PL:Poured/Shovelled
1		Annulus	Bentonite	86.00	87.00	200	90		PL:Poured/Shovelled
1		Annulus	Waterworn/Rounded	87.00	131.00	200	90		Graded, PL:Poured/Shovelled
1		Casing	Casing Protector	-1.00	0.00	168	158		Cemented
1	1	Casing	Pvc Class 18	-0.50	131.00	90	77		Seated, Glued, S: 109.00-115.00m
1	1	Opening	Slots - Horizontal	106.00	109.00	90		0	Mechanically Slotted, PVC Class 18, Glued, SL: 35.0mm

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
106.00	109.00	3.00	Unknown	35.10		3.00		12:00:00	

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	3.00	3.00	Topsoil	Topsoil	
3.00	7.00	4.00	Sand, coarse	Sand	
7.00	11.00	4.00	Clay, light brown	Clay	
11.00	42.00	31.00	Clay, light brown with some Mottling	Clay	
42.00	46.00	4.00	Sand	Sand	
46.00	89.00	43.00	Clay	Clay	
89.00	111.00	22.00	Sand	Sand	
111.00	122.00	11.00	Clay	Clay	
122.00	130.00	8.00	Bedrock, weathered	Bedrock	
130.00	131.00	1.00	Bedrock	Bedrock	

Remarks

24/05/2009: Form A Remarks:
Nat Carling, 24-June-2009: GPS provided by the driller.
13/07/2010: Nat Carling, 13-July-2010: Updated coordinates & added RL's as provided by survey results received from State Water. Also updated cadastre details, as no information existed.

WaterNSW
Work Summary

GW504972

Licence:		**Licence Status:**	
		Authorised Purpose(s):	
		Intended Purpose(s):	STOCK, DOMESTIC, FARMING
Work Type:	Bore		
Work Status:	Supply Obtained		
Construct.Method:			
Owner Type:	Private		
Commenced Date:		**Final Depth:**	30.00 m
Completion Date:	01/01/1920	**Drilled Depth:**	61.00 m
Contractor Name:			
Driller:	Unkown Unknown		
Assistant Driller:			
Property:		**Standing Water Level (m):**	
GWMA:		**Salinity Description:**	
GW Zone:		**Yield (L/s):**	

Site Details

Site Chosen By:

	County	**Parish**	**Cadastre**
Form A:	DENISON	WOPERANA	114//752304
Licensed:			
Region:	50 - Murray	**CMA Map:**	8026
River Basin:	409 - MURRAY RIVERINA	**Grid Zone:**	**Scale:**
Area/District:			
Elevation:	0.00 m (A.H.D.)	**Northing:**	6044713.000
Elevation Source:	Unknown	**Easting:**	366852.000
GS Map:	-	**MGA Zone:**	55

Latitude: 35°43'57.3"S
Longitude: 145°31'39.6"E
Coordinate Source: Map Interpre

Remarks

01/01/1920: Form A Remarks:
Entered by Clare Hillier

***** End of GW504972 *****

Warning To Clients: This raw data has been supplied to the NSW Office of Water by drillers, licensees and other sources. The NOW does not verify the accuracy of this data. The data is presented for use by you at your own risk. You should consider verifying this data before relying on it. Professional hydrogeological advice should be sought in interpreting and using this data.

WaterNSW
Work Summary

GW504638

Licence:		**Licence Status:**	
		Authorised Purpose(s):	
		Intended Purpose(s):	DOMESTIC
Work Type:	Bore		
Work Status:	Supply Obtained		
Construct.Method:			
Owner Type:	Private		
Commenced Date:		**Final Depth:**	20.00 m
Completion Date:	26/05/2011	**Drilled Depth:**	20.00 m
Contractor Name:			
Driller:			
Assistant Driller:			
Property:		**Standing Water Level (m):**	
GWMA:		**Salinity Description:**	
GW Zone:		**Yield (L/s):**	

Site Details

Site Chosen By:

		County	**Parish**	**Cadastre**
	Form A:	DENISON	TOCUMWAL	1241//785541
	Licensed:			
Region:	50 - Murray	**CMA Map:**	8026	
River Basin:	409 - MURRAY RIVERINA	**Grid Zone:**		**Scale:**
Area/District:				
Elevation:	0.00 m (A.H.D.)	**Northing:**	6042861.000	**Latitude:** 35°44'58.1"S
Elevation Source:	Unknown	**Easting:**	368283.000	**Longitude:** 145°32'35.5"E
GS Map:	-	**MGA Zone:**	55	**Coordinate Source:** Map Interpre

Remarks

26/05/2011: Form A Remarks:
Entered by Clare Hillier

***** End of GW504638 *****

Warning To Clients: This raw data has been supplied to the NSW Office of Water by drillers, licensees and other sources. The NOW does not verify the accuracy of this data. The data is presented for use by you at your own risk. You should consider verifying this data before relying on it. Professional hydrogeological advice should be sought in interpreting and using this data.

WaterNSW
Work Summary

GW012744

Licence: 50WA510277 **Licence Status:** CURRENT

Authorised Purpose(s): DOMESTIC,STOCK
Intended Purpose(s): GENERAL USE

Work Type: Bore
Work Status: Supply Obtained
Construct.Method: Cable Tool
Owner Type: Private

Commenced Date:
Completion Date: 01/01/1956
Final Depth: 33.50 m
Drilled Depth:

Contractor Name: (None)
Driller:
Assistant Driller:

Property: LONGFORD RMB 1670 TOCUMWAL 2714 NSW
GWMA: 016 - LOWER MURRAY (D/S COROWA)
GW Zone: 001 - MURRAY - CALIVIL RENMARK
Standing Water Level (m):
Salinity Description:
Yield (L/s):

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	DENISON	TOCUMWAL	173
Licensed:	DENISON	BERIGAN	Whole Lot 173//752296

Region: 50 - Murray
River Basin: 409 - MURRAY RIVERINA
Area/District:
CMA Map: 8026-S
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: (Unknown)
Northing: 6041204.000
Easting: 369741.000
Latitude: 35°45'52.5"S
Longitude: 145°33'32.6"E

GS Map: -
MGA Zone: 55
Coordinate Source: GD.,ACC.MAP

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1	1	Casing	Threaded Steel	0.00	33.50	102			

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
33.50	33.50	0.00	(Unknown)	15.20					

*** End of GW012744 ***

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Appendix D

Historical aerial photographs

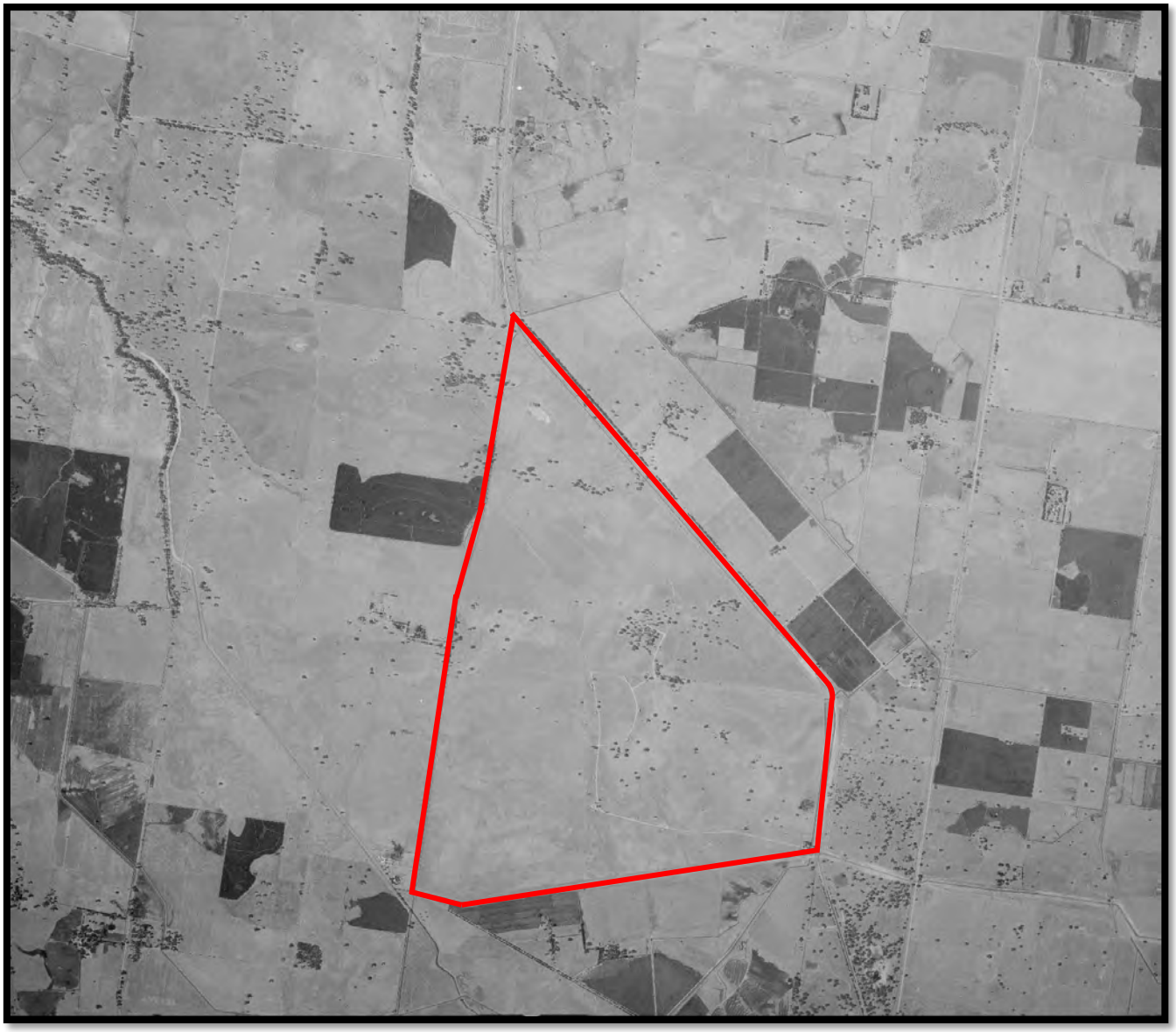
1967 - Source: NSW Historical Imagery



1975 - Source: NSW Historical Imagery



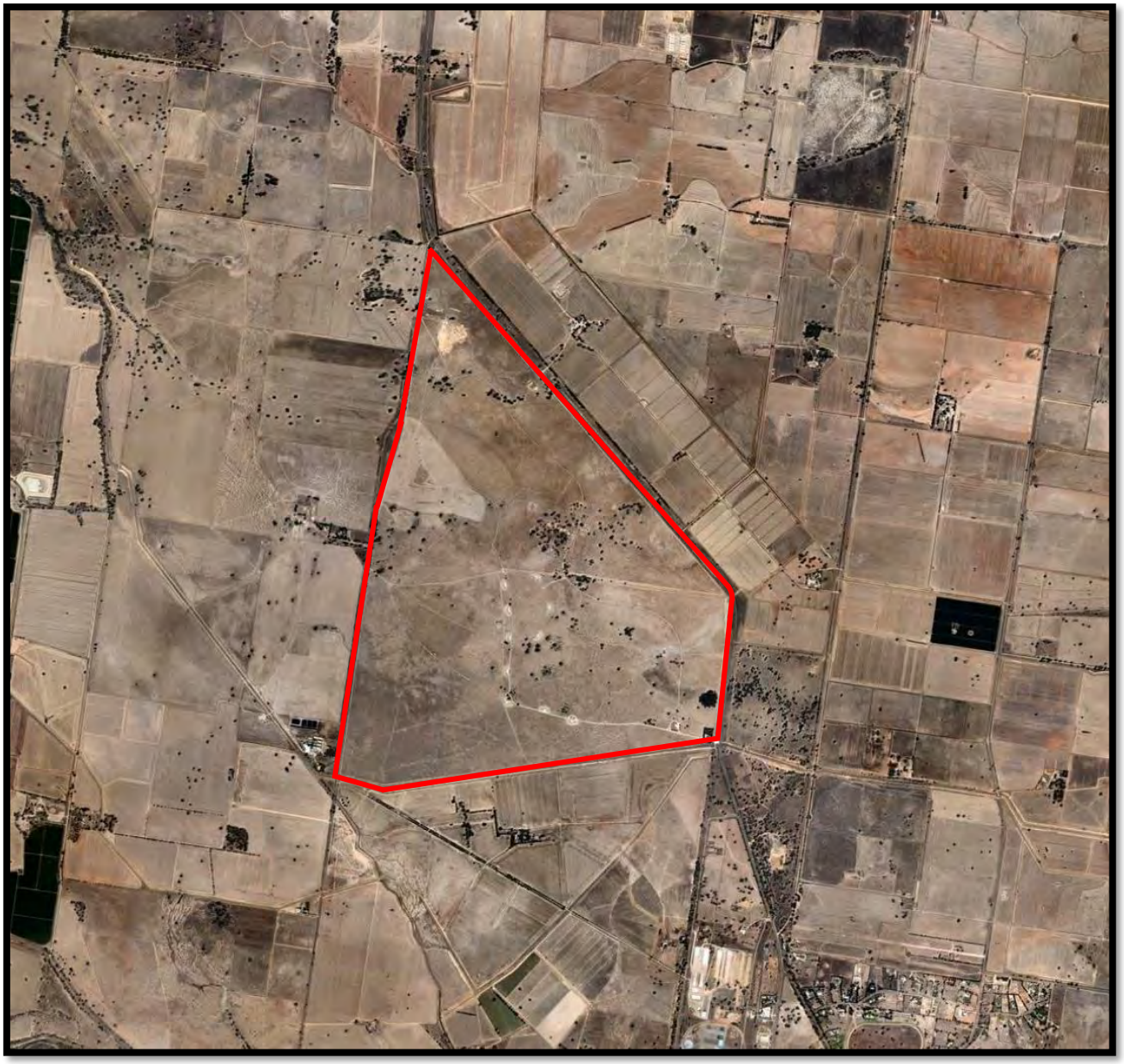
1990 - Source: NSW Historical Imagery



1995 - Source: NSW Historical Imagery



2010 - Source: Nearmaps



2023 - Source: Google Earth





ghd.com

→ The Power of Commitment

Appendix J

Preliminary Hazard Analysis, GHD 2024

GHD Advisory

Tocumwal Magazine Compound Upgrade

Preliminary Hazard Analysis

Orica Australia Pty Ltd

23 July 2024

→ **The Power of Commitment**



Project name		Orica Tocumwal Magazine Compound Upgrade					
Document title		Tocumwal Magazine Compound Upgrade | Preliminary Hazard Analysis					
Project number		12597123					
File name		12597123-RPT-0-Oricia Tocumwal Magazine Compound Upgrade.docx					
Status Code	**Revision**	**Author**	**Reviewer**		**Approved for issue**		
			Name	**Signature**	**Name**	**Signature**	**Date**
S0	A	M. Collard	F. Duncan	N/A Daft	S. Lawer	N/A Daft	16/04/2024
S4	0	M. Collard	F. Duncan		S. Lawer		23/07/2024

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Executive Summary

Orica have proposed to redevelop the Tocumwal Explosives Reserve Magazines. The proposal is to build four 250 tonne high explosive (HE) magazines and a detonator improvised explosive (IE) magazine in new locations on the existing site. The primary objective of these upgrades is to enable the site to comply with Australian Standards (AS) and relevant codes of practice. Whilst the storage orientation is changing due to the proposal, the overall quantity of explosives and diesel is not increasing. The upgraded facility will continue to operate using the existing safety management system and major hazard facility licence, updated to reflect the new magazines.

GHD Pty Ltd (GHD) was commissioned by Orica to prepare a risk screening to determine if the proposed development 'Tocumwal Magazine Compound Upgrade' ('the proposal') is 'potentially hazardous or offensive' in accordance with the State Environment Planning Policy (SEPP) (Resilience and Hazards). To meet this requirement, the following steps were taken:

– A summary of Dangerous Goods (DGs) used on-site during construction and operation
– A risk screening of DGs
– A hazard identification to demonstrate that potential hazards have been identified and control measures are in place
– A consequence analysis was conducted for hazards identified as having potential off-site impacts

The results of the hazard identification (HAZID) revealed that six hazards have the potential for off-site harm.

1. Loss of containment of diesel from the on-site storage tank
2. Loss of containment of diesel from delivery tank
3. Explosion due to pentex boosters, cordtex detonating cords or senatel magnum
4. Explosion of detonators
5. Natural hazards (e.g., flooding, earthquake, lightning, bushfire)
6. Fire started within the project area (e.g hot works)

The consequence modelling for these scenarios was performed using DNV's PHAST version 8.71 commercial software package [1] and the UN SaferGuard Quantity Distance (QD) calculator [2] .The results from the modelling of the explosives and diesel stored on-site showed that there is appropriate separation distance between the storages and the site boundary. Additionally, the consequence analysis results validate that the site upgrades specifically the relocation of the magazines further from the site boundary are an improvement. Furthermore, the new placement of the diesel tank ensures a safer distance between the diesel, which is a possible fuel source, and the magazines.

It was determined that the hazards with potential off-site impact would be suitably controlled with the control measures listed in Table 7. With these safeguards, the risk scenarios identified are controlled to an acceptable level and the project is not a hazardous industry under SEPP (Resilience and Hazards).

The analysis completed demonstrate that the proposal can be designed, constructed, and operated in a manner that will minimise hazardous impact to the public.

This report is subject to, and must be read in conjunction with, the limitations set out in section 1.2 and the assumptions and qualifications contained throughout the Report.

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1. Introduction

Orica is proposing to redevelop the Tocumwal Explosives Reserve Magazines. The proposal would bring the Tocumwal site in line with AS 2187 Australian Standards Explosives - Storage, Transport and Use [3].

The intent of the project is to remove the reliance on the exemption and become fully compliant with the Australian Standards and codes of practice. To achieve this Orica proposes to build four 250 tonne (t) HE magazines and a detonator IE magazine in new locations on the existing site. The same, or slightly reduced quantity of explosives would be stored, and the operational procedures would remain unchanged. The ten old magazines currently existing on the site would be removed and decommissioned.

1.1 Purpose of this report

GHD was commissioned by Orica to prepare a risk screening to determine if the proposed development 'Tocumwal Magazine Compound Upgrade' ('the proposal') is 'potentially hazardous or offensive' in accordance with the State Environmental Planning Policy (SEPP) (Resilience and Hazards) [4] formerly named SEPP No. 33 - Hazardous and Offensive Development.

This assessment has been prepared to inform an Environmental Impact Statement (EIS) and development application under Part 4 of the Environmental Planning and Assessment Act 1979 (EP&A Act). The assessment has been prepared in accordance with relevant statutory considerations.

This report addresses the relevant criteria in the NSW Secretary's Environmental Assessment Requirements (SEARs) (as outlined in Section 3.1) and assesses the potential hazards and risks of the project under the SEPP (Resilience and Hazards).

This report provides sufficient information and assessment of risks to demonstrate that the project will prevent, or mitigate the identified impacts, including human health, the environment and property, associated with the proposal and that the residual risk levels are acceptable in relation to the surrounding land use.

As such, this report focuses on the impact of potential hazards associated with the use of dangerous goods (DGs) and hazardous substances that may arise during the construction and operation of the project. Specifically, this report:

- Describes the existing environment with respect to the project
- Screens the quantities of DGs expected to be used during construction and operation of the project
- Assesses the impacts of construction and operation of the project specific to DGs and other hazardous substances
- Determines if the proposal is deemed a 'potentially hazardous or offensive industry'.

1.2 Scope and limitations

This report: has been prepared by GHD for Orica Australia Pty Ltd and may only be used and relied on by Orica Australia Pty Ltd for the purpose agreed between GHD and Orica Australia Pty Ltd as set out in section 1.1 of this report.

GHD otherwise disclaims responsibility to any person other than Orica Australia Pty Ltd arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report (refer section(s) 1.3 of this report). GHD disclaims liability arising from any of the assumptions being incorrect.

Accessibility of documents

If this report is required to be accessible in any other format, this can be provided by GHD upon request and at an additional cost if necessary.

1.3 Assumptions

The following assumptions have been made in the preparation of this report:

- DG quantities provided are true and correct at the time of the screening
- All plant and equipment items are installed and operated in accordance with appropriate Australian Standards, codes, and guidelines
- DGs are stored in accordance with the Australian Dangerous Goods Code (ADG Code), relevant standards and guidelines, even if not a licensable quantity
- All equipment and systems are designed to be inherently safe
- All equipment is maintained and operated as designed
- The location of the Tocumwal Magazine Compound Upgrade, as assessed in this report, is as shown in the site plan Appendix A
- The chemical data (UN number, dangerous goods classification) was based on available Safety Data Sheets (SDS) and are referenced in Appendix B
- Potential repurposing or decommissioning of the old magazines would be undertaken in the future as a separate activity and is not considered in this scoping report.
- This report is limited to assessing the number of transport movements, as required by SEPP (Resilience and Hazards) and does not assess hazards associated with hazards on the road network or Major Incidents (as defined by Major Hazard Facility regulations).

Any changes to the assumptions used in this report should result in a review of the screening process and update as required.

2. Site description

2.1 Site information

The Tocumwal Explosives Reserve is an established site responsible for storing and distributing explosives used in the mining and quarrying sector. Operated by Orica since 1966, it is situated on the Newell Highway, approximately four kilometres north of the township of Tocumwal on the NSW and Victoria (VIC) border. This site spans approximately 750 hectares of open grazing land, enclosed by a fence. It includes an office, basic machinery and storage sheds.

The existing magazine complex at Tocumwal comprises ten approximately 100-tonne magazines constructed from corrugated iron. These magazines serve as storage units for cast boosters and cord products which are both locally produced by Thales and imported from the Philippines, China, and Chile.

Tocumwal plays a crucial role as the staging point for supplying the full range of explosive products to Australian states. Given the limited magazine storage capacity in the broader supply chain, Tocumwal stands as a pivotal stock centre.

2.2 Land use

The project site is enveloped by agricultural land, with portions currently serving as grazing areas for sheep and cattle through leasing agreements. These agreements will continue after the project's completion. Additionally, the site features small farm dams and drainage lines that further facilitate its agricultural use.

Figure 1 illustrates the existing site layout and surrounding waterways, farmhouses and roads.

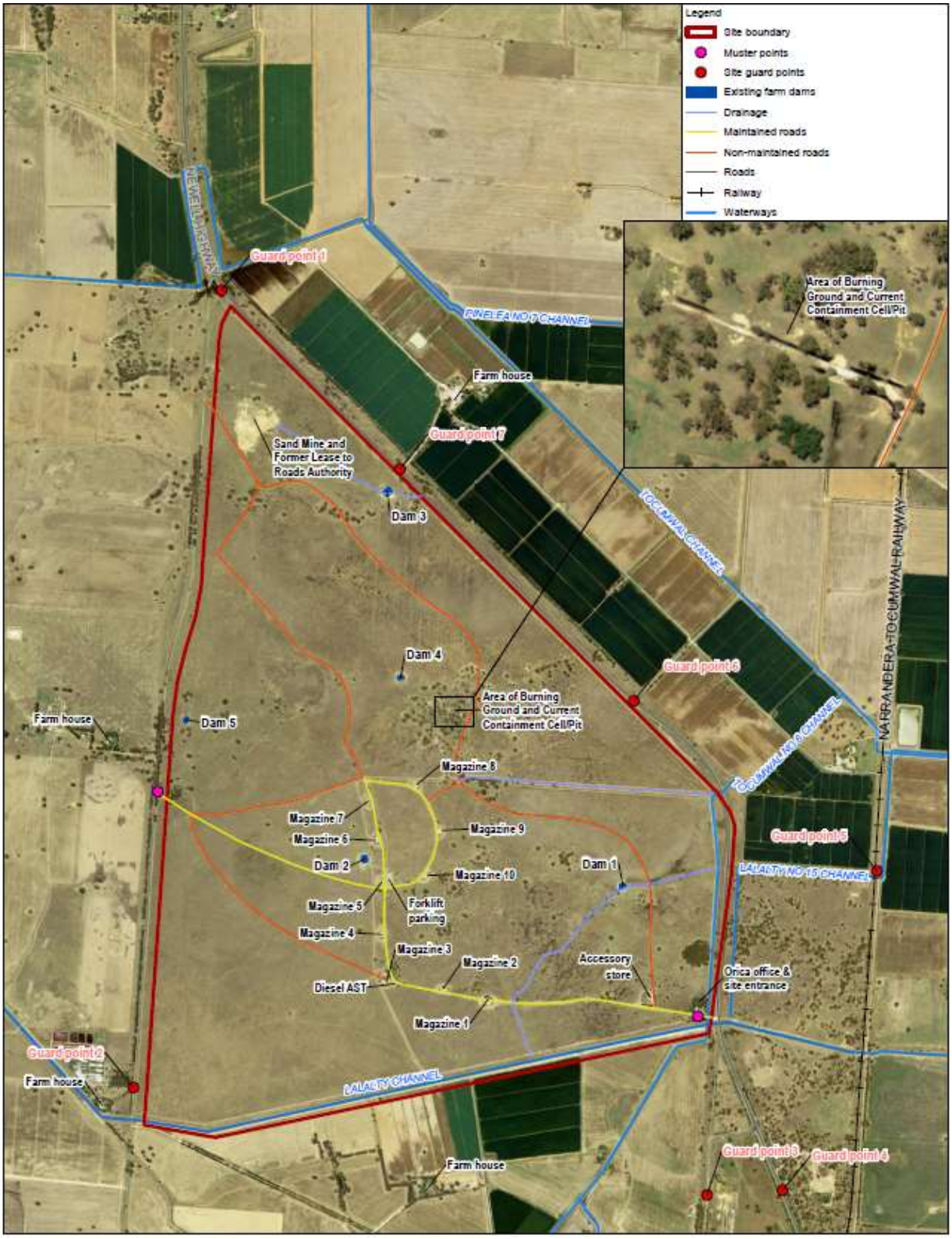


Figure 1 Existing site layout

3. Legislative and policy context

3.1 Secretary's Environmental Assessment Requirements

The SEARs requested a PHA prepared in accordance with Hazardous Industry Planning Advisory Paper No. 6 – Guidelines for Hazard Analysis [5] and Multi-Level Risk Assessment [6]. The SEARs relevant requirements with a reference to where they are addressed in this report, are outlined in Table 1.

Table 1 Hazard and risk SEARs

Requirements	Reference
Identifications of hazards posed by shipping generated by the project	Section 6
Verification that the overall site complies with the requirements under Australian Standard AS 2187 Explosives – Storage, transport and use	Section 8
Verification that the overall site complies with the requirements for ammonium nitrate (security sensitive or otherwise) under Australian Standard AS 4326 – The storage and handling of oxidising agents, if relevant	Section 8
Outcomes and all necessary actions arising from the consultation with safework NSW regarding compliance with the Explosives Act 2003 and Chapter 9 of the Work Health and Safety Regulation 2017.	Section 8

3.2 State Environmental Planning Policy (Resilience and Hazards)

The NSW Department of Planning and Environment consolidated the state environmental planning policies (SEPPs) in December 2021, for introduction in March 2022. As a result, the previously named SEPP 33 – hazardous and offensive development provisions have been transferred to the SEPP (Resilience and Hazards). No policy changes have been made. The SEPP consolidation does not change the legal effect of the SEPPs being repealed and section 30A of the Interpretation Act 1987 applies to the transferred provisions, meaning the transfer does not affect the operation or meaning of the SEPP provisions.

The Department of Planning and Environment, NSW, 2011, Applying SEPP 33: Hazardous and Offensive Development Application Guidelines continues to provide the process for assessing if developments are potentially hazardous or offensive, including threshold levels that trigger the potentially hazardous or offensive status. Applying SEPP 33 is the main guidance document that has been followed for this PHA.

3.3 Hazardous Industry Planning Advisory Paper No 4

The Department of Planning and Environment, NSW, 2011, Hazardous Industry Planning Advisory Paper No 4 – Risk Criteria for Land Use Safety Planning (HIPAP No 4) [7] sets out risk criteria for industries that are considered hazardous to comply to. This document is used when Applying SEPP 33 [4] indicates a development is potentially hazardous.

3.4 Hazardous Industry Planning Advisory Paper No 6

The Department of Planning and Environment, NSW, 2011, Hazardous Industry Planning Advisory Paper No 6 – Guidelines for Hazard Analysis (HIPAP No 6) [5] lists the process required for undertaking a PHA. This document is used when Applying SEPP 33 [4] indicates a development is potentially hazardous.

4. Methodology

The method to determine whether a project would be deemed potentially hazardous or potentially offensive and the required follow up assessments is provided in Table 2.

Table 2 Applying SEPP 33 method for potentially hazardous or offensive industries

Issue	Methodology to determine if potentially hazardous / offensive	Follow up assessment if confirmed as potentially hazardous / offensive industry
Potentially hazardous industry	Applying SEPP 33 risk screening process	Preliminary Hazard Analysis (PHA) required
Potentially offensive industry	Review of potential impacts to the amenity of the site or discharges, such as emissions (e.g., noise, air)	Meeting any licencing requirements issued by relevant authorities e.g., NSW Environmental Protection Agency (EPA) is required

The *Applying SEPP 33* process is discussed in Sections 4.1 to 4.3.

4.1 Risk screening

Applying SEPP 33 relates to any project which falls under the policy's definition of 'potentially hazardous industry' or 'potentially offensive industry'.

A 'hazardous industry' is one in which when all locational, technical, operational, and organisational safeguards are employed, continues to pose a significant risk, as per the requirements of SEPP (Resilience and Hazards). A 'potentially offensive industry' is one which would, in the absence of safeguards, emit a polluting discharge which would cause a significant level of offence.

SEPP (Resilience and Hazards) requires a screening process be undertaken. The overall risk screening process, as outlined in Applying SEPP 33 is summarised in Figure 2.

The risk screening process concentrates on the storage of specific DG classes that have the potential for significant off-site effects. Specifically, the assessment involves the identification of classes and quantities of all DGs to be used, stored, or produced on-site with an indication of storage locations. The quantities of DGs are then assessed against the Applying SEPP 33 threshold quantities. If any of the Applying SEPP 33 threshold quantities are exceeded, then that the project is potentially hazardous, then a PHA is required.

If the project is potentially offensive, after considering the quantity and nature of any discharges and the significance of the offence likely to be caused, having regard to surrounding land use and the proposed controls, then additional controls are required.

4.2 Hazard identification

Following screening, Applying SEPP 33 requires a determination of whether the proposal poses significant risk or offence. This requires identification of potential hazards to highlight any risks associated with the interaction of the proposal (as a whole) with the surrounding environment (i.e., a systematic process to identify any potential off-site impacts).

The Hazard Identification (HAZID) process is a desktop assessment and involves documenting possible events that could lead to a possible off-site incident. The assessment then lists the potential causes of the incident, as well as identification of operational and organisational safeguards to prevent the incidents from occurring or mitigate their impact. The HAZID process identifies the scenarios relevant to the PHA, should it be required.

4.3 Preliminary hazard analysis

For a development proposal classified as 'potentially hazardous', a PHA is required to determine the risk to people, property, and the environment at the proposed location and in the presence of controls. Criteria of acceptability are used to determine if the development proposal is classified as a 'hazardous industry'. If this is the case, the development proposal may not be permissible within most industrial zonings in NSW.

The PHA identifies the potential hazards, analyses these hazards in terms of their impact to people and the environment and their likelihood of occurrence, quantifies the resulting risk to surrounding land uses and assess the risk to demonstrate that the proposal will not impose an unacceptable level of risk.

Applying SEPP 33 identifies three levels of PHA. If a PHA is required, a judgement of the level of risk associated with the proposal is determined using the results of the screening and HAZID stages.

The three levels of PHA are:

– Level 1 – if low potential for harm is identified, a qualitative PHA is completed
– Level 2 – if medium potential for harm is identified, a semi-quantitative PHA is completed
– Level 3 – if high potential for harm is identified, a quantitative PHA is completed.

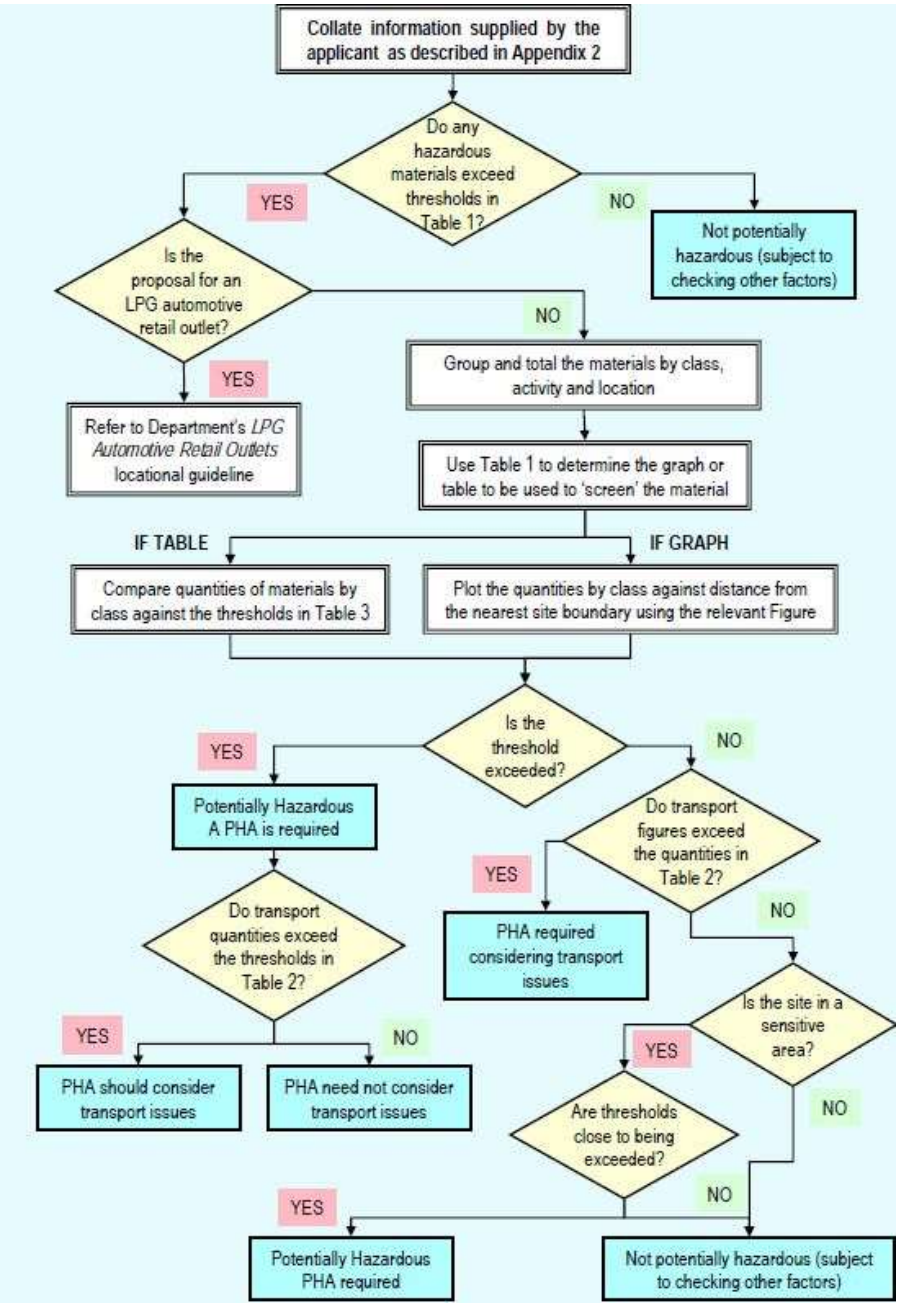


Figure 2 ***SEPP (Resilience and Hazards) risk screening process***

5. Risk screening and emissions

5.1 Dangerous goods screening

A DG is a substance or article that poses a risk to people, property, or the environment [4]. Each class represents a different type of DG. Some classes are divided into packing groups, where Packing Group (PG) I substances present a high level of danger, PG II substances present a medium level of danger, and PG III substances present a low level of danger. A summary of the different DG classes is shown in Table 3.

Table 3 Dangerous good classes [4]

DG Class	Packing Group	Description
1.1	N/A	Substances and articles which have a mass explosion hazard
1.2	N/A	Substances and articles which have a projection hazard but not a mass explosion hazard
1.3	N/A	Substances and articles which have a fire hazard and either a minor blast hazard or a minor projection hazard or both but not a mass explosion hazard
1.4	N/A	Substances and articles which present no significant hazard
1.5	N/A	Very insensitive substances which have a mass explosion hazard
1.6	N/A	Extremely insensitive articles which do not have a mass explosion hazard
2.1	N/A	Flammable gases
2.2	N/A	Non-flammable, non-toxic gases
2.3	N/A	Toxic gases
3	I, II, or III	Flammable liquids
4.1	I, II, or III	Flammable solids, self-reactive substances and solid desensitised explosives
4.2	I, II, or III	Substances liable to spontaneous combustion
4.3	I, II, or III	Substances which in contact with water emit flammable gases
5.1	I, II, or III	Oxidising substances
5.2	I, II, or III	Organic peroxides
6.1	I, II, or III	Toxic substances
6.2	I, II, or III	Infectious substances
7	N/A	Radioactive material
8	I, II, or III	Corrosive substances
9	I, II, or III	Miscellaneous dangerous goods and articles

Note, class C1 combustible liquids are not classified as DGs under the United Nations (UN) but are considered DGs under workplace legislation.

5.1.1 Construction

Due to the nature of constructing the Tocumwal Magazine Compound Upgrade it is expected that chemicals used during the construction of the proposal will be present in small quantities. A standard list of construction material and quantities have been included in Table 4. Therefore, the SEPP (Resilience and Hazards) threshold is not expected to be exceeded during construction.

Table 4 Construction dangerous goods screening

Chemical/ product	UN #	DG class	Packing group	Expected storage quantity	SEPP (Resilience and Hazards) combined storage threshold	Exceedance of SEPP (Resilience and Hazards) threshold
Spray paint	multiple	2.1 – pressurised	N/A	0.02	0.1	Pass (does not exceed)
LPG	1075	2.1 – liquified and pressurised	N/A	0.09	10	Pass (does not exceed)
Acetylene (welding)	1001	2.1 – liquified and pressurised	N/A	0.33	0.5	Pass (does not exceed)
Oxygen (welding)	1072	5.1	N/A	0.3	5	Pass (does not exceed)
Paint (oil based considered worst case)	1263	3	II	0.1	5	Pass (does not exceed)
Solvents	multiple	3	II	0.1		
Epoxy resins	multiple	3	III	0.1	5	Pass (does not exceed)
Cleaning products	multiple	8	II	0.005	25	Pass (does not exceed)
Diesel (C1)	3082	9	III	2.5	None	Pass (excluded) *
General oils and lubricants (C2)	1791	9	III	0.5		
Sealants / joint fillers	N/A	Not classified as DG		0.05	Not applicable	
Detergent	N/A	Not classified as DG		0.005	Not applicable	
Cement, grout, ready-mix concrete	N/A	Not classified as DG		Used on demand	Not applicable	
Concrete curing compounds and formwork de-bonding	N/A	Not classified as DG		Used on demand	Not applicable	
Steel – reinforcing steel and structural steel	N/A	Not classified as DG		Used on demand	Not applicable	

* This refers to dangerous goods that SEPP 33 has excluded from requiring a threshold quantity.

5.1.2 Operations of the project

A summary of the chemicals proposed to be used and/or stored on-site during operation of the proposal is shown in Table 5. Assumptions that have been made about the usage of these chemicals on-site, DG classification, quantities, and whether the chemicals exceed the SEPP (Resilience and Hazards) threshold have also been provided in Table 5. Therefore, the SEPP (Resilience and Hazards) threshold is not exceeded during operation.

Table 5 Operations dangerous goods screening

Chemical/ product	UN #	DG class	Packing group	Expected storage quantity	SEPP (Resilience and Hazards) combined storage threshold	Exceedance of SEPP (Resilience and Hazards) threshold	Comments / assumptions
Diesel	3082	Class C1 combustible liquids		2,000 Litre	None	Pass (excluded) *	
Detonators, Electric for blasting	0030	1.1B	-	10 Tonne	300 m from the site boundary	Pass (does not exceed threshold)	10 million detonators with 0.001 kg of explosives per unit each equals 10000 kg or 10 tonnes. The 0.001 kg of explosive is based on the technical data sheets in Appendix B
Detonators, non-electric for blasting	0029	1.1 B	-				
Detonator Assemblies, non-electric for blasting	0360	1.1 B	-				
Others: i-kon™ III Electronic Detonator Electric Instantaneous II Detonators Carrick II Detonators eDev™ II Electronic Detonator Exel™ Long Period Detonators Exel™ Connectadet™ Detonators Exel™ Millisecond Connectors i-kon™ III Extreme Electronic Detonator uni tronic™ 600 Electronic Detonator	0456	1.4[1]	-			Pass (excluded) [2]	

[1] Detonators are DG Class 1.4 or 1.1 B based on manufacture, the technical data sheets for the detailed type of detonators is available in Appendix B

[2] According to Applying SEPP 33 'Classes 1.4, 1.5, 1.6, 2.2, 7 and 9 are excluded from the risk screening' [4]

Pentex Boosters	0042	1.1D	-	1,000 Tonne	1,100 m from the site boundary	Pass (does not exceed threshold)	Tocumwal Explosives licence is for a maximum of 1000 tonnes (250 tonnes in four magazines)
Cordtex Detonating Cords	0065	1.1D	-		1,100 m from the site boundary	Pass (does not exceed threshold)	
Senatel Magnum	0241	1.1D	-		1,100 m from the site boundary	Pass (does not exceed threshold)	
PETN	0150	1.1D	-		1,100 m from the site boundary	Pass (does not exceed threshold)	
ANFO (Explosive, Blasting, Type B)	0082	1.1D	-		1,100 m from the site boundary	Pass (does not exceed threshold)	

* This refers to dangerous goods that SEPP 33 has excluded from requiring a threshold quantity.

5.2 Transport screening

It is assumed that during construction of the project, there will be low volumes of DGs stored in the construction compound. Therefore, the transportation volumes of chemicals during construction are minimal. Based on this, the construction of the proposal will not exceed transport screening thresholds.

Table 6 shows the transport screening for the operation of the proposal. The diesel is expected to be delivered in 20,000 L truck and the storage tank re-filled four times a year. Based on this, the operation of the proposal will not exceed transport screening thresholds.

There is no assigned transport threshold for DG class 1 as explosives are considered an accountable item and managed separately.

Table 6 Operations transport screening

Chemical/ product	DG Class	Combined transport movements (annual)	Transport movements threshold (annual)	Exceedance of SEPP (Resilience and Hazards) threshold
Diesel	9	4	>1000	Pass (does not exceed threshold)

5.3 Summary of a risk screening results

According to Applying SEPP 33, if any of the screening thresholds are exceeded then the proposed development should be considered a ‘potentially hazardous industry’ and a PHA is required.

The results of the dangerous goods screening and the transport screening indicate that the proposed Tocumwal Explosives Reserve magazines upgrade does not exceed the thresholds within the SEPP (Resilience and Hazards) requirements. The project is therefore not considered a ‘potentially hazardous industry’ and a PHA is not required.

Any change to the separation distance, the proposed design or increase in DG inventories will require a review of this assessment.

5.4 Summary of emissions

An assessment of the air quality and odour, noise and vibration and visual impacts of the proposal will be completed through the EIS. The current operation meets the relevant amenity criteria. As a result, the proposal is not considered to be ‘potentially offensive’.

6. Hazard identification and management

Due to the nature of the class 1 explosives located on-site during operation, a hazard identification process was completed, as outlined in Table 7, to demonstrate that potential hazards have been identified and control measures are in place. The basis for the hazard identification in Table 7 is taken from the Sherpa Consulting hazard and operability (HAZOP) study [8] that was completed on 19 January 2023 in line with Orica's Hazard Study 3 Guidance.

Excluding the construction risk, diesel and explosive storage hazards have existed on-site since 1966. There have been no recorded incidents in over 50 years, indicating effective risk control. The proposal will not be increasing the storage quantities on site. Additionally, relocating the magazine storage away from site boundaries reduces the risk of off-site impact or fatality. The new facility will continue to operate using existing processes and procedures once updated to reflect the new configuration.

The existing operation at Tocumwal has a dedicated truck parking area adjacent to the existing administration building complex. This operation is currently managed by the site's MHF safety management system, which includes, but is not limited to:

– Maintaining adequate distance between parked loaded trucks;
– Limiting parking to two loaded trucks at any given time;
– Contractor management of transport trucks and drivers;
– Transport Management Plan.

This operation is acknowledged as an ongoing major hazard on this site. The management of this operation will continue unabated during the completion of the project that is the subject of this preliminary hazard assessment and EIS. The presence of these trucks will be considered during construction phase hazard and Constructability (HAZCON) study and any other safety studies or hazard studies to determine any additional risk and control measures when required.

Table 7 Hazard identification

ID	Hazard scenario	Cause	Consequences	Potential to cause off-site impact	Identified / recommended safeguards
Construction					
1	Vehicle interaction within the modification area	– Vehicle movements in vicinity of personnel – Vehicle movements in vicinity of other vehicles	Personnel injury	No	– HAZCON – Prepare construction traffic management plan including standard traffic rules and signage for construction, site speed limits, site layout to minimise vehicle reversing and designated pedestrian areas where required – Driver competency – Construction machine inductions/licensing

ID	Hazard scenario	Cause	Consequences	Potential to cause off-site impact	Identified / recommended safeguards
2	Contact with chemicals, including dangerous goods	– General construction activities (welding, refuelling) – Vegetation management (herbicides)	Personnel injury	No	– Store chemicals in line with appropriate standards, such as AS1940 for flammable and combustible liquids, and AS3780 for corrosives. – Regular inspection of chemical storage areas – Safe Work Method Statement detailing safe procedures for chemical handling and transfer – Spill kits to be used in the event of an incident involving release of chemicals – PPE to all personnel handling chemicals
3	Fire started within the project area	– Hot works – Arson	Personnel injury / fatality	Yes	– Prepare construction environmental management plan, including emergency response, refuelling process and hot work permit process – Compliance with existing housekeeping standards – Existing site security (fencing and CCTV) – Inspection and maintenance regime for construction equipment
Construction and Operation					
4	Natural hazards	– Flooding, earthquake, lightning, bushfire	Personnel injury Asset damage Plant shut down	Yes	– Prepare construction environmental management plan, including emergency response – Update existing operational Safety Management System to include new infrastructure including bushfire management plan and emergency response plan – Compliance with existing earthing and bonding strategy, including provision of lightning arrestors. – Compliance with existing housekeeping standards – Site drainage design
Diesel Storage (Operation)					
5	Loss of containment of diesel from the on-site storage tank	– Large spill or leak – Human error – Damage to storage tank e.g., due to external impact or wear/ corrosion	Fire Explosion Asset Damage Personnel injury/fatality	Yes	– Store chemicals in line with AS1940 for flammable and combustible liquids – Bunded area around the tank – Emergency spill kits – Update existing operational Safety Management System to include new infrastructure including bushfire management plan and emergency response plan – Existing fire and evacuation training for staff

ID	Hazard scenario	Cause	Consequences	Potential to cause off-site impact	Identified / recommended safeguards
					– Existing fire water supply and fire main – Existing asset management system, including tanks inspections and maintenance
6	Loss of containment of diesel from delivery tank	– Overfill of tank during tank filling – Tanker drive away whilst connected – Flexible hose failure (leak/rupture) – Operator error - incorrect connection of flexible hose (connection fails)	Fire Explosion Asset Damage Personnel injury/fatality	Yes	– Store chemicals in line with AS1940 for flammable and combustible liquids – Bunded area around the tank – Emergency spill kits – Update existing operational Safety Management System to include new infrastructure including bushfire management plan and emergency response plan – Existing fire and evacuation training for staff – Existing fire water supply and fire main – Driver competency
Magazine Storage (Operation)					
7	Explosion due to: – Pentex Boosters – Cordtex Detonating Cords – Senatel Magnum	– Ignition source – Malicious intent (unauthorised access)	Explosion Asset Damage Personnel injury/fatality	Yes	– Storage complies with AS 2187 Australian Standards Explosives - Storage, Transport and Use – Existing security to prevent unauthorised entry including locks, alarms, fencing and seven guard points – Existing asset management system, including magazine inspections and maintenance – Separation distance from site boundary – Appropriately designed earthen blast mounds to minimise risk of knock-on detonation – Earth grid and lightning protection masts and conductors
8	Explosion of: – Electric Detonators	– Ignition source – Malicious intent (unauthorised access)	Explosion Asset Damage Personnel injury/fatality	Yes	– Storage complies with AS 2187 Australian Standards Explosives - Storage, Transport and Use – Existing security to prevent unauthorised entry including locks, alarms, fencing and seven guard points – Existing asset management system, including magazine inspections and maintenance – Separation distance from site boundary

7. Consequence analysis

Whilst the preliminary risk screening determined that the proposal was not potentially hazardous and a PHA is not needed, the hazard identification process indicated that there are scenarios with the potential for off-site impact. In order to confirm off-site impact, consequence analysis of these scenarios was completed.

7.1 Summary or hazard scenarios

The following six scenarios were identified to potentially have an off-site impact in the HAZID phase of the study.

1. Loss of containment of diesel from the on-site storage tank
2. Loss of containment of diesel from delivery tank
3. Explosion due to pentex boosters, cordtex detonating cords or senatel magnum
4. Explosion of detonators
5. Natural hazards (e.g., flooding, earthquake, lightning, bushfire)
6. Fire started within the project area (e.g hot works)

Hazards 5 of natural hazard like bushfire are covered in the other SEARs requirements of a bush fire assessment report. Hazard 6 is an ignition source which in a worst-case scenario could lead to an explosion, subsequently is covered in hazards 3 and 4. Therefore, only hazards 1 to 4 were modelled for consequence results.

The diesel consequence modelling was performed using DNV's PHAST version 8.71 commercial software package [1]. A summary of the model input parameters and PHAST outputs are presented in Section 7.2.

The explosion modelling was performed using the UN SaferGuard Quantity Distance (QD) calculator [2]. The calculator provides an internationally recognised review of the appropriate separation distances. It does not negate or invalidate Orica's existing process. A summary of the calculator is available in Appendix C.

7.2 Consequence results

7.2.1 Diesel loss of containment scenarios

The general modelling input parameters used in the diesel consequence modelling are shown in Table 8.

Table 8 General diesel loss of containment modelling input parameters

Parameter	Value	Units	Comment
Release location	-	-	All releases are assumed to be outdoor releases, over land
Release direction	-	-	Vertical
Height of interest	1.5	m	Representing the height of a typical person standing or crouching at work
Surface roughness	1	m	Representing regular large obstacle coverage. The surface roughness affects the turbulence in the air as it reaches the release
Ambient temperature	17	°C	Average based on the Bureau of Meteorology (BoM) statistics for Tocumwal Airport [9]
Surface temperature	17	°C	Average based on the BoM statistics for Tocumwal Airport [9]
Humidity	60	%	Average based on the BoM statistics for Tocumwal Airport [9]
Weather conditions	1/F		Wind speed: 1m/s, stability: night, moderate wind
	3/D		Wind speed: 3m/s, stability: neutral, high wind
	5/D	-	Wind speed: 5m/s, stability: neutral, high wind
Material	Diesel Fuel	-	

7.2.2 Diesel flammable limits

The flammable range of a gas is the concentration range for which it will burn if an ignition source is present. This is described by the following:

– **Upper Flammable Limit (UFL)**

  This is the upper air fuel mixture concentration at which the material will burn in air. Concentrations higher than the UFL are considered too rich to burn.

– **Lower Flammable Limit (LFL)**

  This is the lower air fuel mixture concentration at which the material will burn in air.

– **Fraction Lower Flammable Limit (0.5 LFL)**

  This is a concentration (50% LFL) providing a safety factor that gives an indication of the maximum distance at which a flammable cloud could be ignited. This considers the effects of imperfect mixing that may lead to local concentrations higher than those predicted by the dispersion modelling.

The flammability limit values are defined for diesel in Table 9, value is in ppm (parts per million).

Table 9 Flammability Limit Values

Material	0.5 LFL	LFL	UFL
Diesel fuel	2,500 ppm	5,000 ppm	45,000 ppm

7.2.2.1 Scenario 1: diesel tank

Scenario 1 is the loss of containment of the on-site tank containing 2,000 L (2 m^3) of diesel. The input parameters for scenario 1 are shown in Table 10.

Table 10 Diesel storage modelling input parameters

Parameter	Value	Units	Comment
Model	Atmospheric tank	-	-
Scenario	Catastrophic rupture	-	-
Inventory	2	m^3	Maximum inventory of the tank
Elevation	1	m	-
Tank Head	1.5	m	Average height of a small tank
Surface area under tank	Concrete		-
Bund height	0.5	m	Low wall height
Bund area	4.8	m^2	Minimum bund capacity based on 120% of the tanks inventory

The following results and respective tables were generated for this scenario. The only consequence results generated for scenario 1 are late pool fire and flash fires.

Table 11 is the dispersion result of scenario 1, the results indicate that this diesel will travel 2.7 m at 0.5 LFL (2,500 ppm) from the tank based on the downwind direction. This is minimal movement and will be effectively controlled by safeguards identified in Table 7. The dispersion results correspond with flash fire impacts. Flash fire is the combustion of flammable vapour and air mixture in which the flame passes through the mixture at a rate less than sonic velocity so that negligible damaging overpressure is generated.

Table 11 Scenario 1: dispersion and flash fire results

	Distance downwind to defined concentrations (m)		
	0.5 LFL	LFL	UFL
Scenario 1: diesel tank	2.7	2.7	2.5

Pool fire will form if a flammable or combustible liquid spill ignites. Pool fires have low momentum flames and therefore their direction is dependent on wind conditions. Late pool fire heat radiation distances for each of the relevant loss of containment scenarios are presented in Table 12 and Figure 3. The red circle (23 kW/m^2) in Figure 3 indicates an area where a pool fire is likely fatal for personnel in the area. However, it's important to note that this area does not necessitate prolonged presence of personnel nearby.

Table 12 Scenario 1: late pool fire results

	Distance downwind to intensity level (m)			
	4.7 kW/m2	**10 kW/m2**	**12.6 kW/m2**	**23 kW/m2**
Category 1/F	13.1	9.6	8.7	6.7
Category 3/D	13.4	10.3	9.5	7.8
Category 5/D	13.2	10.4	9.7	8.2



Figure 3 Scenario 1: late pool fire results

7.2.2.2 Scenario 2: diesel tanker

Scenario 2 is the loss of containment of the tanker containing 20,000 L (20 m^3) of diesel. The input parameters for scenario 2 are shown in Table 13.

Table 13 Diesel tanker modelling input parameters

Parameter	Value	Units	Comment
Model	Atmospheric tank		
Scenario	Catastrophic rupture		
Inventory	20	m^3	
Elevation	1	m	
Tank Head	3.6	m	Height of a gas tanker

The following results and respective tables were generated for this scenario: The only consequence results generated for scenario 2 are late pool fire and flash fires.

Table 14 is the dispersion result of scenario 2, the results indicate that this diesel will travel 5.4 m at 0.5 LFL (2,500 ppm) from the tanker based on the downwind direction. This is minimal movement and will be effectively controlled by safeguards identified in Table 7. The dispersion results also correspond with flash fire impacts.

Table 14 Scenario 2: dispersion and flash fire results

	Distance downwind to defined concentrations (m)		
	0.5 LFL	LFL	UFL
Scenario 2: diesel tanker	5.9	5.9	5.9

Late pool fire heat radiation distances for each of the relevant loss of containment scenarios are presented in Table 15 and Figure 4. The results show that the pool effect zone stays within the boundaries of the site at level 2 (12.6 kW/m^2).

Table 15 Scenario 2: late pool fire

	Distance downwind to intensity level (m)			
	4.7 kW/m2	10 kW/m2	12.6 kW/m2	23 kW/m2
Category 1/F	71.7	44.7	40.7	Not reached
Category 3/D	85.0	50.6	43.8	Not reached
Category 5/D	91.5	54.3	45.1	Not reached

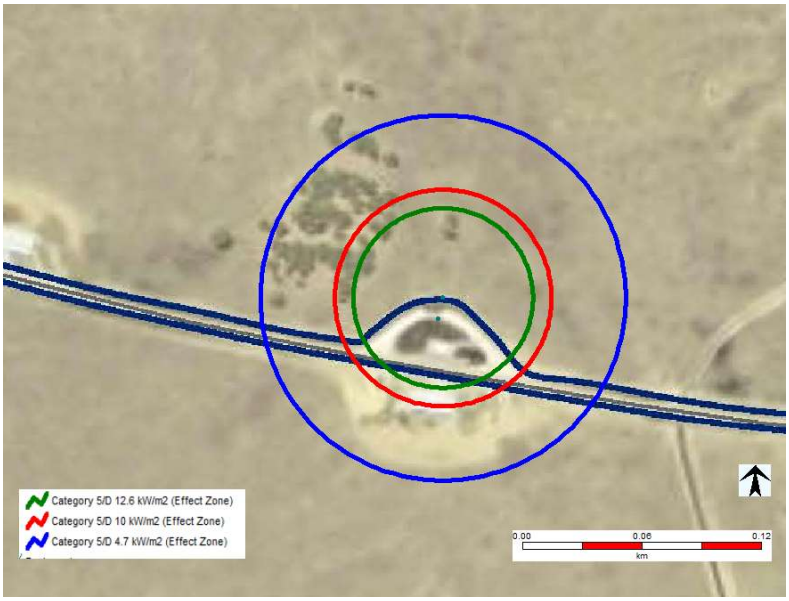


Figure 4 Scenario 2: late pool fire results

Scenario 2 has a greater impact due to the truck holding more diesel than the tank. However, both loss of containment scenarios resulting in minor on-site impacts, which can be effectively managed through proper diesel storage and refilling procedures. Furthermore, the diesel is being relocated to have a larger separation distance from the magazines.

7.2.3 Explosive

7.2.3.1 Scenario 3: magazines

The proposed site will have 4 magazines with 1.1D explosives, these magazines will have a maximum license quantity of 250 T each. This is a reduction from the original class 1.1D licence limit of 1100 T down to 1000 T.

The results in Table 16 are based on 250 tonnes of pentex boosters, cordtex detonating cords and senatel magnum using the Hopkinson-Cranz scaling law in Appendix C.

Table 16 Scenario 3: magazine explosion results

Coefficient Z (m/kg$^{1/3}$)	Definitions	Range (m)
8	Distances between ammunition process buildings (APB) within an explosive storage area (ESA).	504
14.8	Distances between an explosive storehouse (ESH) and a public traffic route with civilian access.	932
22.2	Distances between an explosive storehouse (ESH) and a building inhabited by civilians.	1396
44.4	Distances between an explosive storehouse (ESH) and a vulnerable building inhabited by civilians (e.g., a school).	2797

Figure 5 presents the results from Table 16 measuring from the new HE Magazine 05 which is closest to the site boundary. The figure highlights that coefficients 22.2 m/kg$^{1/3}$ and 44.4 m/kg$^{1/3}$ will have an off-site influence as they cross the site boundary (red line). However, it's worth noting that the orange area corresponding to 22.2 m/kg$^{1/3}$ (1396 m from the magazine) does not encompass any buildings inhabited by civilians, as indicated by the presence of green house markers. Similarly, the pink area associated with 44.4 m/kg$^{1/3}$ (2797 m from the magazine) excludes venerable buildings such as schools or nursing homes.

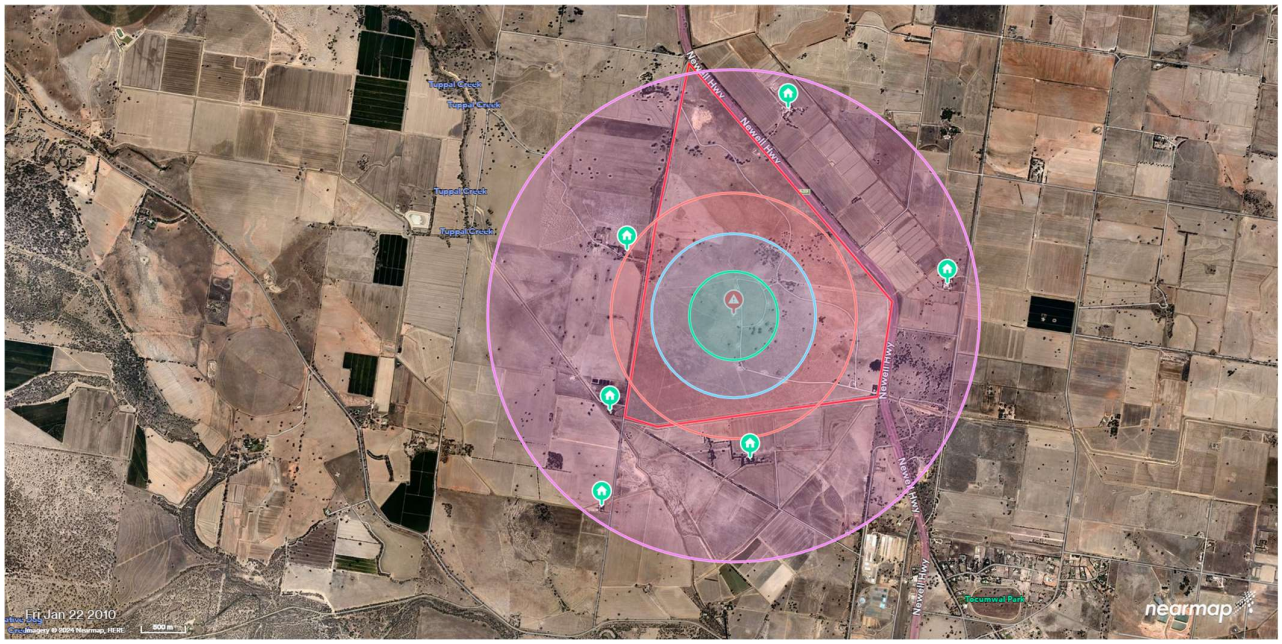


Figure 5 Scenario 3: magazine explosion results

It is important to note that these areas in Figure 5 could shift slightly depending on whether the explosion occurred at one of the other three magazines However, HE Magazine 05 is closest to the site boundary therefore the worst case scenario.

7.2.3.2 Scenario 4: detonators

The results in Table 17 are based on 10 T of electric detonators using the Hopkinson-Cranz scaling law in Appendix C.

Table 17 Scenario 4: detonators explosion results

Coefficient Z (m/kg$^{1/3)}$	Definitions	Range (m)
8	Distances between ammunition process buildings (APB) within an explosive storage area (ESA).	172

Coefficient Z (m/kg$^{1/3}$)	Definitions	Range (m)
14.8	Distances between an explosive storehouse (ESH) and a public traffic route with civilian access.	318
22.2	Distances between an explosive storehouse (ESH) and a building inhabited by civilians.	478
44.4	Distances between an explosive storehouse (ESH) and a vulnerable building inhabited by civilians (e.g., a school).	957

Figure 6 presents the results from Table 17 measuring from the only IE Magazine indicated by the red marker. The 44.4 m/kg$^{1/3}$ pink area (809 m from the magazine) is the only coefficient Z which is outside the site boundary (red line). However, that area only includes a public traffic route with civilian access and no vulnerable building inhabited by civilians.

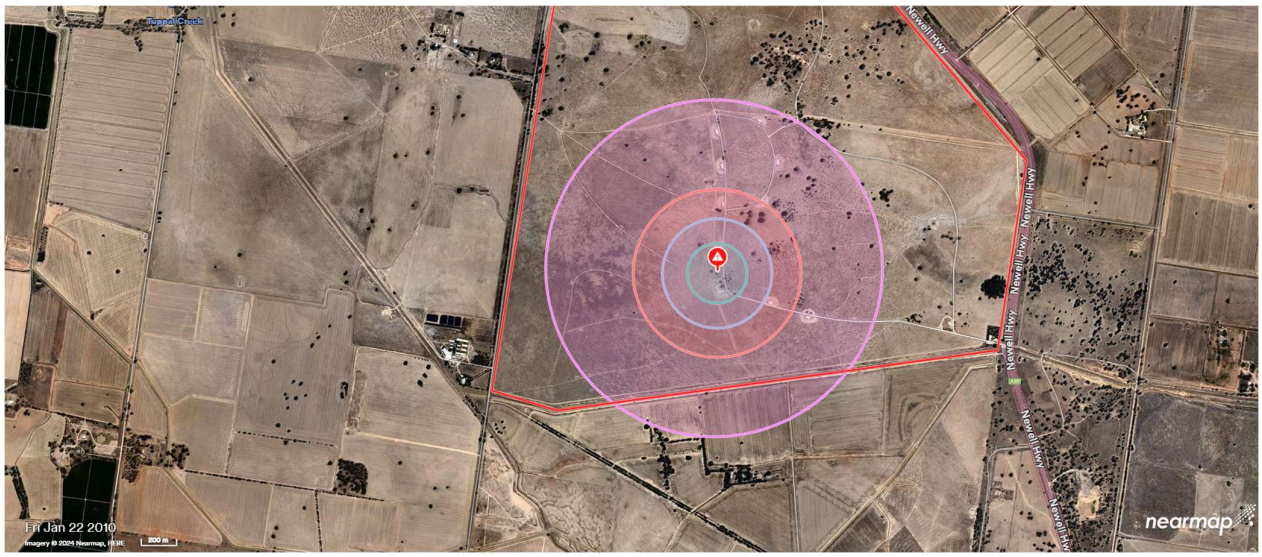


Figure 6 Scenario 4: detonator explosion results

Scenario 4 has a smaller impact compared to Scenario 3 due to the 6 T of explosives being stored, as opposed to the 250 T. While Scenario 3 could potentially have a significant impact and does affect off-site areas, it is unlikely to occur due to the safeguards in place and compliance with AS 2187.

Notably, the original site has no reported incidents in its over 50 years of operation that indicate an explosion has occurred. Furthermore, the magazines are currently undergoing upgrades to position them further away from the site boundary than the original layout. Previously, Magazine 1 was only 375 meters from the site boundary, but now the IE Magazine is the closest, situated at 640 meters from the boundary.

8. Standards and other requirements

The SEARs required verification that the whole site complied to Australian Standard AS 2187.1 Explosives – Storage, transport and use [10] and Australian Standard AS 4326 – The storage and handling of oxidising agents [11], if relevant. Whilst AS 2187.1 compliance is required, AS 4326 is not relevant[3], as none of the DGs stored on site have a DG division 5.1 classification. The following sections provide a response to the compliance to requirements. This section does not constitute an audit of the site.

8.1 Australian Standard AS 2187 1 Explosives – Storage, transport and use compliance

Table 18 provides commentary on the compliance to AS2187.1. Only the applicable sections are included.

Table 18 AS 2187.1 requirements

Sections	Applicable to Orica	Response
Section 2 design requirements	2.1 General requirements for above – ground magazine	The finalised design will include: – appropriate consideration of siting the magazines – appropriate drainage – the required vegetation clearances – the required separation distances – the required signage – appropriate lighting – the required lightning protection – the required magazine access controls, including locks – appropriate internal and external finishes
	2.4 Fixed or permanent magazines – above ground	The finalised design will include: – appropriate construction materials – the required layout dimensions – appropriate doors – appropriate ventilation – appropriate lightning protection – appropriate lighting – appropriate signage/marking
Section 3 segregation and separation distances	3.1 Segregation	The finalised design will include: – appropriate storage segregation – appropriate storage compatibility
	3.2 Separation distances - class I explosives	The finalised design will include: – appropriate magazine location to manage risk – appropriate separation distances between explosive classes – appropriate separation distances between magazines – appropriate separation from other site works, including protected works
Section 4 management of magazines	4.1 General requirements	The finalised design will include updated (as required) management plans for:

[3] AS 4326 clause 1.2.2 (b) states that this standard does no apply to forms and concentrations of ammonium nitrate that are not Divsision 5.1 dangerous goods.

Sections	Applicable to Orica	Response
		– appropriate handling exclusion zones – appropriate safety equipment
	4.2 Person in charge of a magazine	The finalised design will include updated (as required) management plans for: – appropriate nomination of persons in charge – appropriate duties
	4.3 Housekeeping	The finalised design will include updated (as required) management plans for: – appropriate exclusion of articles and materials – appropriate cleanliness – appropriate restrictions of activities
	4.4 Maintenance	The finalised design will include updated (as required) management plans for: – authorising maintenance – appropriate maintenance activities
	4.5 Materials handling equipment	The finalised design will include updated (as required) management plans for: – appropriate maintenance activities of equipment – use of appropriate powered vehicles – use of appropriate lifting appliances – use of appropriate miscellaneous equipment
	4.6 Management	The finalised design will include updated (as required) management plans for: – appropriate rules – appropriate access to site – appropriate package stacking – appropriate storage – appropriate issuing and disposal of explosives
	4.7 Records	The finalised design will include updated (as required) management plans for: – appropriate record keeping
Section 5 emergency procedures	5.1 Thunderstorms and dust storms	The finalised design will include updated (as required) management plans for: – management of activities for approaching thunderstorms and dust storms
	5.2 Theft	The finalised design will include updated (as required) management plans for: – treating explosives as an accountable item
	5.3 Fire	The finalised design will include updated (as required) management plans for: – fighting fires and firefighter risk
Appendix B	Mounding of magazines	The finalised design will include: – appropriate mounding size, location and material
Appendix C	Fencing of magazines	The finalised design will include: – appropriate fence type, location and size

8.2 Explosives Act 2003 and Chapter 9 of the Work Health and Safety Regulation 2017 compliance

SafeWork NSW provided a list of actions required as part of the proposal. These are listed in Table 19.

Table 19 SafeWork NSW requirements

Requirements	Response
Implement a security fence around the MHF facility	A security fence exists around the site.
Implement a vegetation management plan for the facility.	There is no change to the existing vegetation management because of the proposal.
Provide details for security coverage off CCTV for the magazines and the truck parking area.	The finalised design will include CCTV security coverage of relevant areas on site.
The separation distance between trucks whilst parked should meet the requirements of the relevant Australian standards.	The finalised design will meet Australian Standard requirements.
Provide details of the lightning protection system.	The finalised design will incorporate a lightning protection system.
Ensure that all safety assessments are current before implementing the change for each magazine	As part of the existing MHF Safety Case, all documentation will be reviewed and updated as required.
Prepare construction, operational hazard and risk assessments that should be submitted to SafeWork NSW	As part of the planning approval process, Final Hazard Assessment and Hazard and Operability Studies are required to be submitted. A Construction Management Plan, including associated risk assessments, will also be completed. Copies can be provided to SafeWork.
Perform a bush fire assessment report for the proposed development	A bushfire assessment has been completed as part of the EIS
Details should be provided of what will happen to the old magazines after the construction of the new magazines	The finalised design will include the decommissioning and removal of the old magazines.

9. Conclusion

This report includes a risk screening of the proposal in accordance with the requirements of the SEPP (Resilience and Hazards). The results indicate that the screening thresholds for DG storage and transportation during construction and operation are not exceeded by any of the DGs proposed to be stored.

Although none of the thresholds are exceeded a hazard identification process was completed to identify hazards with potential for off-site impacts. The process identified six hazards with the potential for off-site impact.

A consequence analysis was completed to confirm any off-site impacts. The consequence results validated that there is suitable separation of the magazine and diesel storages from, each other and the site boundary. The site upgrades, specifically the relocation of the magazines further from the site boundary, are an improvement from the previous storage arrangement. Furthermore, the new placement of the diesel tank ensures a safer distance between the diesel which is a possible ignition source and the magazines. The consequence analysis found that the hazards with potential off-site impact can be suitably controlled using the safeguards defined in Table 7.

The hazard identification and analysis demonstrate that the proposal can be designed, constructed, and operated in a manner that will minimise hazardous impact to the public.

Any changes to the assumptions used in this report should result in a review and update of the screening, HAZID, and consequence analysis processes.

10. Abbreviations

Table 20 Terms and abbreviations

Abbreviation	Description
0.5 LFL	Fraction Lower Flammable Limit
AASTP	Allied Ammunition Storage and Transport Publication
ADG	Australian Dangerous Goods Code
AS	Australian Standards
BoM	Bureau of Meteorology
DG	Dangerous Good
EIS	Environmental Impact Statement
EP&A Act	Environmental Planning and Assessment Act 1979
GHD	GHD Pty Ltd
ha	hectares
HAZID	Hazard Identification
HAZCON	Hazard and Constructability
HAZOP	Hazard and Operability
HE	High Explosive
HIPAP	Hazardous Industry Planning Advisory Paper
IE	Improvised Explosive
km	Kilometres
L	Litre
LFL	Lower Flammable Limit
m	Metres
NSW	New South Wales
PG	Packing Group
PHA	Preliminary Hazard Analysis
ppm	parts per million
QD	quantity distance
SA	South Australia
SDS	Safety Data Sheet
SEARs	Secretary's Environmental Assessment Requirements
SEPP	SEPP (Resilience and Hazards), formerly called State Environmental Planning Policy No. 33 – Hazardous and Offensive Development
T	tonnes
TNT	Trinitrotoluene
UFL	Upper Flammable Limit
UN	United Nations
US	United States
VIC	Victoria

11. References

[1] DNV, “Software for the Assessment of Flammable, Explosive and Toxic Impact (SAFETI),” DNV, Version 8.71.

[2] UN SaferGuard, “Quantity Distance Calculator,” UN SaferGuard, [Online]. Available: https://unsaferguard.org/un-saferguard/quantity-distance-calculator. [Accessed 13 March 2024].

[3] Australian Standards, “AS 2187 Explosives - Storage, transport and use,” Australian Standards, 2006.

[4] Department of Planning (DoP), Applying SEPP 33: Hazardous and Offensive Development Application Guidelines, NSW, 2011.

[5] Department of Planning (DoP, Hazardous Industry Planning Advisory Paper No. 6 – Guidelines for Hazard Analysis, NSW, 2011.

[6] Department of Planning & Infrastructure, “Multi-level Risk Assessment,” Department of Planning & Infrastructure, NSW, 2011.

[7] NSW Planning, “Hazardous Industry Planning Advisory Paper No 4 (HIPAP 4) – Risk Criteria for Land Use Safety Planning,” NSW Planning, 2011.

[8] P. Fuller, “HAZOP REPORT TOCUMWAL 2.0 HAZARD STUDY 3 MAGAZINE UPGRADES ORICA,” Sherpa Consulting, Tocumwal, 2023.

[9] Australia Bureau of Meteorology, “Summary statistics TOCUMWAL AIRPORT,” Australia Bureau of Meteorology, 4 April 2024. [Online]. Available: http://www.bom.gov.au/climate/averages/tables/cw_074106.shtml. [Accessed 4 April 2024].

[10] Australian Standard, “ AS 2187 1 Explosives – Storage, transport and use Part 1: Storage,” Australian Standard, 1998.

[11] Australian Standards, “AS 4326 – The storage and handling of oxidising agents,” Australian Standards, 2008.

[12] UN SaferGuard, “INTERNATIONAL AMMUNITION TECHNICAL GUIDELINES - Formulae for ammunition management,” United Nations Office for Disarmament Affairs, New York, 2021.

[13] Department of Planning (DoP), “Applying SEPP 33: Hazardous and Offensive Development Application Guidelines,” NSW, 2011.

[14] Department of Planning (DoP), Hazardous Industry Planning Advisory Paper No. 4 – Risk Criteria for Land Use Safety Planning, NSW, 2011.

[15] Department of Planning (DoP), “State Environmental Planning Policy (Resilience and Hazards) 2021,” NSW, 2021.

[16] Australian Standard , “AS 2187.2 Explosives - Storage and use,” Australian Standard , 2006.

[17] Australian Standards, “AS 2187 3 Explosives – Storage, transport and use (Pyrotechnics - Shopgoods fireworks - Design, performance and testing),” Australian Standards, 1999.

[18] Australian Standards, “AS 2187.4 Explosives – Storage, transport and use (Pyrotechnics - Outdoor displays),” Australian Standards, 1998.

[19] Johnex Explosives, “Johnex Instantaneous Electric Detonators,” Johnex Explosives, Australia.

Appendix A

Site layout



Legend

- Roads
- Earthen blast mound
- Phase 1 layout
- Light vehicle passing lane
- Site boundary

Paper Size ISO A4

0 50 100 150 200

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

GHD

Orica Australia Pty Ltd
Orica Tocumwal Magazine Compound Upgrade

Project No. **12597123**
Revision No. **1**
Date **13/09/2023**

Project Footprint

FIGURE 3.1

\\ghdnet\ghd\AU\Newcastle\Projects\22\12597123\GIS\Maps\Deliverables\12597123_OricaTocumwalCompound.aprx - 12597123_004_Footprint_Rev1
Print date: 13 Sep 2023 - 11:57

Data source: Phase 1 layout, Blast mound - Orica, 2023; Roads - DCS, 2023; NSW_Imagery: © Department of Customer Service 2020. Created by: egubatanga

Appendix B

Safety data sheets

SAFETY DATA SHEET

Revision date: 20-Apr-2022

Revision Number 17

1. IDENTIFICATION OF THE MATERIAL AND SUPPLIER

Product identifier

Product Name PENTEX BOOSTERS

Product Code(s) 000000009017

Other means of identification

Proper shipping name BOOSTERS

UN number 0042

Synonyms Pentex AP, Pentex AU, Pentex G, Pentex G L, Pentex G400, Pentex H, Pentex PP900, Pentex PPK, Pentex PPP, Pentex ProTECT, Pentex Stopeprime, Pentex W, Pento-Seis

Pure substance/mixture Mixture

Recommended use of the chemical and restrictions on use

Recommended use Initiating explosive charges. Restricted to professional users.

Uses advised against No information available.

Supplier
Orica Australia Pty Ltd
ABN: 99 004 117 828
1 Nicholson Street
Melbourne 3000
Australia

Telephone Number: +61 3 9665 7111
Facsimile: +61 3 9665 7937

Emergency telephone number

Emergency telephone number **AUSTRALIA: 1 800 033 111 (ALL HOURS)**
INTERNATIONAL AUSTRALIA: +61 3 9663 2130 (ALL HOURS)

Please ensure you refer to the limitations of this Safety Data Sheet as set out in the "Other Information" section at the end of this Data Sheet.

2. HAZARDS IDENTIFICATION

GHS Classification

Classified as dangerous goods in accordance with the Australian Code for the Transport of Explosives by Road and Rail.

Classified as a hazardous chemical in accordance with the criteria of Safe Work Australia - Globally Harmonized System (GHS).

Explosives	Division 1.1
Acute toxicity - Oral	Category 3

Acute toxicity - Dermal	Category 3
Acute toxicity - Inhalation (Dusts/Mists)	Category 3
Specific target organ toxicity (single exposure)	Category 1
Specific target organ toxicity (repeated exposure)	Category 2
Chronic aquatic toxicity	Category 2

SIGNAL WORD
Danger

Label elements

Exploding bomb
Skull and crossbones
Health hazard
Environment



Hazard statements
H201 - Explosive; mass explosion hazard
H301 - Toxic if swallowed
H311 - Toxic in contact with skin
H331 - Toxic if inhaled
H370 - Causes damage to organs
H373 - May cause damage to organs through prolonged or repeated exposure
H411 - Toxic to aquatic life with long lasting effects

Precautionary Statements - Prevention
Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking
Keep only in original packaging
Ground and bond container and receiving equipment
Do not subject to grinding/shock/friction
Do not breathe dusts or mists
Wash hands thoroughly after handling
Do not eat, drink or smoke when using this product
Use only outdoors or in a well-ventilated area
Wear protective gloves / protective clothing / eye protection / face protection
Avoid release to the environment
Precautionary Statements - Response
If exposed or concerned: Call a POISON CENTER or doctor
Get medical advice/attention if you feel unwell
Specific treatment (see First aid on this SDS)
IF ON SKIN: Wash with plenty of soap and water
Call a POISON CENTER or doctor/physician if you feel unwell
Take off immediately all contaminated clothing and wash it before reuse
IF INHALED: Remove person to fresh air and keep comfortable for breathing
Call a POISON CENTER or doctor/physician
IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician
Rinse mouth
In case of fire: Explosion risk. Evacuate area. DO NOT fight fire when fire reaches explosives
Collect spillage
Precautionary Statements - Storage
Store in accordance with:
AS2187.1 in a well ventilated magazine.
Store in a well-ventilated place. Keep container tightly closed
Store locked up

Precautionary Statements - Disposal
Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable
Refer to manufacturer/supplier for information on recovery/recycling

Other hazards which do not result in classification
Poisons Schedule (SUSMP) None allocated

3. COMPOSITION/INFORMATION ON INGREDIENTS

Mixture

Chemical name	CAS No.	Weight-%
Trinitrotoluene (TNT)	118-96-7	30-70%
Cyclonite (RDX, Cyclotrimethylenetrinitramine)	121-82-4	0-70%
Pentaerythritol tetranitrate (PETN)	78-11-5	0-70%
Barium sulfate	7727-43-7	<10%
Ingredients determined not to be hazardous	-	to 100%

4. FIRST AID MEASURES

Description of first aid measures

General advice For advice, contact a Poisons Information Centre (e.g. phone Australia 13 11 26; New Zealand 0800 764 766) or a doctor. Take a copy of the Safety Data Sheet when going for medical treatment. Take off contaminated clothing and shoes immediately.

Inhalation Remove to fresh air and keep at rest in a position comfortable for breathing. If breathing is difficult, (trained personnel should) give oxygen. Immediately give oxygen if victim turns blue (lips, ears, fingernails). If breathing has stopped, give artificial respiration. Get medical attention immediately.

Eye contact In the case of contact with eyes, rinse immediately with plenty of water and seek medical advice.

Skin contact Immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Call a physician immediately.

Ingestion Rinse mouth immediately and drink plenty of water. Drink 1 or 2 glasses of water. Do NOT induce vomiting. Get immediate medical advice/attention. Never give anything by mouth to an unconscious person.

Self-protection of the first aider Remove all sources of ignition. Avoid contact with skin. Do not breathe fume, gas, mist, vapours, spray. Ensure that medical personnel are aware of the material(s) involved, take precautions to protect themselves and prevent spread of contamination. Use personal protective equipment as required. See section 8 for more information.

Most important symptoms and effects, both acute and delayed

Symptoms See Section 11 for additional Toxicological Information. Nitrates can be absorbed through cut, burnt or broken skin. Dizziness. Drowsiness. May cause allergic skin reaction. Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting.

Indication of any immediate medical attention and special treatment needed

Note to physicians Treat symptomatically. Explosive material. Shrapnel from detonation may cause burns, wounds and bruises. PETN is a vasodilator. Maintain blood pressure by fluid administration.

May cause methemoglobinemia.
Clinical findings: The smooth muscle relaxant effect of nitrate salts may lead to headache,

dizziness and marked hypotension. Cyanosis is clinically detectable when approximately 15% of the haemoglobin has been converted to methaemoglobin (ferric iron). Symptoms such as headache, dizziness, weakness and dyspnoea occur when methemoglobin concentrations are 30% to 40%; at levels of about 60% stupor, convulsions, coma and respiratory paralysis occur and the blood is a chocolate brown colour. At higher levels death may result. Spectrophotometric analysis can determine the presence and concentration of methemoglobin in the blood.

Treatment:
1. Give 100% oxygen.
2. In cases of (a) ingestion: use gastric lavage, (b) contamination of skin (unburnt or burnt): continue washing to remove salts.
3. Observe blood pressure and treat hypotension if necessary.
4. When methaemoglobin concentrations exceed 40% or when symptoms are present, give methylene blue 1 or 2 mg/kg body weight in a 1% solution by slow intravenous injection. If cyanosis has not been resolved within one hour a second dose of 2 mg/kg body weight may be given. The total dose should not exceed 7 mg/kg body weight as unwanted effects such as dyspnoea, chest pain, vomiting, diarrhoea, mental confusion and cyanosis may occur. Without treatment methaemoglobin levels of 20-30% revert to normal within 3 days.
5. Bed rest is required for methaemoglobin levels in excess of 40%.
6. Continue to monitor and give oxygen for at least two hours after treatment with methylene blue.
7. Consider transfer to centre where haemoperfusion can be performed to remove the nitrates from the blood if the condition of the patient is unstable.
8. Following inhalation of oxides of nitrogen the patient should be observed in hospital for 24 hours for delayed onset of pulmonary oedema.

Further observation for 2-3 weeks may be required to detect the onset of the inflammatory changes of bronchiolitis fibrosa obliterans.

Liver and kidney damage are possible complications. Effects may be delayed.

5. FIRE FIGHTING MEASURES

Suitable Extinguishing Media

Suitable Extinguishing Media Do not fight fires involving explosives.

Unsuitable extinguishing media

Specific hazards arising from the chemical

Specific hazards arising from the chemical Explosive. May be ignited by heat, sparks or flames. May explode from friction, heat or contamination. Risk of explosion by shock or heating under confinement. On burning under confined or semi-confined conditions, some oxides of nitrogen and/or carbon will be present. Brown fumes indicate the presence of toxic oxides of nitrogen. Environmentally hazardous.

Hazardous combustion products Carbon oxides. Nitrogen oxides. Oxides of sulfur. Barium oxide.

Special protective actions for fire-fighters

Special protective equipment for fire-fighters In the case of a small fire, if actual explosive is not burning, carefully remove as much explosive as possible to a safe distance. Firefighters should wear self-contained breathing apparatus and full firefighting turnout gear. Fight fire remotely due to the risk of explosion. However, if explosive is burning, evacuate area immediately and allow to burn. DO NOT fight fire.

A major fire may involve a risk of explosion. An adjacent detonation may also involve the

risk of explosion. Mass explosion hazard. Risk of explosion by shock, friction, fire or other sources of ignition.

Hazchem code E

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Personal precautions Explosive material. Evacuate personnel to safe areas. ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). Do not subject to grinding/shock/friction. Use personal protective equipment as required. Avoid contact with skin, eyes and inhalation of vapors. Ensure adequate ventilation. Avoid generation of dust. Do not breathe dust.

Other information Refer to protective measures listed in Sections 7 and 8.

In the case of a transport accident notify the Police, Regulatory Authorities and Orica Australia Pty Ltd (Telephone: 1800 033 111 -- 24 hour service) and/or Orica New Zealand Ltd (Telephone: 0800 734 607 -- 24 hour service) or Orica International (Telephone: +61 3 9663 2130 -- 24 hour service Australia).

For emergency responders Explosive material. Remove all sources of ignition. Use personal protection recommended in Section 8.

Environmental precautions

Environmental precautions Keep out of waterways. Should not be released into the environment. Prevent product from entering drains. Local authorities should be advised if significant spillages cannot be contained.

Methods and material for containment and cleaning up

Methods for containment Prevent further leakage or spillage if safe to do so. Keep out of drains, sewers, ditches and waterways.

Methods for cleaning up Handle with care. Use non-sparking tools. Ground and bond containers when transferring material. Pick up and transfer to properly labelled containers. Avoid contamination with other substances. Keep in suitable, closed containers for disposal.

7. HANDLING AND STORAGE

Precautions for safe handling

Advice on safe handling Keep out of reach of children. Handle with care. Avoid contact with skin and eyes. Avoid breathing dust or spray mist. Avoid breathing vapors or mists. Use personal protection equipment. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Take precautionary measures against static discharges. Avoid contamination with other substances. Avoid impact with solid surfaces or other boosters. Do not drill into explosive.

General hygiene considerations Take off contaminated clothing and wash before reuse. Contaminated work clothing should not be allowed out of the workplace. Do not get in eyes, on skin, or on clothing. Handle in accordance with good industrial hygiene and safety practice.

Conditions for safe storage, including any incompatibilities

Storage Conditions Store material in a well ventilated magazine suitably licensed for the explosives hazard classification. Do not store with other explosives products that have an incompatible explosives hazard classification (for example detonators must not be stored with blasting/high explosives). Store in accordance with the particular national regulations. Keep

away from heat, sparks, flame and other sources of ignition (i.e., pilot lights, electric motors and static electricity). Store in a cool, dry area away from potential sources of heat, open flames, sunlight or other chemicals. Store away from other materials. Protect from physical damage. Keep/store only in original container. Protect from moisture.

Incompatible materials Incompatible with combustible materials. Incompatible with oxidizing agents. Incompatible with reducing agents. Incompatible with strong acids and bases.

Poisons Schedule (SUSMP) None allocated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Exposure Limits No value assigned for this specific material by Safe Work Australia. However, Workplace Exposure Standard(s) for constituent(s) and decomposition product(s):

2,4,6-Trinitrotoluene (TNT): 8hr TWA = 0.5 mg/m^3, Sk
Cyclonite: 8hr TWA = 1.5 mg/m^3, Sk
Barium sulfate: 8hr TWA = 10 mg/m^3
Nitrogen dioxide: 8hr TWA = 5.6 mg/m^3 (3 ppm), 15 min STEL = 9.4 mg/m^3 (5 ppm)

As published by Safe Work Australia Workplace Exposure Standards for Airborne Contaminants.

TWA - The time-weighted average airborne concentration of a particular substance when calculated over an eight-hour working day, for a five-day working week.

`Sk' (skin) Notice - absorption through the skin may be a significant source of exposure. The exposure standard is invalidated if such contact should occur.

STEL (Short Term Exposure Limit) - the airborne concentration of a particular substance calculated as a time-weighted average over 15 minutes, which should not be exceeded at any time during a normal eight hour work day. According to current knowledge this concentration should neither impair the health of, nor cause undue discomfort to, nearly all workers.

These Workplace Exposure Standards are guides to be used in the control of occupational health hazards. All atmospheric contamination should be kept to as low a level as is workable. These workplace exposure standards should not be used as fine dividing lines between safe and dangerous concentrations of chemicals. They are not a measure of relative toxicity.

Appropriate engineering controls

Engineering controls Apply technical measures to comply with the occupational exposure limits. Ensure adequate ventilation, especially in confined areas.

If in the handling and application of this material, safe exposure levels could be exceeded, the use of engineering controls such as local exhaust ventilation must be considered and the results documented. If achieving safe exposure levels does not require engineering controls, then a detailed and documented risk assessment using the relevant Personal Protective Equipment (PPE) (refer to PPE section below) as a basis must be carried out to determine the minimum PPE requirements.

Individual protection measures, such as personal protective equipment

The selection of PPE is dependent on a detailed risk assessment. The risk assessment should consider the work situation, the physical form of the chemical, the handling methods, and environmental factors.

OVERALLS, SAFETY SHOES, SAFETY GLASSES, GLOVES, DUST MASK.



Eye/face protection	Wear safety glasses with side shields (or goggles).
Skin and body protection	Overalls. Protective shoes or boots.
Hand protection	Protective gloves.
Respiratory protection	If determined by a risk assessment an inhalation risk exists, wear a dust mask/respirator meeting the requirements of AS/NZS 1715 and AS/NZS 1716.
Environmental exposure controls	No information available.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Physical state	Solid
Appearance	Article. Cardboard or plastic tubes, with or without caps. Various colours.
Color	Tan to Brown (contents)
Odor	Mild
Odor threshold	No information available.

Property	**Values**	**Remarks • Method**
pH	No data available	None known
pH (as aqueous solution)	No data available	None known
Melting point / freezing point	No data available	None known
Boiling point / boiling range	No data available	None known
Flash point	No data available	None known
Evaporation rate	No data available	None known
Flammability (solid, gas)	No data available	None known
Flammability Limit in Air		None known
Upper flammability or explosive limits	No data available	
Lower flammability or explosive limits	No data available	
Vapor pressure	No data available	None known
Vapor density	No data available	None known
Relative density	1.5-1.8 @ 20C	None known
Water solubility	Insoluble in water	None known
Solubility(ies)	No data available	None known
Partition coefficient	No data available	None known
Autoignition temperature	No data available	None known
Decomposition temperature	No data available	None known
Kinematic viscosity	No data available	None known
Dynamic viscosity	No data available	None known

Other information

10. STABILITY AND REACTIVITY

Reactivity

Reactivity Explosive.

Chemical stability

Stability Explosive. Risk of explosion by shock, friction, fire or other sources of ignition. Heating, particularly under confinement, may cause an explosion. May cause a mass explosion. Detonation may occur from impact, friction, or excessive heating.

Explosion data

Sensitivity to mechanical impact Yes.

Sensitivity to static discharge Yes.

Possibility of hazardous reactions

Possibility of hazardous reactions A major fire may involve a risk of explosion. An adjacent detonation may also involve the risk of explosion. Mass explosion hazard. Explosion may result due to shock, friction, fire or other sources of ignition. Detonation may occur from heavy impact or excessive heating. Explosion creates the potential for shrapnel.

Hazardous polymerization Hazardous polymerization does not occur.

Conditions to avoid

Conditions to avoid Heat. Keep away from open flames, hot surfaces and sources of ignition. Static discharge (electrostatic discharge). Do not subject to grinding/shock/friction. Avoid contact with other chemicals. Avoid contact with combustible substances. Protect from moisture. Avoid impact with solid surfaces or other boosters. Avoid contamination of the material.

Incompatible materials

Incompatible materials Incompatible with combustible materials. Incompatible with oxidizing agents. Incompatible with reducing agents. Incompatible with strong acids and bases.

Hazardous decomposition products

Hazardous decomposition products Carbon oxides. Nitrogen oxides. Oxides of sulfur. Barium oxide.

11. TOXICOLOGICAL INFORMATION

Acute toxicity

Information on likely routes of exposure

Product Information No adverse health effects expected if the chemical is handled in accordance with this Safety Data Sheet and the chemical label. Symptoms or effects that may arise if the chemical is mishandled and overexposure occurs are:

Inhalation May cause irritation of respiratory tract. Toxic by inhalation. May cause central nervous system depression with nausea, headache, dizziness, vomiting, and incoordination. May cause a reduction in blood pressure.

Eye contact May cause irritation.

Skin contact May cause irritation. Toxic in contact with skin. May be absorbed through the skin in harmful amounts. Nitrates can be absorbed through cut, burnt or broken skin. May cause sensitization in susceptible persons. Repeated or prolonged skin contact may cause allergic reactions with susceptible persons. Shrapnel from detonation may cause burns, wounds and bruises. Further information is provided under 'Chronic Effects'.

Ingestion Toxic if swallowed. Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhoea. May cause central nervous system depression. May cause a lowering of blood pressure (hypotension). May cause adverse liver effects. Ingestion of larger amounts may cause defects to the central nervous system (e.g. dizziness, headache). May cause drowsiness or dizziness. May cause seizures, convulsions.

Symptoms Dizziness. Drowsiness. May cause allergic skin reaction. Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting.

Numerical measures of toxicity - Product Information

No information available.

Numerical measures of toxicity - Component Information

Component Information

Chemical name	Oral LD50	Dermal LD50	Inhalation LC50
Trinitrotoluene (TNT)	= 795 mg/kg (Rat) = 607 mg/kg (Rat)	-	-
Cyclonite (RDX, Cyclotrimethylenetrinitramine)	= 71 mg/kg (Rat)	-	-
Pentaerythritol tetranitrate (PETN)	= 1660 mg/kg (Rat)	-	-
Barium sulfate	= 307000 mg/kg (Rat)	-	-

See section 16 for terms and abbreviations

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Skin corrosion/irritation No information available.

Serious eye damage/eye irritation No information available.

Respiratory or skin sensitization No information available.

Germ cell mutagenicity No information available.

Carcinogenicity No information available.

Reproductive toxicity No information available.

STOT - single exposure Causes damage to organs.

STOT - repeated exposure May cause damage to organs through prolonged or repeated exposure.

Aspiration hazard No information available.

Chronic effects: Available evidence from animal studies indicate that repeated or prolonged exposure to a component of this material could result in effects on the blood system, central nervous system, bone marrow, eye, kidneys and liver. Repeated or prolonged skin contact may cause dermatitis.

For TNT, evidence from studies on exposed workers has shown increased incidences of catarats following chronic exposure. Blood effects observed in exposed workers include aplastic anaemia, leucocytosis, leucopenia and methaemoglobinaemia.
2,4,6-Trinitrotoluene is mutagenic in bacteria with and without metabolic activation. This

material has been classified by the International Agency for Research on Cancer (IARC) as a Group 3 agent. Group 3 - The agent is not classifiable as to its carcinogenicity to humans. Data available is insufficient for an assessment to be made.

Workers exposed to oral doses of the component RDX (unspecified amounts) have experienced neurological dysfunction (mainly seizures and convulsions), alterations in blood pressure, disorientation, nausea, restlessness, muscle twitching and lethargy. Rats and other exposed animals were reported to develop seizures, tremors, decreased body weight, liver and kidney damage, blood disorders and hyperactivity.

PETN is absorbed slowly through the lungs and gastrointestinal tract but not appreciably through the skin. Vasodilatory agent, therefore causes dilation of the blood vessels and a reduction in blood pressure. Exposure to high doses may cause methaemoglobinaemia. Negative in AMES test for mutagenicity.

12. ECOLOGICAL INFORMATION

Ecotoxicity

Ecotoxicity Keep out of waterways. Toxic to aquatic life with long lasting effects.

Chemical name	Algae/aquatic plants	Fish	Toxicity to microorganisms	Crustacea
Cyclonite (RDX, Cyclotrimethylenetrinitramine)	-	LC50: 1.9 - 6.6mg/L (96h, Lepomis macrochirus) LC50: 5.6 - 10mg/L (96h, Lepomis macrochirus) LC50: 5.4 - 7.4mg/L (96h, Oncorhynchus mykiss) LC50: 5 - 8.7mg/L (96h, Pimephales promelas) LC50: 3.0 - 5.0mg/L (96h, Pimephales promelas)	-	-
Pentaerythritol tetranitrate (PETN)	-	LC50: =926mg/L (96h, Pimephales promelas)	-	-

Persistence and degradability

Persistence and degradability No information available.

Bioaccumulative potential

Bioaccumulation Bioaccumulation is not expected.

Chemical name	Partition coefficient
Trinitrotoluene (TNT)	1.6

Mobility

Mobility in soil For RDX:. Expected to be mobile in soil.

Other adverse effects

Chemical name	EU - Endocrine Disrupters Candidate List	EU - Endocrine Disruptors - Evaluated Substances	Endocrine disrupting potential
Cyclonite (RDX, Cyclotrimethylenetrinitramine)	Group III Chemical	-	-

13. DISPOSAL CONSIDERATIONS

Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations. Should not be released into the environment. Small quantities of damaged or deteriorated explosives may be destroyed by inclusion in a blast hole containing good explosive (s). For large quantities of damaged or deteriorated explosives notify Orica Australia Pty Ltd and/or Orica New Zealand Pty Ltd.

14. TRANSPORT INFORMATION

ADG
Classified as Dangerous Goods by the criteria of the Australian Code for the Transport of Explosives by Road and Rail; DANGEROUS GOODS.

UN number	0042
Proper shipping name	BOOSTERS
Hazard class	1.1D
Hazchem code	E

IATA
Forbidden

IMDG
Classified as Dangerous Goods by the criteria of the International Maritime Dangerous Goods Code (IMDG Code) for transport by sea; DANGEROUS GOODS.

UN number	0042
UN proper shipping name	BOOSTERS
Transport hazard class(es)	1.1D
IMDG EMS Fire	F-B
IMDG EMS Spill	S-X

15. REGULATORY INFORMATION

Safety, health and environmental regulations/legislation specific for the substance or mixture

National regulations

Australia
Classified as dangerous goods in accordance with the Australian Code for the Transport of Explosives by Road and Rail.

Classified as a hazardous chemical in accordance with the criteria of Safe Work Australia - Globally Harmonized System (GHS).

See section 8 for national exposure control parameters

Poisons Schedule (SUSMP) None allocated

International Inventories
AIIC All the constituents of this material are listed on the Australian Inventory of Industrial Chemicals.

Legend:
- Australian Inventory of Industrial Chemicals

International Regulations

The Montreal Protocol on Substances that Deplete the Ozone Layer Not applicable

The Stockholm Convention on Persistent Organic Pollutants Not applicable

The Rotterdam Convention Not applicable

16. OTHER INFORMATION

International Agency for Research on Cancer. In: `IARC Monographs on the Evaluation of Carcinogenic Risk to Humans'. World Health Organisation, Vol 65, 1996
Toxicology Profile for RDX; Agency for Toxic Substances and Disease Registry; US Department of Health and Human Services; 01/2012

Reason(s) For Issue: Revised Primary SDS
Change to Product Name

Issuing Date: 20-Apr-2022

This Safety Data Sheet has been prepared by Ixom Operations Pty Ltd (Toxicology and SDS Services).

Revision Note:
The symbol (*) in the margin of this SDS indicates that this line has been revised.

Key or legend to abbreviations and acronyms used in the safety data sheet

Legend Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

TWA	TWA (time-weighted average)	STEL	STEL (Short Term Exposure Limit)
Ceiling	Maximum limit value	*	Skin designation
C	Carcinogen		

Key literature references and sources for data used to compile the SDS

EPA (Environmental Protection Agency)
Acute Exposure Guideline Level(s) (AEGL(s))
U.S. Environmental Protection Agency Federal Insecticide, Fungicide, and Rodenticide Act
U.S. Environmental Protection Agency High Production Volume Chemicals
Food Research Journal
Hazardous Substance Database
International Uniform Chemical Information Database (IUCLID)
Japan GHS Classification
Australian Industrial Chemicals Introduction Scheme (AICIS)
NIOSH (National Institute for Occupational Safety and Health)
National Library of Medicine's ChemID Plus (NLM CIP)
National Library of Medicine's PubMed database (NLM PUBMED)
National Toxicology Program (NTP)
New Zealand's Chemical Classification and Information Database (CCID)
Organization for Economic Co-operation and Development Environment, Health, and Safety Publications
Organization for Economic Co-operation and Development High Production Volume Chemicals Program
Organization for Economic Co-operation and Development Screening Information Data Set
RTECS (Registry of Toxic Effects of Chemical Substances)
World Health Organization

Disclaimer
This SDS summarises to our best knowledge at the date of issue, the chemical health and safety hazards of the material

and general guidance on how to safely handle the material in the workplace. Since The Supplier cannot anticipate or control the conditions under which the product may be used, each user must, prior to usage, assess and control the risks arising from its use of the material.

If clarification or further information is needed, the user should contact their Supplier representative or The Supplier at the contact details on page 1.

The Supplier's responsibility for the material as sold is subject to the terms and conditions of sale, a copy of which is available upon request.

End of Safety Data Sheet

SAFETY DATA SHEET

Revision date: 21-Aug-2020

Revision Number 6

1. IDENTIFICATION OF THE MATERIAL AND SUPPLIER

Product identifier

Product Name ANFO

Product Code(s) 000022013201

Other means of identification

Proper shipping name EXPLOSIVE, BLASTING, TYPE B

UN number 0082

Synonyms Ammonium nitrate/fuel oil, ANFO 94/6

Pure substance/mixture Mixture

Recommended use of the chemical and restrictions on use

Recommended use Blasting explosive.

Uses advised against Do not use in reactive ground.

Supplier
Orica Australia Pty Ltd
ABN: 99 004 117 828
1 Nicholson Street
Melbourne 3000
Australia

Telephone Number: +61 3 9665 7111
Facsimile: +61 3 9665 7937

Emergency telephone number

Emergency telephone number **AUSTRALIA: 1 800 033 111 (ALL HOURS)**
INTERNATIONAL AUSTRALIA: +61 3 9663 2130 (ALL HOURS)

Please ensure you refer to the limitations of this Safety Data Sheet as set out in the "Other Information" section at the end of this Data Sheet.

2. HAZARDS IDENTIFICATION

GHS Classification

Classified as dangerous goods in accordance with the Australian Code for the Transport of Explosives by Road and Rail.

Classified as a hazardous chemical in accordance with the criteria of Safe Work Australia - Globally Harmonized System (GHS).

Explosives	Division 1.1
Serious eye damage/eye irritation	Category 2A
Carcinogenicity	Category 2

SIGNAL WORD
Danger

Label elements

Exploding bomb
Exclamation mark
Health hazard



Hazard statements
H201 - Explosive; mass explosion hazard
H319 - Causes serious eye irritation
H351 - Suspected of causing cancer

The following health/environmental hazard categories fall outside the scope of the Workplace Health and Safety Regulations:
H412 - Harmful to aquatic life with long lasting effects

Precautionary Statements - Prevention
Obtain special instructions before use
Do not handle until all safety precautions have been read and understood
Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking
Do not subject to grinding/shock/friction
Wash hands thoroughly after handling
Wear eye protection/ face protection
Precautionary Statements - Response
IF exposed or concerned: Get medical advice/attention
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
If eye irritation persists: Get medical advice/attention
In case of fire: Evacuate area
Explosion risk in case of fire
DO NOT fight fire when fire reaches explosives
Precautionary Statements - Storage
Store in accordance with:
AS2187.1 in a well ventilated magazine.
Store locked up
Precautionary Statements - Disposal
Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

Other hazards which do not result in classification
Harmful to aquatic life with long lasting effects

Poisons Schedule (SUSMP) None allocated

3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance

Not applicable

Mixture

Chemical name	CAS No.	Weight-%
Ammonium nitrate	6484-52-2	>90%

Fuels, diesel	68334-30-5	<10%
Ingredients determined not to be hazardous	-	<1%

4. FIRST AID MEASURES

Description of first aid measures

General advice For advice, contact a Poisons Information Centre (e.g. phone Australia 13 11 26; New Zealand 0800 764 766) or a doctor. Take a copy of the Safety Data Sheet when going for medical treatment.

Emergency telephone number Poisons Information Center, Australia: 13 11 26
Poisons Information Center, New Zealand: 0800 764 766

Inhalation Remove to fresh air and keep at rest in a position comfortable for breathing. Administer oxygen if breathing is difficult. If breathing has stopped, give artificial respiration. Get medical attention immediately.

Eye contact Immediately flush with plenty of water. After initial flushing, remove any contact lenses and continue flushing for at least 15 minutes. Keep eye wide open while rinsing. Get medical attention immediately if symptoms occur.

Skin contact Wash off immediately with plenty of water. Get medical attention if irritation develops and persists. Take off contaminated clothing and wash before reuse.

Ingestion Clean mouth with water and drink afterwards plenty of water. Do NOT induce vomiting. Get medical attention. Never give anything by mouth to an unconscious person.

Self-protection of the first aider Remove all sources of ignition. Ensure that medical personnel are aware of the material(s) involved, take precautions to protect themselves and prevent spread of contamination. Use personal protective equipment as required. See section 8 for more information.

Most important symptoms and effects, both acute and delayed

Symptoms May cause redness and tearing of the eyes. Nitrates can be absorbed through cut, burnt or broken skin.

Indication of any immediate medical attention and special treatment needed

Note to physicians Treat symptomatically. Explosive material. Shrapnel from detonation may cause burns, wounds and bruises. Treat as for exposure to nitrates. May cause methemoglobinemia.

Clinical findings: The smooth muscle relaxant effect of nitrate salts may lead to headache, dizziness and marked hypotension. Cyanosis is clinically detectable when approximately 15% of the haemoglobin has been converted to methaemoglobin (ferric iron). Symptoms such as headache, dizziness, weakness and dyspnoea occur when methemoglobin concentrations are 30% to 40%; at levels of about 60% stupor, convulsions, coma and respiratory paralysis occur and the blood is a chocolate brown colour. At higher levels death may result. Spectrophotometric analysis can determine the presence and concentration of methemoglobin in the blood.

1. Give 100% oxygen.
2. In cases of (a) ingestion: use gastric lavage, (b) contamination of skin (unburnt or burnt): continue washing to remove salts.
3. Observe blood pressure and treat hypotension if necessary.
4. When methaemoglobin concentrations exceed 40% or when symptoms are present, give methylene blue 1 or 2 mg/kg body weight in a 1% solution by slow intravenous injection. If cyanosis has not been resolved within one hour a second dose of 2 mg/kg body weight may be given. The total dose should not exceed 7 mg/kg body weight as unwanted effects such as dyspnoea, chest pain, vomiting, diarrhoea, mental confusion and cyanosis may occur.

Without treatment methaemoglobin levels of 20-30% revert to normal within 3 days.
5. Bed rest is required for methaemoglobin levels in excess of 40%.
6. Continue to monitor and give oxygen for at least two hours after treatment with methylene blue.
7. Consider transfer to centre where haemoperfusion can be performed to remove the nitrates from the blood if the condition of the patient is unstable.
8. Following inhalation of oxides of nitrogen the patient should be observed in hospital for 24 hours for delayed onset of pulmonary oedema.

Further observation for 2-3 weeks may be required to detect the onset of the inflammatory changes of bronchiolitis fibrosa obliterans.

5. FIRE FIGHTING MEASURES

Suitable Extinguishing Media

Suitable Extinguishing Media Do not fight fires involving explosives.

Unsuitable extinguishing media .

Specific hazards arising from the chemical

Specific hazards arising from the chemical Explosive. May be ignited by heat, sparks or flames. May explode from friction, heat or contamination. Risk of explosion by shock or heating under confinement. On burning under confined or semi-confined conditions, some oxides of nitrogen and/or carbon will be present. Brown fumes indicate the presence of toxic oxides of nitrogen.

Hazardous combustion products Carbon oxides. Nitrogen oxides. Ammonium nitrate fumes. Ammonia.

Special protective actions for fire-fighters

Special protective equipment for fire-fighters In the case of a small fire, if actual explosive is not burning, carefully remove as much explosive as possible to a safe distance. Firefighters should wear self-contained breathing apparatus and full firefighting turnout gear. However, if explosive is burning, evacuate area immediately and allow to burn. DO NOT fight fire.

A major fire may involve a risk of explosion. An adjacent detonation may also involve the risk of explosion. Mass explosion hazard.

Hazchem code E

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Personal precautions Explosive material. Evacuate personnel to safe areas. ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). Do not subject to grinding/shock/friction. Use personal protective equipment as required. Avoid contact with skin, eyes and inhalation of vapors. Ensure adequate ventilation.

Other information Refer to protective measures listed in Sections 7 and 8.

In the case of a transport accident notify the Police, Regulatory Authorities and Orica Australia Pty Ltd (Telephone: 1800 033 111 -- 24 hour service) and/or Orica New Zealand Ltd (Telephone: 0800 734 607 -- 24 hour service) or Orica International (Telephone: +61 3 9663 2130 -- 24 hour service Australia).

For emergency responders Explosive material. Remove all sources of ignition. Use personal protection recommended in Section 8.

Environmental precautions

Environmental precautions Keep out of waterways. Local authorities should be advised if significant spillages cannot be contained.

Methods and material for containment and cleaning up

Methods for containment Prevent further leakage or spillage if safe to do so. Keep out of drains, sewers, ditches and waterways.

Methods for cleaning up Handle with care. Take up with inert, damp, non-combustible material using clean non-sparking tools and place into loosely covered plastic containers for later disposal. After cleaning, flush away traces with water.

7. HANDLING AND STORAGE

Precautions for safe handling

Advice on safe handling Keep out of reach of children. Handle with care. Avoid contact with skin and eyes. Avoid breathing vapors or mists. Use personal protection equipment. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Take precautionary measures against static discharges. Avoid contamination with other substances.

General hygiene considerations Contaminated work clothing should not be allowed out of the workplace. Do not get in eyes, on skin, or on clothing. Wear suitable gloves and eye/face protection.

Conditions for safe storage, including any incompatibilities

Storage Conditions Store material in a well ventilated magazine suitably licensed for the explosives hazard classification. Do not store with other explosives products that have an incompatible explosives hazard classification (for example detonators must not be stored with blasting/high explosives). Store in accordance with local regulations. Store in a cool, dry area away from potential sources of heat, open flames, sunlight or other chemicals. Store away from strong acids, strong alkalis, nitrites, chlorates, chlorides and permanganates. Store away from other materials. Protect from physical damage.

Incompatible materials Incompatible with strong acids and bases. Incompatible with combustible materials. Incompatible with permanganates. Ammonium nitrate is a powerful oxidising agent. Ammonium nitrate is incompatible with, and must be stored away from, tetranitromethane, dichloroisocyanuric acid, trichloroisocyanuric acid, bromates, chlorates, chlorites, hypochlorites, perchlorates, chloroisocyanurates, nitrites, powdered metals.

Poisons Schedule (SUSMP) None allocated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Exposure Limits This product, as supplied, does not contain any hazardous materials with occupational exposure limits established by the region specific regulatory bodies

Chemical name	Australia	ACGIH TLV
Fuels, diesel 68334-30-5		TWA: 100 mg/m^3 total hydrocarbons inhalable fraction and vapor S*

Decomposition product(s):

Nitrogen dioxide: 8hr TWA = 5.6 mg/m^3 (3 ppm), 15 min STEL = 9.4 mg/m^3 (5 ppm)

As published by Safe Work Australia Workplace Exposure Standards for Airborne Contaminants.

TWA - The time-weighted average airborne concentration of a particular substance when calculated over an eight-hour working day, for a five-day working week.

STEL (Short Term Exposure Limit) - the airborne concentration of a particular substance calculated as a time-weighted average over 15 minutes, which should not be exceeded at any time during a normal eight hour work day. According to current knowledge this concentration should neither impair the health of, nor cause undue discomfort to, nearly all workers.

TWA (ACGIH - Time-weighted Average) the time-weighted average concentration for a conventional 8-hour work day and a 40-hour work week, to which it is believed that nearly all workers may be repeatedly exposed, day after day, without adverse effect.

These Workplace Exposure Standards are guides to be used in the control of occupational health hazards. All atmospheric contamination should be kept to as low a level as is workable. These workplace exposure standards should not be used as fine dividing lines between safe and dangerous concentrations of chemicals. They are not a measure of relative toxicity.

Appropriate engineering controls

Engineering controls

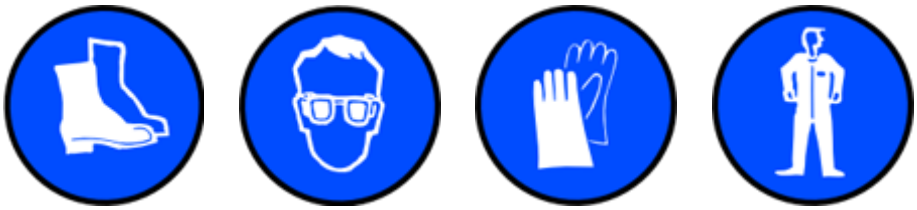
Apply technical measures to comply with the occupational exposure limits. Eyewash stations. Ventilation systems.

If in the handling and application of this material, safe exposure levels could be exceeded, the use of engineering controls such as local exhaust ventilation must be considered and the results documented. If achieving safe exposure levels does not require engineering controls, then a detailed and documented risk assessment using the relevant Personal Protective Equipment (PPE) (refer to PPE section below) as a basis must be carried out to determine the minimum PPE requirements.

Individual protection measures, such as personal protective equipment

The selection of PPE is dependent on a detailed risk assessment. The risk assessment should consider the work situation, the physical form of the chemical, the handling methods, and environmental factors.

OVERALLS, SAFETY SHOES, CHEMICAL GOGGLES, GLOVES.



Eye/face protection

Goggles.

Skin and body protection

Overalls. Protective shoes or boots.

Hand protection

Protective gloves.

Respiratory protection

No protective equipment is needed under normal use conditions. If exposure limits are exceeded or irritation is experienced, ventilation and evacuation may be required.

Environmental exposure controls

No information available.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Physical state	Solid
Appearance	Granules
Color	Off-white or Pink
Odor	Slight Kerosene / Diesel
Odor threshold	No information available.

Property	**Values**	**Remarks • Method**
pH	No data available	None known
Melting point / freezing point	No data available	None known
Boiling point / boiling range	No data available	None known
Flash point	>61 C	None known
Evaporation rate	No data available	None known
Flammability (solid, gas)	No data available	None known
Flammability Limit in Air		None known
Upper flammability or explosive limits	No data available	
Lower flammability or explosive limits	No data available	
Vapor pressure	No data available	None known
Vapor density	No data available	None known
Relative density	0.8 @ 20C	None known
Water solubility	Partially soluble	None known
Solubility(ies)	No data available	None known
Partition coefficient	No data available	None known
Autoignition temperature	No data available	None known
Decomposition temperature	No data available	None known
Kinematic viscosity	No data available	None known
Dynamic viscosity	No data available	None known
Explosive properties	Explosive; mass explosion hazard	

Other information

10. STABILITY AND REACTIVITY

Reactivity

Reactivity Explosive.

Chemical stability

Stability Explosive properties. Risk of explosion by shock, friction, fire or other sources of ignition. Capable of detonation, explosive decomposition, or explosive reaction but requires a strong initiating source or must be heated under confinement before initiation. Detonation may occur from static electricity discharge or mechanical/heavy impact, particularly under confinement.

Explosion data

Sensitivity to mechanical impact Yes. However, this type of explosive is relatively insensitive.

Sensitivity to static discharge Yes. However, this type of explosive is relatively insensitive.

Possibility of hazardous reactions

Possibility of hazardous reactions A major fire may involve a risk of explosion. An adjacent detonation may also involve the risk of explosion. Mass explosion hazard. Explosion may result due to shock, friction, fire or other sources of ignition. Detonation may occur from heavy impact or excessive heating. Explosion creates the potential for shrapnel.

Hazardous polymerization Hazardous polymerization does not occur.

Conditions to avoid

Conditions to avoid Heat. Keep away from open flames, hot surfaces and sources of ignition. Static discharge (electrostatic discharge). Do not subject to grinding/shock/friction. Avoid contact with other chemicals. Avoid contact with combustible substances. Protect from moisture.

Incompatible materials

Incompatible materials Incompatible with strong acids and bases. Incompatible with combustible materials. Incompatible with permanganates. Ammonium nitrate is a powerful oxidising agent. Ammonium nitrate is incompatible with, and must be stored away from, tetranitromethane, dichloroisocyanuric acid, trichloroisocyanuric acid, bromates, chlorates, chlorites, hypochlorites, perchlorates, chloroisocyanurates, nitrites, powdered metals.

Hazardous decomposition products

Hazardous decomposition products Carbon oxides. Nitrogen oxides. Ammonium nitrate fumes. Ammonia. When heated to decomposition (unconfined) ammonium nitrate produces nitrous oxide, white ammonium nitrate fumes and water. When mixed with strong acids, and occasionally during blasting, it produces an irritating toxic brown gas, mostly nitrogen dioxide. When molten it may decompose violently due to shock or pressure.

11. TOXICOLOGICAL INFORMATION

Acute toxicity

Information on likely routes of exposure

Product Information No adverse health effects expected if the chemical is handled in accordance with this Safety Data Sheet and the chemical label. Symptoms or effects that may arise if the chemical is mishandled and overexposure occurs are:

Inhalation May cause irritation of respiratory tract. Causes headache, drowsiness or other effects to the central nervous system. Blasting may produce a toxic brown gas of nitrogen dioxide. Inhalation of the gas may result in chest discomfort, shortness of breath and possible pulmonary oedema, the onset of which may be delayed.

Eye contact Causes eye irritation.

Skin contact May cause irritation. Prolonged skin contact may defat the skin and produce dermatitis. Shrapnel from detonation may cause burns, wounds and bruises. Nitrates can be absorbed through cut, burnt or broken skin. Further information is provided under 'Chronic Effects'.

Ingestion Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhoea. Ingestion of larger amounts may cause defects to the central nervous system (e.g. dizziness, headache). May cause a lowering of blood pressure (hypotension).

Symptoms May cause redness and tearing of the eyes.

Numerical measures of toxicity - Product Information
No information available.

Numerical measures of toxicity - Component Information

Component Information

Chemical name	Oral LD50	Dermal LD50	Inhalation LC50

Ammonium nitrate	= 2217 mg/kg (Rat)	-	> 88.8 mg/L (Rat) 4 h
Fuels, diesel	= 7500 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	= 4.6 mg/L (Rat) 4 h

See section 16 for terms and abbreviations

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Skin corrosion/irritation No information available.

Serious eye damage/eye irritation Causes serious eye irritation.

Respiratory or skin sensitization No information available.

Germ cell mutagenicity No information available.

Carcinogenicity Suspected of causing cancer. Contains a known or suspected carcinogen.

Chemical name	Australia
Fuels, diesel - 68334-30-5	Carc. 2

Reproductive toxicity No information available.

STOT - single exposure No information available.

STOT - repeated exposure No information available.

Aspiration hazard Not classified.

Chronic effects: No information available for the products.

NITRATES: Absorption of nitrates by ingestion, inhalation or through burnt or broken skin may cause dilation of the blood vessels by direct smooth muscle relaxation with a subsequent lowering of blood pressure and may also cause breathing difficulties, blueness of the skin (cyanosis) and methaemoglobinaemia.

For diesel: Available evidence from animal studies indicate that repeated or prolonged exposure to a component of this material could result in effects on the skin. This material contains within the diesel oil component of this formulation polycyclic aromatic hydrocarbons (PAHs). Some PAHs have been implicated as potential skin carcinogens in humans under conditions of poor personal hygiene, prolonged or repeated skin contact and exposure to sunlight. Toxic effects are unlikely to occur if good personal hygiene is practised.

Diesel fuel has been classified by the International Agency for Research on Cancer (IARC) as a Group 3 agent. Group 3 - The agent is not classifiable as to its carcinogenicity to humans.

Diesel fuel has been shown to be carcinogenic in animal tests and has caused mutations in vitro. Repeated dermal exposures to high concentrations in test animals resulted in reduced litter size and litter weight, and increased foetal resorptions at maternally toxic doses.

12. ECOLOGICAL INFORMATION

Ecotoxicity

Ecotoxicity Keep out of waterways. May cause long lasting harmful effects to aquatic life.

Ammonium nitrate is a plant nutrient. Large scale contamination may kill vegetation and cause poisoning in livestock and poultry.

Chemical name	Algae/aquatic plants	Fish	Toxicity to microorganisms	Crustacea
Ammonium nitrate	-	LC50: 65 - 85mg/L (48h, Cyprinus carpio)	-	-
Fuels, diesel	-	LC50: =35mg/L (96h, Pimephales promelas)	-	-

Persistence and degradability

Persistence and degradability No information available.

Bioaccumulative potential

Bioaccumulation No information available.

Chemical name	Partition coefficient
Ammonium nitrate	-3.1

Mobility

Mobility in soil No information available.

Other adverse effects

Other adverse effects For diesel oil:. Floats on water. Spills may form a film on water surfaces causing physical damage to organisms. Oxygen transfer could also be impaired.

Ammonium nitrate was evaluated at 5, 10, 25 and 50 mg (NH4+)/L. The fertility of Daphnia magna was decreased at 50 mg/L Post embryonic growth of crustacea was impaired at 10, 25 and 50 mg/L.

13. DISPOSAL CONSIDERATIONS

Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations. Should not be released into the environment. Small quantities of damaged or deteriorated explosives may be destroyed by inclusion in a blast hole containing good explosive (s). For large quantities of damaged or deteriorated explosives notify Orica Australia Pty Ltd and/or Orica New Zealand Pty Ltd.

14. TRANSPORT INFORMATION

ADG
Classified as Dangerous Goods by the criteria of the Australian Code for the Transport of Explosives by Road and Rail; DANGEROUS GOODS.
UN number 0082
Proper shipping name EXPLOSIVE, BLASTING, TYPE B
Hazard class 1.1D
Hazchem code E

IATA
Forbidden

IMDG
Classified as Dangerous Goods by the criteria of the International Maritime Dangerous Goods Code (IMDG Code) for transport by sea; DANGEROUS GOODS.

UN number	0082
UN proper shipping name	EXPLOSIVE, BLASTING, TYPE B
Transport hazard class(es)	1.1D
IMDG EMS Fire	F-B
IMDG EMS Spill	S-Y

15. REGULATORY INFORMATION

Safety, health and environmental regulations/legislation specific for the substance or mixture

National regulations

Australia
Classified as dangerous goods in accordance with the Australian Code for the Transport of Explosives by Road and Rail.

Classified as a hazardous chemical in accordance with the criteria of Safe Work Australia - Globally Harmonized System (GHS).

See section 8 for national exposure control parameters

Poisons Schedule (SUSMP) None allocated

International Inventories

AICS	All the constituents of this material are listed on the Australian Inventory of Chemical Substances.

Legend:
AICS - Australian Inventory of Chemical Substances

International Regulations

The Montreal Protocol on Substances that Deplete the Ozone Layer Not applicable

The Stockholm Convention on Persistent Organic Pollutants Not applicable

The Rotterdam Convention Not applicable

16. OTHER INFORMATION

ACGIH is a registered trademark of The American Conference of Governmental Industrial Hygienists.

Reason(s) For Issue: 5 Yearly Revised Primary SDS

Issuing Date: 21-Aug-2020

This Safety Data Sheet has been prepared by Ixom Operations Pty Ltd (Toxicology and SDS Services).

Revision Note:
The symbol (*) in the margin of this SDS indicates that this line has been revised.

Key or legend to abbreviations and acronyms used in the safety data sheet
Legend Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

TWA	TWA (time-weighted average)	STEL	STEL (Short Term Exposure Limit)
Ceiling	Maximum limit value	*	Skin designation
C	Carcinogen		

Key literature references and sources for data used to compile the SDS

EPA (Environmental Protection Agency)
Acute Exposure Guideline Level(s) (AEGL(s))
U.S. Environmental Protection Agency Federal Insecticide, Fungicide, and Rodenticide Act
U.S. Environmental Protection Agency High Production Volume Chemicals
Food Research Journal
Hazardous Substance Database
International Uniform Chemical Information Database (IUCLID)
Japan GHS Classification
Australian Industrial Chemicals Introduction Scheme (AICIS)
NIOSH (National Institute for Occupational Safety and Health)
National Library of Medicine's ChemID Plus (NLM CIP)
National Library of Medicine's PubMed database (NLM PUBMED)
National Toxicology Program (NTP)
New Zealand's Chemical Classification and Information Database (CCID)
Organization for Economic Co-operation and Development Environment, Health, and Safety Publications
Organization for Economic Co-operation and Development High Production Volume Chemicals Program
Organization for Economic Co-operation and Development Screening Information Data Set
RTECS (Registry of Toxic Effects of Chemical Substances)
World Health Organization

Disclaimer

This SDS summarises to our best knowledge at the date of issue, the chemical health and safety hazards of the material and general guidance on how to safely handle the material in the workplace. Since The Supplier cannot anticipate or control the conditions under which the product may be used, each user must, prior to usage, assess and control the risks arising from its use of the material.

If clarification or further information is needed, the user should contact their Supplier representative or The Supplier at the contact details on page 1.

The Supplier's responsibility for the material as sold is subject to the terms and conditions of sale, a copy of which is available upon request.

End of Safety Data Sheet

SAFETY DATA SHEET

Revision date: 27-Jul-2022

Revision Number 7

1. IDENTIFICATION OF THE MATERIAL AND SUPPLIER

Product identifier

Product Name	CORDTEX DETONATING CORDS
Product Code(s)	000023868401

Other means of identification

Proper shipping name	CORD, DETONATING
UN number	0065
Synonyms	DETONATING CORDS, CORDTEX 3.6W, CORDTEX 5W, CORDTEX 5W U/G, CORDTEX 5P, CORDTEX 10P, CORDTEX 70P, CORDTEX PYROCORD, CORDTEX AP, CORDTEX 18, CORDTEX XTL NC, CORDTEX 10G, CORDTEX POWERSPLIT 10P
Pure substance/mixture	Mixture

Recommended use of the chemical and restrictions on use

Recommended use	Detonating cord for initiating charges. Restricted to professional users.
Uses advised against	No information available.

Supplier

Orica Australia Pty Ltd
ABN: 99 004 117 828
1 Nicholson Street
Melbourne 3000
Australia

Telephone Number: +61 3 9665 7111
Facsimile: +61 3 9665 7937

Emergency telephone number

Emergency telephone number — **AUSTRALIA: 1 800 033 111 (ALL HOURS)**
INTERNATIONAL AUSTRALIA: +61 3 9663 2130 (ALL HOURS)

Please ensure you refer to the limitations of this Safety Data Sheet as set out in the "Other Information" section at the end of this Data Sheet.

2. HAZARDS IDENTIFICATION

GHS Classification

Classified as dangerous goods in accordance with the Australian Code for the Transport of Explosives by Road and Rail.

Classified as a hazardous chemical in accordance with the criteria of Safe Work Australia - Globally Harmonized System (GHS).

Explosives	Division 1.1

SIGNAL WORD
Danger

Label elements

Exploding bomb



Hazard statements
H201 - Explosive; mass explosion hazard

Precautionary Statements - Prevention
Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking
Keep only in original packaging
Ground and bond container and receiving equipment
Do not subject to grinding/shock/friction
Wear protective gloves / protective clothing / eye protection / face protection
Precautionary Statements - Response

In case of fire: Explosion risk. Evacuate area. DO NOT fight fire when fire reaches explosives
Precautionary Statements - Storage
Store in accordance with:
AS2187.1 in a well ventilated magazine.
Precautionary Statements - Disposal
Refer to manufacturer/supplier for information on disposal/recovery/recycling

Other hazards which do not result in classification
Poisons Schedule (SUSMP) None allocated

3. COMPOSITION/INFORMATION ON INGREDIENTS

Mixture

Chemical name	CAS No.	Weight-%
Pentaerythritol tetranitrate (PETN)	78-11-5	10-80%
Ingredients determined not to be hazardous	-	to 100%

Additional information
Continuous PETN explosive core enclosed in plastic tapes and fibres with an outer sleeve of textiles or plastic.

4. FIRST AID MEASURES

Description of first aid measures

General advice For advice, contact a Poisons Information Centre (e.g. phone Australia 13 11 26; New Zealand 0800 764 766) or a doctor.

Inhalation Remove to fresh air and keep at rest in a position comfortable for breathing. Call a physician if symptoms occur.

Eye contact In the case of contact with eyes, rinse immediately with plenty of water and seek medical advice.

Skin contact Wash skin with soap and water. Get medical attention if symptoms occur.

Ingestion Rinse mouth immediately and drink plenty of water. Do NOT induce vomiting. Get immediate medical advice/attention.

Self-protection of the first aider Remove all sources of ignition. Ensure that medical personnel are aware of the material(s) involved, take precautions to protect themselves and prevent spread of contamination. Use personal protective equipment as required. See section 8 for more information.

Most important symptoms and effects, both acute and delayed

Symptoms No information available.

Indication of any immediate medical attention and special treatment needed

Note to physicians Treat symptomatically. Explosive material. Treat as for exposure to nitrates. May cause methemoglobinemia. PETN is a vasodilator. Maintain blood pressure by fluid administration. Shrapnel from detonation may cause burns, wounds and bruises.

5. FIRE FIGHTING MEASURES

Suitable Extinguishing Media

Suitable Extinguishing Media Do not fight fires involving explosives.

Unsuitable extinguishing media

Specific hazards arising from the chemical

Specific hazards arising from the chemical Explosive. May be ignited by heat, sparks or flames. May explode from friction, heat or contamination. Risk of explosion by shock or heating under confinement. On burning under confined or semi-confined conditions, some oxides of nitrogen and/or carbon will be present. Brown fumes indicate the presence of toxic oxides of nitrogen.

Hazardous combustion products Carbon oxides. Nitrogen oxides.

Special protective actions for fire-fighters

Special protective equipment for fire-fighters In the case of a small fire, if actual explosive is not burning, carefully remove as much explosive as possible to a safe distance. Firefighters should wear self-contained breathing apparatus and full firefighting turnout gear. However, if explosive is burning, evacuate area immediately and allow to burn. DO NOT fight fire.

A major fire may involve a risk of explosion. An adjacent detonation may also involve the risk of explosion. Mass explosion hazard.

Hazchem code E

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Personal precautions Explosive material. Evacuate personnel to safe areas. ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). Do not subject to grinding/shock/friction. Use personal protective equipment as required. Avoid generation of dust. Do not breathe dust.

Other information Refer to protective measures listed in Sections 7 and 8.

In the case of a transport accident notify the Police, Regulatory Authorities and Orica Australia Pty Ltd (Telephone: 1800 033 111 -- 24 hour service) and/or Orica New Zealand

Ltd (Telephone: 0800 734 607 -- 24 hour service) or Orica International (Telephone: +61 3 9663 2130 -- 24 hour service Australia).

For emergency responders Explosive material. Remove all sources of ignition. Use personal protection recommended in Section 8.

Environmental precautions

Environmental precautions Keep out of waterways. Local authorities should be advised if significant spillages cannot be contained.

Methods and material for containment and cleaning up

Methods for containment Prevent further leakage or spillage if safe to do so.

Methods for cleaning up Handle with care. Use non-sparking tools. Ground and bond containers when transferring material. Pick up and transfer to properly labelled containers. Avoid contamination with other substances. Keep in suitable, closed containers for disposal.

7. HANDLING AND STORAGE

Precautions for safe handling

Advice on safe handling Handle with care. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Take precautionary measures against static discharges. Do NOT subject the material to impact, friction between hard surfaces nor to any form of heating. Avoid contact with skin and eyes. Keep out of reach of children. Protect ends of cords from contact with moisture and oil. Avoid contamination with other substances.

General hygiene considerations Contaminated work clothing should not be allowed out of the workplace. Do not get in eyes, on skin, or on clothing. Wash hands before breaks and immediately after handling the product.

Conditions for safe storage, including any incompatibilities

Storage Conditions Store material in a well ventilated magazine suitably licensed for the explosives hazard classification. Do not store with other explosives products that have an incompatible explosives hazard classification (for example detonators must not be stored with blasting/high explosives). Store in accordance with the particular national regulations. Keep away from heat, sparks, flame and other sources of ignition (i.e., pilot lights, electric motors and static electricity). Store in a cool, dry area away from potential sources of heat, open flames, sunlight or other chemicals. Store away from other materials. Protect from physical damage. Keep/store only in original container. Protect from moisture.

Incompatible materials Incompatible with combustible materials. Incompatible with oxidizing agents. Incompatible with reducing agents. Incompatible with strong acids and bases. Permanganates. Nitrites. Chlorates. Chlorides.

Poisons Schedule (SUSMP) None allocated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Exposure Limits No value assigned for this specific material by Safe Work Australia.

Appropriate engineering controls

Engineering controls Ensure adequate ventilation, especially in confined areas.

Individual protection measures, such as personal protective equipment

The selection of PPE is dependent on a detailed risk assessment. The risk assessment should consider the work situation, the physical form of the chemical, the handling methods, and environmental factors.

OVERALLS, SAFETY SHOES, SAFETY GLASSES, GLOVES.



Eye/face protection Wear safety glasses with side shields (or goggles).

Skin and body protection Overalls. Protective shoes or boots.

Hand protection Protective gloves.

Respiratory protection If determined by a risk assessment an inhalation risk exists, wear a dust mask meeting the requirements of AS/NZS 1715 and AS/NZS 1716.

Environmental exposure controls No information available.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Physical state	Solid
Appearance	Flexible cords with outer coverings of textiles and plastics. White powder core.
Color	Various
Odor	Odourless
Odor threshold	No information available.

Property	**Values**	**Remarks • Method**
pH	No data available	None known
pH (as aqueous solution)	No data available	None known
Melting point / freezing point	141.3 C(for PETN)	None known
Boiling point / boiling range	No data available	None known
Flash point	No data available	None known
Evaporation rate	No data available	None known
Flammability (solid, gas)	No data available	None known
Flammability Limit in Air		None known
Upper flammability or explosive limits	No data available	
Lower flammability or explosive limits	No data available	
Vapor pressure	No data available	None known
Vapor density	No data available	None known
Relative density	1.77 (for PETN)	None known
Water solubility	Insoluble in water	None known
Solubility(ies)	No data available	None known
Partition coefficient	No data available	None known
Autoignition temperature	No data available	None known

Decomposition temperature	> 150C (for PETN)	None known
Kinematic viscosity	No data available	None known
Dynamic viscosity	No data available	None known
Explosive properties	Explosive; mass explosion hazard	

Other information

10. STABILITY AND REACTIVITY

Reactivity

Reactivity Explosive.

Chemical stability

Stability Explosive. Risk of explosion by shock, friction, fire or other sources of ignition. Heating, particularly under confinement, may cause an explosion. May cause a mass explosion. Detonation may occur from impact, friction, or excessive heating.

Explosion data

Sensitivity to mechanical impact Yes.

Sensitivity to static discharge Yes.

Possibility of hazardous reactions

Possibility of hazardous reactions A major fire may involve a risk of explosion. An adjacent detonation may also involve the risk of explosion. Mass explosion hazard. Explosion may result due to shock, friction, fire or other sources of ignition. Detonation may occur from heavy impact or excessive heating. Explosion creates the potential for shrapnel.

Hazardous polymerization Hazardous polymerization does not occur.

Conditions to avoid

Conditions to avoid Heat. Keep away from open flames, hot surfaces and sources of ignition. Static discharge (electrostatic discharge). Do not subject to grinding/shock/friction. Avoid contact with other chemicals. Avoid contact with combustible substances. Protect from moisture. Avoid impact with solid surfaces or other boosters. Avoid contamination of the material.

Incompatible materials

Incompatible materials Incompatible with combustible materials. Incompatible with oxidizing agents. Incompatible with reducing agents. Incompatible with strong acids and bases. Permanganates. Nitrites. Chlorates. Chlorides.

Hazardous decomposition products

Hazardous decomposition products Carbon oxides. Nitrogen oxides.

11. TOXICOLOGICAL INFORMATION

Acute toxicity

Information on likely routes of exposure

Product Information No adverse health effects expected if the chemical is handled in accordance with this Safety Data Sheet and the chemical label. Symptoms or effects that may arise if the chemical is mishandled and overexposure occurs are:

Inhalation May cause irritation of respiratory tract. May cause central nervous system depression with nausea, headache, dizziness, vomiting, and incoordination.

Eye contact May cause irritation.

Skin contact Not an expected route of exposure. Repeated or prolonged exposure may cause irritation of eyes and skin. Shrapnel from detonation may cause burns, wounds and bruises.

Ingestion Not an expected route of exposure. Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhoea. May cause a lowering of blood pressure (hypotension). Ingestion of larger amounts may cause defects to the central nervous system (e.g. dizziness, headache).

Symptoms No information available.

Numerical measures of toxicity - Product Information
No information available.

Numerical measures of toxicity - Component Information

Component Information

Chemical name	Oral LD50	Dermal LD50	Inhalation LC50
Pentaerythritol tetranitrate (PETN)	= 1660 mg/kg (Rat)	-	-

See section 16 for terms and abbreviations

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Skin corrosion/irritation No information available.

Serious eye damage/eye irritation No information available.

Respiratory or skin sensitization No information available.

Germ cell mutagenicity No information available.

Carcinogenicity No information available.

Reproductive toxicity No information available.

STOT - single exposure No information available.

STOT - repeated exposure No information available.

Aspiration hazard No information available.

Chronic effects: PETN is absorbed slowly through the lungs and gastrointestinal tract but not appreciably through the skin. Vasodilatory agent, therefore causes dilation of the blood vessels and a reduction in blood pressure. Exposure to high doses may cause methaemoglobinaemia. Negative in AMES test for mutagenicity.

12. ECOLOGICAL INFORMATION

Ecotoxicity

Ecotoxicity Keep out of waterways.

Chemical name	Algae/aquatic plants	Fish	Toxicity to microorganisms	Crustacea
Pentaerythritol tetranitrate (PETN)	-	LC50: =926mg/L (96h, Pimephales promelas)	-	-

Persistence and degradability

Persistence and degradability No information available.

Bioaccumulative potential

Bioaccumulation No information available.

Mobility

Mobility in soil No information available.

Other adverse effects

13. DISPOSAL CONSIDERATIONS

Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations. Small quantities of damaged or deteriorated explosives may be destroyed by inclusion in a blast hole containing good explosive (s). For large quantities of damaged or deteriorated explosives notify Orica Australia Pty Ltd and/or Orica New Zealand Pty Ltd.

14. TRANSPORT INFORMATION

ADG
Classified as Dangerous Goods by the criteria of the Australian Code for the Transport of Explosives by Road and Rail; DANGEROUS GOODS.

UN number 0065
Proper shipping name CORD, DETONATING
Hazard class 1.1D
Hazchem code E

IATA
Forbidden

IMDG
Classified as Dangerous Goods by the criteria of the International Maritime Dangerous Goods Code (IMDG Code) for transport by sea; DANGEROUS GOODS.

UN number 0065
UN proper shipping name CORD, DETONATING
Transport hazard class(es) 1.1D
IMDG EMS Fire F-B
IMDG EMS Spill S-X

15. REGULATORY INFORMATION

Safety, health and environmental regulations/legislation specific for the substance or mixture

National regulations

Australia
Classified as dangerous goods in accordance with the Australian Code for the Transport of Explosives by Road and Rail.

Classified as a hazardous chemical in accordance with the criteria of Safe Work Australia - Globally Harmonized System (GHS).

See section 8 for national exposure control parameters

Poisons Schedule (SUSMP) None allocated

International Inventories

AIIC	All the constituents of this material are listed on the Australian Inventory of Industrial Chemicals.

Legend:
- Australian Inventory of Industrial Chemicals

International Regulations

The Montreal Protocol on Substances that Deplete the Ozone Layer Not applicable

The Stockholm Convention on Persistent Organic Pollutants Not applicable

The Rotterdam Convention Not applicable

16. OTHER INFORMATION

`Registry of Toxic Effects of Chemical Substances'. Ed. D. Sweet, US Dept. of Health & Human Services: Cincinatti, 2022

Reason(s) For Issue: 5 Yearly Revised Primary SDS
Addition/Change of synonymous name(s)

Issuing Date: 27-Jul-2022

This Safety Data Sheet has been prepared by Ixom Operations Pty Ltd (Toxicology and SDS Services).

Revision Note:
The symbol (*) in the margin of this SDS indicates that this line has been revised.

Key or legend to abbreviations and acronyms used in the safety data sheet

Legend Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

TWA	TWA (time-weighted average)	STEL	STEL (Short Term Exposure Limit)
Ceiling	Maximum limit value	*	Skin designation
C	Carcinogen		

Key literature references and sources for data used to compile the SDS

EPA (Environmental Protection Agency)
Acute Exposure Guideline Level(s) (AEGL(s))
U.S. Environmental Protection Agency Federal Insecticide, Fungicide, and Rodenticide Act

U.S. Environmental Protection Agency High Production Volume Chemicals
Food Research Journal
Hazardous Substance Database
International Uniform Chemical Information Database (IUCLID)
Japan GHS Classification
Australian Industrial Chemicals Introduction Scheme (AICIS)
NIOSH (National Institute for Occupational Safety and Health)
National Library of Medicine's ChemID Plus (NLM CIP)
National Library of Medicine's PubMed database (NLM PUBMED)
National Toxicology Program (NTP)
New Zealand's Chemical Classification and Information Database (CCID)
Organization for Economic Co-operation and Development Environment, Health, and Safety Publications
Organization for Economic Co-operation and Development High Production Volume Chemicals Program
Organization for Economic Co-operation and Development Screening Information Data Set
RTECS (Registry of Toxic Effects of Chemical Substances)
World Health Organization

Disclaimer

This SDS summarises to our best knowledge at the date of issue, the chemical health and safety hazards of the material and general guidance on how to safely handle the material in the workplace. Since The Supplier cannot anticipate or control the conditions under which the product may be used, each user must, prior to usage, assess and control the risks arising from its use of the material.

If clarification or further information is needed, the user should contact their Supplier representative or The Supplier at the contact details on page 1.

The Supplier's responsibility for the material as sold is subject to the terms and conditions of sale, a copy of which is available upon request.

End of Safety Data Sheet

SAFETY DATA SHEET

Revision date: 23-Mar-2021

Revision Number 8

1. IDENTIFICATION OF THE MATERIAL AND SUPPLIER

Product identifier

Product Name ELECTRIC DETONATORS (1.1B PACKAGING)

Product Code(s) 000022014301

Other means of identification

Proper shipping name DETONATORS, ELECTRIC

UN number 0030

Synonyms Instantaneous electric detonators (1.1B); Instantaneous seismic detonators (1.1B); Zero delay electric detonators (1.1B); Short delay electric detonators (1.1B); Delay electric detonators (1.1B); Dynadet TE Instantaneous electric detonators (1.1B); Carrick R electric detonators (1.1B); Dynaseis detonators (1.1B);

Pure substance/mixture Mixture

Recommended use of the chemical and restrictions on use

Recommended use Electric detonators. Initiating explosive charges. Restricted to professional users.

Uses advised against No information available.

Supplier
Orica Australia Pty Ltd
ABN: 99 004 117 828
1 Nicholson Street
Melbourne 3000
Australia

Telephone Number: +61 3 9665 7111
Facsimile: +61 3 9665 7937

Emergency telephone number

Emergency telephone number **AUSTRALIA: 1 800 033 111 (ALL HOURS)**
INTERNATIONAL AUSTRALIA: +61 3 9663 2130 (ALL HOURS)

Please ensure you refer to the limitations of this Safety Data Sheet as set out in the "Other Information" section at the end of this Data Sheet.

2. HAZARDS IDENTIFICATION

GHS Classification

Classified as dangerous goods in accordance with the Australian Code for the Transport of Explosives by Road and Rail.

Classified as a hazardous chemical in accordance with the criteria of Safe Work Australia - Globally Harmonized System (GHS).

Explosives	Division 1.1 Category B
Reproductive toxicity	Category 1A

SIGNAL WORD
Danger

Label elements



Hazard statements
H201 - Explosive; mass explosion hazard
H360 - May damage fertility or the unborn child

Precautionary Statements - Prevention
Obtain special instructions before use
Do not handle until all safety precautions have been read and understood
Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking
Keep only in original packaging
Ground and bond container and receiving equipment
Do not subject to grinding/shock/friction
Wear protective gloves / protective clothing / eye protection / face protection
Precautionary Statements - Response
If exposed or concerned: Get medical advice/attention
In case of fire: Explosion risk. Evacuate area. DO NOT fight fire when fire reaches explosives
Precautionary Statements - Storage
Store in accordance with:
AS2187.1 in a well ventilated magazine.
Store locked up
Precautionary Statements - Disposal
Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable
Refer to manufacturer/supplier for information on disposal/recovery/recycling

Other hazards which do not result in classification
Poisons Schedule (SUSMP) None allocated

3. COMPOSITION/INFORMATION ON INGREDIENTS

Mixture

Chemical name	CAS No.	Weight-%
Pentaerythritol tetranitrate (PETN)	78-11-5	<1%
Aluminium powder (stabilised)	7429-90-5	<1%
Tetryl (N-Methyl- N,2,4,6-tetranitroaniline)	479-45-8	<1%
Lead azide	13424-46-9	<1%
Lead styphnate	15245-44-0	<1%
Metal and plastic components and other non-hazardous components	-	>60%

Additional information
Metal shell (copper or aluminium) with attached copper wires. The primary and secondary explosive powders are contained within the shell.

4. FIRST AID MEASURES

Description of first aid measures

General advice	For advice, contact a Poisons Information Centre (e.g. phone Australia 13 11 26; New Zealand 0800 764 766) or a doctor. Take a copy of the Safety Data Sheet when going for medical treatment.
Emergency telephone number	Poisons Information Center, Australia: 13 11 26 Poisons Information Center, New Zealand: 0800 764 766
Inhalation	In case of inhalation of blasting fumes:. Remove to fresh air and keep at rest in a position comfortable for breathing. If breathing is difficult, (trained personnel should) give oxygen. Call a physician if symptoms occur.
Eye contact	Not an expected route of exposure.
Skin contact	Not an expected route of exposure. If skin irritation or rash occurs: Get medical advice/attention.
Ingestion	Get immediate medical advice/attention.
Self-protection of the first aider	Remove all sources of ignition. Ensure that medical personnel are aware of the material(s) involved, take precautions to protect themselves and prevent spread of contamination.

Most important symptoms and effects, both acute and delayed

Symptoms	None known.

Indication of any immediate medical attention and special treatment needed

Note to physicians	Treat symptomatically. Detonator assemblies are explosive - handle with care. Shrapnel from detonation may cause burns, wounds and bruises. Explosive material containing lead. Long term exposure to detonation fumes may result in lead poisoning.

5. FIRE FIGHTING MEASURES

Suitable Extinguishing Media

Suitable Extinguishing Media	Do not fight fires involving explosives.

Unsuitable extinguishing media

Specific hazards arising from the chemical

Specific hazards arising from the chemical	Explosive. May be ignited by heat, sparks or flames. Avoid stray currents. Risk of explosion by shock or heating under confinement. May explode from friction, heat or contamination.
Hazardous combustion products	Carbon oxides. Nitrogen oxides. Metal oxides. Lead oxides. Lead fume.

Special protective actions for fire-fighters

Special protective equipment for fire-fighters	In the case of a small fire, if actual explosive is not burning, carefully remove as much explosive as possible to a safe distance. However, if explosive is burning, evacuate area immediately and allow to burn. DO NOT fight fire. A major fire may involve a risk of explosion. An adjacent detonation may also involve the risk of explosion. Mass explosion hazard.

Hazchem code E

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Personal precautions Evacuate personnel to safe areas. ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). Do not subject to grinding/shock/friction. Use personal protective equipment as required.

Other information Refer to protective measures listed in Sections 7 and 8.

In the case of a transport accident notify the Police, Regulatory Authorities and Orica Australia Pty Ltd (Telephone: 1800 033 111 -- 24 hour service) and/or Orica New Zealand Ltd (Telephone: 0800 734 607 -- 24 hour service) or Orica International (Telephone: +61 3 9663 2130 -- 24 hour service Australia).

For emergency responders Explosive material. Remove all sources of ignition. Use personal protection recommended in Section 8.

Environmental precautions

Environmental precautions Keep out of waterways.

Methods and material for containment and cleaning up

Methods for containment Prevent further leakage or spillage if safe to do so. Keep out of drains, sewers, ditches and waterways.

Methods for cleaning up Handle with care. Use non-sparking tools. Ground and bond containers when transferring material. Pick up and transfer to properly labelled containers. Avoid contamination with other substances. Keep in suitable, closed containers for disposal.

7. HANDLING AND STORAGE

Precautions for safe handling

Advice on safe handling Handle with care. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Keep out of reach of children. Take precautionary measures against static discharges. Do not allow radio transmitters near electric detonators. Do NOT subject the material to impact, friction between hard surfaces nor to any form of heating.

General hygiene considerations Wash hands before breaks and after work. When using do not eat, drink or smoke.

Conditions for safe storage, including any incompatibilities

Storage Conditions Store material in a well ventilated magazine suitably licensed for the explosives hazard classification. Do not store with other explosives products that have an incompatible explosives hazard classification (for example detonators must not be stored with blasting/high explosives). Store in accordance with the particular national regulations. Keep away from heat, sparks, flame and other sources of ignition (i.e., pilot lights, electric motors and static electricity). Store in a cool, dry area away from potential sources of heat, open flames, sunlight or other chemicals. Store away from other materials. Protect from physical damage. Keep/store only in original container. Protect from moisture.

Incompatible materials Incompatible with combustible materials. Incompatible with oxidizing agents.

Poisons Schedule (SUSMP) None allocated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Exposure Limits No value assigned for this specific material by Safe Work Australia. However, Workplace Exposure Standard(s) for constituent(s):

Chemical name	Australia	ACGIH TLV
Aluminium powder (stabilised) 7429-90-5	10 mg/m³ 5 mg/m³	TWA: 1 mg/m³ respirable particulate matter
Tetryl (N-Methyl- N,2,4,6-tetranitroaniline) 479-45-8	1.5 mg/m³	TWA: 1.5 mg/m³

Lead, inorganic dusts & fumes (as Pb): 8hr TWA = 0.05 mg/m³
Tetryl; (2,4,6-Trinitrophenylmethylnitramine): 8hr TWA = 1.5 mg/m³, Sen
Aluminium (metal dust): 8hr TWA = 10 mg/m³

As published by Safe Work Australia Workplace Exposure Standards for Airborne Contaminants.

TWA - The time-weighted average airborne concentration of a particular substance when calculated over an eight-hour working day, for a five-day working week.

`Sen' Notice - sensitiser. The substance can cause a specific immune response in some people. An affected individual may subsequently react to exposure to minute levels of that substance and should not be further exposed to the substance.

These Workplace Exposure Standards are guides to be used in the control of occupational health hazards. All atmospheric contamination should be kept to as low a level as is workable. These workplace exposure standards should not be used as fine dividing lines between safe and dangerous concentrations of chemicals. They are not a measure of relative toxicity.

Appropriate engineering controls

Engineering controls Apply technical measures to comply with the occupational exposure limits. Ensure adequate ventilation, especially in confined areas.

If in the handling and application of this material, safe exposure levels could be exceeded, the use of engineering controls such as local exhaust ventilation must be considered and the results documented. If achieving safe exposure levels does not require engineering controls, then a detailed and documented risk assessment using the relevant Personal Protective Equipment (PPE) (refer to PPE section below) as a basis must be carried out to determine the minimum PPE requirements.

Individual protection measures, such as personal protective equipment

The selection of PPE is dependent on a detailed risk assessment. The risk assessment should consider the work situation, the physical form of the chemical, the handling methods, and environmental factors.

OVERALLS, SAFETY SHOES, SAFETY GLASSES, GLOVES.



Eye/face protection Wear safety glasses with side shields (or goggles).

Skin and body protection	Overalls. Protective shoes or boots.
Hand protection	Protective gloves.
Respiratory protection	No protective equipment is needed under normal use conditions. If exposure limits are exceeded or irritation is experienced, ventilation and evacuation may be required.
Environmental exposure controls	No information available.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Physical state	Solid
Appearance	Article.
Color	Metallic
Odor	Odourless
Odor threshold	No information available.

Property	**Values**	**Remarks • Method**
pH	No data available	None known
Melting point / freezing point	No data available	None known
Boiling point / boiling range	No data available	None known
Flash point	No data available	None known
Evaporation rate	No data available	None known
Flammability (solid, gas)	No data available	None known
Flammability Limit in Air		None known
Upper flammability or explosive limits	No data available	
Lower flammability or explosive limits	No data available	
Vapor pressure	No data available	None known
Vapor density	No data available	None known
Relative density	No data available	None known
Water solubility	Insoluble in water	None known
Solubility(ies)	No data available	None known
Partition coefficient	No data available	None known
Autoignition temperature	No data available	None known
Decomposition temperature	No data available	None known
Kinematic viscosity	No data available	None known
Dynamic viscosity	No data available	None known
Explosive properties	Explosive; mass explosion hazard	

Other information

10. STABILITY AND REACTIVITY

Reactivity

Reactivity	Explosive.

Chemical stability

Stability	Risk of explosion by shock, friction, fire or other sources of ignition. Heating, particularly under confinement, may cause an explosion. Detonation may occur from static electricity discharge or mechanical/heavy impact, particularly under confinement.

Explosion data

Sensitivity to mechanical impact Yes.

Sensitivity to static discharge Yes.

Possibility of hazardous reactions

Possibility of hazardous reactions Explosion may result due to shock, friction, fire or other sources of ignition. Detonation may occur from heavy impact or excessive heating. A major fire may involve a risk of explosion. An adjacent detonation may also involve the risk of explosion. Mass explosion hazard. Explosion creates the potential for shrapnel.

Hazardous polymerization Hazardous polymerization does not occur.

Conditions to avoid

Conditions to avoid Heat. Keep away from open flames, hot surfaces and sources of ignition. Static discharge (electrostatic discharge). Do not subject to grinding/shock/friction. Do not subject to shock. Avoid contact with other chemicals. Protect from moisture. Avoid exposure to radio transmitters (including mobile phones).

Incompatible materials

Incompatible materials Incompatible with combustible materials. Incompatible with oxidizing agents.

Hazardous decomposition products

Hazardous decomposition products Carbon oxides. Nitrogen oxides. Metal oxides. Lead oxides. Lead fume.

11. TOXICOLOGICAL INFORMATION

Acute toxicity

Information on likely routes of exposure

Product Information No adverse health effects expected if the chemical is handled in accordance with this Safety Data Sheet and the chemical label. Symptoms or effects that may arise if the chemical is mishandled and overexposure occurs are:

Inhalation Not an expected route of exposure. Initiation can cause the presence of lead fume in air. Test firing of detonators in poorly ventilated areas can cause presence of lead fume in air. Lead fumes may be irritant to mucous membranes and respiratory tract. Harmful: danger of serious damage to health by prolonged exposure through inhalation.

Eye contact Not expected to cause eye irritation.

Skin contact Not expected to cause skin irritation. Contact with contents may cause irritation or dermatitis. Product is or contains a sensitizer. Shrapnel from detonation may cause burns, wounds and bruises.

Ingestion Specific test data for the substance or mixture is not available.

Symptoms None known.

Numerical measures of toxicity - Product Information

No information available.

Numerical measures of toxicity - Component Information

Component Information

Chemical name	Oral LD50	Dermal LD50	Inhalation LC50
Pentaerythritol tetranitrate (PETN)	= 1660 mg/kg (Rat)	-	-

See section 16 for terms and abbreviations

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Skin corrosion/irritation No information available.

Serious eye damage/eye irritation No information available.

Respiratory or skin sensitization No information available.

Germ cell mutagenicity No information available.

Carcinogenicity Not classified. Classification is based on mixture calculation methods based on component data.

Chemical name	Australia
Lead styphnate - 15245-44-0	Carc. 2

Reproductive toxicity May damage fertility or the unborn child.

STOT - single exposure No information available.

STOT - repeated exposure No information available.

Aspiration hazard Not classified.

Chronic effects: Long term exposure to low concentrations of lead (by any route) may result in blood effects, anaemia, central and peripheral nervous system damage, gastrointestinal disturbances, renal injury, foetotoxicity, developmental deficiencies in neonates and children, and testicular damage including decreased sperm count.

Exposure to explosive charge material unlikely. The main hazard is the possibility of exposure to lead fumes when test firing detonators in a poorly ventilated area. The effects of lead poisoning may not be appartent immediately but significant absorption over a period of time may produce adverse effects as noted earlier due to accumulation of lead in the body.

12. ECOLOGICAL INFORMATION

Ecotoxicity

Ecotoxicity Keep out of waterways. May cause long-term adverse effects in the aquatic environment.

Chemical name	Algae/aquatic plants	Fish	Toxicity to microorganisms	Crustacea
Pentaerythritol tetranitrate (PETN)	-	LC50: =926mg/L (96h, Pimephales promelas)	-	-

Persistence and degradability

Persistence and degradability No information available.

Bioaccumulative potential

Bioaccumulation No information available.

Mobility

Mobility in soil No information available.

Other adverse effects

Other adverse effects Contains lead compounds which can be harmful to the environment.

13. DISPOSAL CONSIDERATIONS

Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations. Small quantities of damaged or deteriorated explosives may be destroyed by inclusion in a blast hole containing good explosive (s). For large quantities of damaged or deteriorated explosives notify Orica Australia Pty Ltd and/or Orica New Zealand Pty Ltd.

14. TRANSPORT INFORMATION

ADG
Classified as Dangerous Goods by the criteria of the Australian Code for the Transport of Explosives by Road and Rail; DANGEROUS GOODS.

UN number	0030
Proper shipping name	DETONATORS, ELECTRIC
Hazard class	1.1B
Hazchem code	E

IATA
Forbidden

IMDG
Classified as Dangerous Goods by the criteria of the International Maritime Dangerous Goods Code (IMDG Code) for transport by sea; DANGEROUS GOODS.

UN number	0030
UN proper shipping name	DETONATORS, ELECTRIC
Transport hazard class(es)	1.1B
IMDG EMS Fire	F-B
IMDG EMS Spill	S-X

15. REGULATORY INFORMATION

Safety, health and environmental regulations/legislation specific for the substance or mixture

National regulations

Australia
Classified as dangerous goods in accordance with the Australian Code for the Transport of Explosives by Road and Rail.

Classified as a hazardous chemical in accordance with the criteria of Safe Work Australia - Globally Harmonized System (GHS).

See section 8 for national exposure control parameters

Poisons Schedule (SUSMP) None allocated

Chemical name	National pollutant inventory
Lead azide - 13424-46-9	10 tonne/yr Threshold category 1 2000 tonne/yr Threshold category 2b 60000 MWH Threshold category 2b 20 MW Threshold category 2b
Lead styphnate - 15245-44-0	10 tonne/yr Threshold category 1 2000 tonne/yr Threshold category 2b 60000 MWH Threshold category 2b 20 MW Threshold category 2b

International Inventories

AICS All the constituents of this material are listed on the Australian Inventory of Industrial Chemicals.

Legend:
- Australian Inventory of Industrial Chemicals

International Regulations

The Montreal Protocol on Substances that Deplete the Ozone Layer Not applicable

The Stockholm Convention on Persistent Organic Pollutants Not applicable

The Rotterdam Convention Not applicable

16. OTHER INFORMATION

Reason(s) For Issue: 5 Yearly Revised Primary SDS

Issuing Date: 23-Mar-2021

This Safety Data Sheet has been prepared by Ixom Operations Pty Ltd (Toxicology and SDS Services).

Revision Note:
The symbol (*) in the margin of this SDS indicates that this line has been revised.

Key or legend to abbreviations and acronyms used in the safety data sheet

Legend Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

TWA	TWA (time-weighted average)	STEL	STEL (Short Term Exposure Limit)
Ceiling	Maximum limit value	*	Skin designation
C	Carcinogen		

Key literature references and sources for data used to compile the SDS

EPA (Environmental Protection Agency)
Acute Exposure Guideline Level(s) (AEGL(s))
U.S. Environmental Protection Agency Federal Insecticide, Fungicide, and Rodenticide Act
U.S. Environmental Protection Agency High Production Volume Chemicals
Food Research Journal

Hazardous Substance Database
International Uniform Chemical Information Database (IUCLID)
Japan GHS Classification
Australian Industrial Chemicals Introduction Scheme (AICIS)
NIOSH (National Institute for Occupational Safety and Health)
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National Library of Medicine's PubMed database (NLM PUBMED)
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Organization for Economic Co-operation and Development High Production Volume Chemicals Program
Organization for Economic Co-operation and Development Screening Information Data Set
RTECS (Registry of Toxic Effects of Chemical Substances)
World Health Organization

Disclaimer

This SDS summarises to our best knowledge at the date of issue, the chemical health and safety hazards of the material and general guidance on how to safely handle the material in the workplace. Since The Supplier cannot anticipate or control the conditions under which the product may be used, each user must, prior to usage, assess and control the risks arising from its use of the material.

If clarification or further information is needed, the user should contact their Supplier representative or The Supplier at the contact details on page 1.

The Supplier's responsibility for the material as sold is subject to the terms and conditions of sale, a copy of which is available upon request.

End of Safety Data Sheet

SAFETY DATA SHEET

Revision date: 25-Aug-2021

Revision Number 4

1. IDENTIFICATION OF THE MATERIAL AND SUPPLIER

Product identifier

Product Name SENATEL MAGNUM

Product Code(s) 000000009251

Other means of identification

Proper shipping name EXPLOSIVE, BLASTING, TYPE E

UN number 0241

Pure substance/mixture Mixture

Recommended use of the chemical and restrictions on use

Recommended use Mining, quarrying and general blasting work where an energetic water-resistant explosive is required. Restricted to professional users.

Uses advised against No information available.

Supplier
Orica Australia Pty Ltd
ABN: 99 004 117 828
1 Nicholson Street
Melbourne 3000
Australia

Telephone Number: +61 3 9665 7111
Facsimile: +61 3 9665 7937

Emergency telephone number

Emergency telephone number **AUSTRALIA: 1 800 033 111 (ALL HOURS)**
INTERNATIONAL AUSTRALIA: +61 3 9663 2130 (ALL HOURS)

Please ensure you refer to the limitations of this Safety Data Sheet as set out in the "Other Information" section at the end of this Data Sheet.

2. HAZARDS IDENTIFICATION

GHS Classification

Classified as dangerous goods in accordance with the Australian Code for the Transport of Explosives by Road and Rail.

Classified as a hazardous chemical in accordance with the criteria of Safe Work Australia - Globally Harmonized System (GHS).

Explosives	Division 1.1 Category D
Serious eye damage/eye irritation	Category 2A

SIGNAL WORD

Danger

Label elements

Exploding bomb
Exclamation mark



Hazard statements
H201 - Explosive; mass explosion hazard
H319 - Causes serious eye irritation

Precautionary Statements - Prevention
Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking
Keep only in original packaging
Do not subject to grinding/shock/friction
Wash hands thoroughly after handling
Wear protective gloves / protective clothing / eye protection / face protection
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
If eye irritation persists: Get medical advice/attention
In case of fire: Explosion risk. Evacuate area. DO NOT fight fire when fire reaches explosives
Precautionary Statements - Storage
Store in accordance with:
AS2187.1 in a well ventilated magazine.
Precautionary Statements - Disposal
Refer to manufacturer/supplier for information on disposal/recovery/recycling

Other hazards which do not result in classification
Poisons Schedule (SUSMP) None allocated

3. COMPOSITION/INFORMATION ON INGREDIENTS

Mixture

Chemical name	CAS No.	Weight-%
Ammonium nitrate	6484-52-2	>60%
Sodium perchlorate	7601-89-0	<10%
Aluminium	7429-90-5	<10%
Non hazardous component(s)	-	to 100%

4. FIRST AID MEASURES

Description of first aid measures

General advice For advice, contact a Poisons Information Centre (e.g. phone Australia 13 11 26; New Zealand 0800 764 766) or a doctor. Take a copy of the Safety Data Sheet when going for medical treatment.

Emergency telephone number Poisons Information Center, Australia: 13 11 26
Poisons Information Center, New Zealand: 0800 764 766

Inhalation Remove to fresh air and keep at rest in a position comfortable for breathing. If breathing is difficult, (trained personnel should) give oxygen. Immediately give oxygen if victim turns

blue (lips, ears, fingernails). If breathing has stopped, give artificial respiration. Get medical attention immediately.

Eye contact Immediately flush with plenty of water. After initial flushing, remove any contact lenses and continue flushing for at least 15 minutes. Keep eye wide open while rinsing. Get medical attention immediately if symptoms occur.

Skin contact Wash off immediately with plenty of water. Get medical attention if irritation develops and persists. Take off contaminated clothing and wash before reuse.

Ingestion Clean mouth with water and drink afterwards plenty of water. Do NOT induce vomiting. Get medical attention. Never give anything by mouth to an unconscious person.

Self-protection of the first aider Remove all sources of ignition. Ensure that medical personnel are aware of the material(s) involved, take precautions to protect themselves and prevent spread of contamination. Use personal protective equipment as required. See section 8 for more information.

Most important symptoms and effects, both acute and delayed

Symptoms May cause redness and tearing of the eyes. Nitrates can be absorbed through cut, burnt or broken skin.

Indication of any immediate medical attention and special treatment needed

Note to physicians Treat symptomatically. Explosive material. Shrapnel from detonation may cause burns, wounds and bruises. Treat as for exposure to nitrates. May cause methemoglobinemia. Clinical findings: The smooth muscle relaxant effect of nitrate salts may lead to headache, dizziness and marked hypotension. Cyanosis is clinically detectable when approximately 15% of the haemoglobin has been converted to methaemoglobin (ferric iron). Symptoms such as headache, dizziness, weakness and dyspnoea occur when methemoglobin concentrations are 30% to 40%; at levels of about 60% stupor, convulsions, coma and respiratory paralysis occur and the blood is a chocolate brown colour. At higher levels death may result. Spectrophotometric analysis can determine the presence and concentration of methemoglobin in the blood.

Treatment:
1. Give 100% oxygen.
2. In cases of (a) ingestion: use gastric lavage, (b) contamination of skin (unburnt or burnt): continue washing to remove salts.
3. Observe blood pressure and treat hypotension if necessary.
4. When methaemoglobin concentrations exceed 40% or when symptoms are present, give methylene blue 1 or 2 mg/kg body weight in a 1% solution by slow intravenous injection. If cyanosis has not been resolved within one hour a second dose of 2 mg/kg body weight may be given. The total dose should not exceed 7 mg/kg body weight as unwanted effects such as dyspnoea, chest pain, vomiting, diarrhoea, mental confusion and cyanosis may occur. Without treatment methaemoglobin levels of 20-30% revert to normal within 3 days.
5. Bed rest is required for methaemoglobin levels in excess of 40%.
6. Continue to monitor and give oxygen for at least two hours after treatment with methylene blue.
7. Consider transfer to centre where haemoperfusion can be performed to remove the nitrates from the blood if the condition of the patient is unstable.
8. Following inhalation of oxides of nitrogen the patient should be observed in hospital for 24 hours for delayed onset of pulmonary oedema.

Further observation for 2-3 weeks may be required to detect the onset of the inflammatory changes of bronchiolitis fibrosa obliterans.

Effects from exposure to decomposition products including nitrogen dioxide (possible decomposition component) can include chest discomfort, shortness of breath and possible pulmonary oedema, the onset of which may be delayed. The exposed person should be kept under medical surveillance for 24 hours for delayed onset of pulmonary oedema.

5. FIRE FIGHTING MEASURES

Suitable Extinguishing Media

Suitable Extinguishing Media Do not fight fires involving explosives.

Unsuitable extinguishing media

Specific hazards arising from the chemical

Specific hazards arising from the chemical Explosive. May be ignited by heat, sparks or flames. May explode from friction, heat or contamination. Risk of explosion by shock or heating under confinement. On burning under confined or semi-confined conditions, some oxides of nitrogen and/or carbon will be present. Brown fumes indicate the presence of toxic oxides of nitrogen.

Hazardous combustion products Carbon oxides. Nitrogen oxides. Ammonium nitrate fumes. Ammonia. Aluminium oxides.

Special protective actions for fire-fighters

Special protective equipment for fire-fighters In the case of a small fire, if actual explosive is not burning, carefully remove as much explosive as possible to a safe distance. However, if explosive is burning, evacuate area immediately and allow to burn. DO NOT fight fire.

A major fire may involve a risk of explosion. An adjacent detonation may also involve the risk of explosion. Mass explosion hazard.

Hazchem code E

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Personal precautions Explosive material. Evacuate personnel to safe areas. ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). Do not subject to grinding/shock/friction. Use personal protective equipment as required. Avoid contact with skin, eyes and inhalation of vapors. Ensure adequate ventilation.

Other information Refer to protective measures listed in Sections 7 and 8.

In the case of a transport accident notify the Police, Regulatory Authorities and Orica Australia Pty Ltd (Telephone: 1800 033 111 -- 24 hour service) and/or Orica New Zealand Ltd (Telephone: 0800 734 607 -- 24 hour service) or Orica International (Telephone: +61 3 9663 2130 -- 24 hour service Australia).

For emergency responders Explosive material. Remove all sources of ignition. Use personal protection recommended in Section 8.

Environmental precautions

Environmental precautions Keep out of waterways. Local authorities should be advised if significant spillages cannot be contained.

Methods and material for containment and cleaning up

Methods for containment Prevent further leakage or spillage if safe to do so. Keep out of drains, sewers, ditches and waterways.

Methods for cleaning up Handle with care. Collect with clean non-metallic implements. Use a spark-free shovel. Collect in properly labelled containers, with loose fitting lids, for disposal. After cleaning,

flush away traces with water.

7. HANDLING AND STORAGE

Precautions for safe handling

Advice on safe handling Keep out of reach of children. Handle with care. Avoid contact with skin and eyes. Avoid breathing vapors or mists. Use personal protection equipment. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Take precautionary measures against static discharges. Avoid contamination with other substances.

General hygiene considerations Contaminated work clothing should not be allowed out of the workplace. Do not get in eyes, on skin, or on clothing. Wear suitable gloves and eye/face protection.

Conditions for safe storage, including any incompatibilities

Storage Conditions Store material in a well ventilated magazine suitably licensed for the explosives hazard classification. Do not store with other explosives products that have an incompatible explosives hazard classification (for example detonators must not be stored with blasting/high explosives). Store in accordance with local regulations. Store in a cool, dry area away from potential sources of heat, open flames, sunlight or other chemicals. Store away from strong acids, strong alkalis, nitrites, chlorates, chlorides, permanganates. Store away from other materials. Protect from physical damage.

Incompatible materials Incompatible with strong acids and bases. Incompatible with combustible materials. Incompatible with permanganates. Ammonium nitrate is a powerful oxidising agent. Ammonium nitrate is incompatible with, and must be stored away from, tetranitromethane, dichloroisocyanuric acid, trichloroisocyanuric acid, bromates, chlorates, chlorites, hypochlorites, perchlorates, chloroisocyanurates, nitrites, powdered metals, strong acids, reducing agents, permanganates, combustible materials, brass, bronze, copper, zinc.

Poisons Schedule (SUSMP) None allocated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Exposure Limits No value assigned for this specific material by Safe Work Australia. However, Workplace Exposure Standard(s) for constituent(s):

Chemical name	Australia	ACGIH TLV
Aluminium 7429-90-5	10 mg/m^3 5 mg/m^3	TWA: 1 mg/m^3 respirable particulate matter

Aluminium (metal dust): 8hr TWA = 10 mg/m^3
Oil mist, refined mineral: 8hr TWA = 5 mg/m^3

For potential decomposition product: Nitrogen dioxide: 8hr TWA = 5.6 mg/m^3 (3 ppm), 15 min STEL = 9.4 mg/m^3 (5 ppm)

As published by Safe Work Australia Workplace Exposure Standards for Airborne Contaminants.

TWA - The time-weighted average airborne concentration of a particular substance when calculated over an eight-hour working day, for a five-day working week.

STEL (Short Term Exposure Limit) - the airborne concentration of a particular substance calculated as a time-weighted average over 15 minutes, which should not be exceeded at any time during a normal eight hour work day. According to current knowledge

this concentration should neither impair the health of, nor cause undue discomfort to, nearly all workers.

TWA (ACGIH - Time-weighted Average) the time-weighted average concentration for a conventional 8-hour work day and a 40-hour work week, to which it is believed that nearly all workers may be repeatedly exposed, day after day, without adverse effect.

These Workplace Exposure Standards are guides to be used in the control of occupational health hazards. All atmospheric contamination should be kept to as low a level as is workable. These workplace exposure standards should not be used as fine dividing lines between safe and dangerous concentrations of chemicals. They are not a measure of relative toxicity.

Appropriate engineering controls

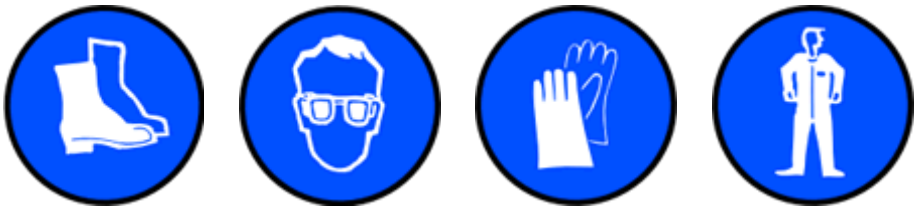
Engineering controls Apply technical measures to comply with the occupational exposure limits. Eyewash stations. Ventilation systems.

If in the handling and application of this material, safe exposure levels could be exceeded, the use of engineering controls such as local exhaust ventilation must be considered and the results documented. If achieving safe exposure levels does not require engineering controls, then a detailed and documented risk assessment using the relevant Personal Protective Equipment (PPE) (refer to PPE section below) as a basis must be carried out to determine the minimum PPE requirements.

Individual protection measures, such as personal protective equipment

The selection of PPE is dependent on a detailed risk assessment. The risk assessment should consider the work situation, the physical form of the chemical, the handling methods, and environmental factors.

OVERALLS, SAFETY SHOES, CHEMICAL GOGGLES, GLOVES.



Eye/face protection Goggles.

Skin and body protection Overalls. Protective shoes or boots.

Hand protection Protective gloves.

Respiratory protection No protective equipment is needed under normal use conditions. If exposure limits are exceeded or irritation is experienced, ventilation and evacuation may be required.

Environmental exposure controls No information available.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Physical state	Article. Cartridged into plastic 'sausages' with metal clips at both ends.
Appearance	Emulsion
Color	Grey / Cream
Odor	Negligible
Odor threshold	No information available.

Property	**Values**	**Remarks • Method**
pH	No data available	None known

pH (as aqueous solution)	No data available	None known
Melting point / freezing point	No data available	None known
Boiling point / boiling range	No data available	None known
Flash point	Not applicable	None known
Evaporation rate	No data available	None known
Flammability (solid, gas)	No data available	None known
Flammability Limit in Air		None known
Upper flammability or explosive limits	No data available	
Lower flammability or explosive limits	No data available	
Vapor pressure	No data available	None known
Vapor density	No data available	None known
Relative density	1.15-1.35 @ 20°C	None known
Water solubility	Insoluble in water	None known
Solubility(ies)	No data available	None known
Partition coefficient	No data available	None known
Autoignition temperature	No data available	None known
Decomposition temperature	No data available	None known
Kinematic viscosity	No data available	None known
Dynamic viscosity	No data available	None known
Explosive properties	Explosive; mass explosion hazard	

Other information

10. STABILITY AND REACTIVITY

Reactivity

Reactivity Explosive.

Chemical stability

Stability Explosive properties. Risk of explosion by shock, friction, fire or other sources of ignition. Capable of detonation, explosive decomposition, or explosive reaction but requires a strong initiating source or must be heated under confinement before initiation. Detonation may occur from static electricity discharge or mechanical/heavy impact, particularly under confinement.

Explosion data

Sensitivity to mechanical impact Yes.

Sensitivity to static discharge Yes.

Possibility of hazardous reactions

Possibility of hazardous reactions A major fire may involve a risk of explosion. An adjacent detonation may also involve the risk of explosion. Mass explosion hazard. Explosion may result due to shock, friction, fire or other sources of ignition. Detonation may occur from heavy impact or excessive heating. Explosion creates the potential for shrapnel.

Hazardous polymerization Hazardous polymerization does not occur.

Conditions to avoid

Conditions to avoid Heat. Keep away from open flames, hot surfaces and sources of ignition. Static discharge (electrostatic discharge). Do not subject to grinding/shock/friction. Avoid contact with other chemicals. Avoid contact with combustible substances. Protect from moisture.

Incompatible materials

Incompatible materials Incompatible with strong acids and bases. Incompatible with combustible materials. Incompatible with permanganates. Ammonium nitrate is a powerful oxidising agent. Ammonium nitrate is incompatible with, and must be stored away from, tetranitromethane, dichloroisocyanuric acid, trichloroisocyanuric acid, bromates, chlorates, chlorites, hypochlorites, perchlorates, chloroisocyanurates, nitrites, powdered metals, strong acids, reducing agents, permanganates, combustible materials, brass, bronze, copper, zinc.

Hazardous decomposition products

Hazardous decomposition products Carbon oxides. Nitrogen oxides. Ammonium nitrate fumes. Ammonia. Aluminium oxides. When heated to decomposition (unconfined) ammonium nitrate produces nitrous oxide, white ammonium nitrate fumes and water. When mixed with strong acids, and occasionally during blasting, it produces an irritating toxic brown gas, mostly nitrogen dioxide. When molten it may decompose violently due to shock or pressure.

11. TOXICOLOGICAL INFORMATION

Acute toxicity

Information on likely routes of exposure

Product Information No adverse health effects expected if the chemical is handled in accordance with this Safety Data Sheet and the chemical label. Symptoms or effects that may arise if the chemical is mishandled and overexposure occurs are:

Inhalation May cause irritation of respiratory tract. Causes headache, drowsiness or other effects to the central nervous system. Blasting may produce a toxic brown gas of nitrogen dioxide. Inhalation of the gas may result in chest discomfort, shortness of breath and possible pulmonary oedema, the onset of which may be delayed.

Eye contact Causes eye irritation.

Skin contact May cause irritation. Prolonged skin contact may defat the skin and produce dermatitis. Shrapnel from detonation may cause burns, wounds and bruises. Nitrates can be absorbed through cut, burnt or broken skin. Further information is provided under 'Chronic Effects'.

Ingestion Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhoea. Ingestion of larger amounts may cause defects to the central nervous system (e.g. dizziness, headache). May cause a lowering of blood pressure (hypotension).

Symptoms May cause redness and tearing of the eyes.

Numerical measures of toxicity - Product Information
No information available.

Numerical measures of toxicity - Component Information

Component Information

Chemical name	Oral LD50	Dermal LD50	Inhalation LC50
Ammonium nitrate	= 2217 mg/kg (Rat)	-	> 88.8 mg/L (Rat) 4 h
Sodium perchlorate	= 2100 mg/kg (Rat)	-	-

See section 16 for terms and abbreviations

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Skin corrosion/irritation No information available.

Serious eye damage/eye irritation Causes serious eye irritation.

Respiratory or skin sensitization No information available.

Germ cell mutagenicity No information available.

Carcinogenicity No information available.

Reproductive toxicity No information available.

STOT - single exposure No information available.

STOT - repeated exposure No information available.

Aspiration hazard No information available.

Chronic effects: No information available for the product.

NITRATES: Absorption of nitrates by ingestion, inhalation or through burnt or broken skin may cause dilation of the blood vessels by direct smooth muscle relaxation with a subsequent lowering of blood pressure and may also cause breathing difficulties, blueness of the skin (cyanosis) and methaemoglobinaemia.

12. ECOLOGICAL INFORMATION

Ecotoxicity

Ecotoxicity Keep out of waterways.

Ammonium nitrate is a plant nutrient. Large scale contamination may kill vegetation and cause poisoning in livestock and poultry. Ammonium nitrate was evaluated at 5, 10, 25 and 50 mg (NH4+)/L. The fertility of Daphnia magna was decreased at 50 mg/L. Post embryonic growth of crustacea was impaired at 10, 25 and 50 mg/L. Can stimulate weed and algal growth in static surface waters.

Chemical name	Algae/aquatic plants	Fish	Toxicity to microorganisms	Crustacea
Ammonium nitrate	-	LC50: 65 - 85mg/L (48h, Cyprinus carpio)	-	-

Persistence and degradability

Persistence and degradability No information available.

Bioaccumulative potential

Bioaccumulation No information available.

Chemical name	Partition coefficient
Ammonium nitrate	-3.1

Mobility

Mobility in soil No information available.

Other adverse effects

13. DISPOSAL CONSIDERATIONS

Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations. Small quantities of damaged or deteriorated explosives may be destroyed by inclusion in a blast hole containing good explosive (s). For large quantities of damaged or deteriorated explosives notify Orica Australia Pty Ltd and/or Orica New Zealand Pty Ltd.

14. TRANSPORT INFORMATION

ADG
Classified as Dangerous Goods by the criteria of the Australian Code for the Transport of Explosives by Road and Rail; DANGEROUS GOODS.

UN number	0241
Proper shipping name	EXPLOSIVE, BLASTING, TYPE E
Hazard class	1.1D
Hazchem code	E

IATA
Forbidden

IMDG
Classified as Dangerous Goods by the criteria of the International Maritime Dangerous Goods Code (IMDG Code) for transport by sea; DANGEROUS GOODS.

UN number	0241
UN proper shipping name	EXPLOSIVE, BLASTING, TYPE E
Transport hazard class(es)	1.1D
IMDG EMS Fire	F-B
IMDG EMS Spill	S-X

15. REGULATORY INFORMATION

Safety, health and environmental regulations/legislation specific for the substance or mixture

National regulations

Australia
Classified as dangerous goods in accordance with the Australian Code for the Transport of Explosives by Road and Rail.

Classified as a hazardous chemical in accordance with the criteria of Safe Work Australia - Globally Harmonized System (GHS).

See section 8 for national exposure control parameters

Poisons Schedule (SUSMP) None allocated

International Inventories

AIIC	All the constituents of this material are listed on the Australian Inventory of Industrial

Chemicals.

Legend:
- Australian Inventory of Industrial Chemicals

International Regulations

The Montreal Protocol on Substances that Deplete the Ozone Layer Not applicable

The Stockholm Convention on Persistent Organic Pollutants Not applicable

The Rotterdam Convention Not applicable

16. OTHER INFORMATION

ACGIH is a registered trademark of The American Conference of Governmental Industrial Hygienists.
`Registry of Toxic Effects of Chemical Substances'. Ed. D. Sweet, US Dept. of Health & Human Services: Cincinatti, 2021

Reason(s) For Issue: 5 Yearly Revised Primary SDS

Issuing Date: 25-Aug-2021

This Safety Data Sheet has been prepared by Ixom Operations Pty Ltd (Toxicology and SDS Services).

Revision Note:
The symbol (*) in the margin of this SDS indicates that this line has been revised.

Key or legend to abbreviations and acronyms used in the safety data sheet

Legend Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

TWA	TWA (time-weighted average)	STEL	STEL (Short Term Exposure Limit)
Ceiling	Maximum limit value	*	Skin designation
C	Carcinogen		

Key literature references and sources for data used to compile the SDS

EPA (Environmental Protection Agency)
Acute Exposure Guideline Level(s) (AEGL(s))
U.S. Environmental Protection Agency Federal Insecticide, Fungicide, and Rodenticide Act
U.S. Environmental Protection Agency High Production Volume Chemicals
Food Research Journal
Hazardous Substance Database
International Uniform Chemical Information Database (IUCLID)
Japan GHS Classification
Australian Industrial Chemicals Introduction Scheme (AICIS)
NIOSH (National Institute for Occupational Safety and Health)
National Library of Medicine's ChemID Plus (NLM CIP)
National Library of Medicine's PubMed database (NLM PUBMED)
National Toxicology Program (NTP)
New Zealand's Chemical Classification and Information Database (CCID)
Organization for Economic Co-operation and Development Environment, Health, and Safety Publications
Organization for Economic Co-operation and Development High Production Volume Chemicals Program
Organization for Economic Co-operation and Development Screening Information Data Set
RTECS (Registry of Toxic Effects of Chemical Substances)
World Health Organization

Disclaimer
This SDS summarises to our best knowledge at the date of issue, the chemical health and safety hazards of the material and general guidance on how to safely handle the material in the workplace. Since The Supplier cannot anticipate or

control the conditions under which the product may be used, each user must, prior to usage, assess and control the risks arising from its use of the material.

If clarification or further information is needed, the user should contact their Supplier representative or The Supplier at the contact details on page 1.

The Supplier's responsibility for the material as sold is subject to the terms and conditions of sale, a copy of which is available upon request.

End of Safety Data Sheet

Safety Data Sheet

SECTION 1 – IDENTIFICATION

Name, Address, and Telephone of the Responsible Party

Dyno Nobel Inc.
2795 East Cottonwood Parkway, Suite 500
Salt Lake City, Utah 84121
Phone: 801-364-4800 Fax 801-321-6703
E-Mail: dnna.hse@am.dynonobel.com www.dynonobel.com

SDS #: 1120
Date: 05/20/2015
Supersedes: 12/15/11

Product Identifier

Product Form: Substance

Product Name:

PETN, Recrystallized
PETN, Crude
PETN, Medium Fine
PETN, Super Fine
PETN, Cap Grade
PETN, Balloon Grade
PETN, Booster Grade

Other Means of Identification

Intended Use of the Product

Explosive manufacturing

Emergency Telephone Number

FOR 24 HOUR EMERGENCY, CALL **CHEMTREC (USA) 800-424-9300**
CANUTEC (CANADA) 613-996-6666

SECTION 2 – HAZARD(S) IDENTIFICATION

Classification of the Substance or Mixture

Classification (GHS-US)

Unst. Expl H200

Label Elements

GHS-US Labeling

Hazard Pictograms (GHS-US) :



GHS01

Signal Word (GHS-US) : Danger

Hazard Statements (GHS-US) : H200 - Unstable explosives.

Precautionary Statements (GHS-US) : P201 - Obtain special instructions before use.
P202 - Do not handle until all safety precautions have been read and understood.
P280 - Wear eye protection, face protection, face shield, protective clothing, protective gloves.
P372 - Explosion risk in case of fire.
P373 - DO NOT fight fire when fire reaches explosives.
P380 - Evacuate area.
P401 - Store local, regional, national, territorial, provincial, and international regulations.
P501 - Dispose of contents/container according to local, regional, national, territorial, provincial, and international regulations.

Other Hazards

Hazards Not Otherwise Classified (HNOC): Not available

Other Hazards: Not available

DYNO
Dyno Nobel
Groundbreaking Performance

SECTION 3 - COMPOSITION/INFORMATION ON INGREDIENTS

Substances

Name	Product identifier	% (w/w)	Ingredient Classification (GHS-US)
Pentaerythrite tetranitrate	(CAS No) 78-11-5	98 - 100	Unst. Expl, H200

Full text of H-phrases: see section 16

*NOTE: Must be shipped wetted with not less than 25% water by weight.

Ingredients, other than those mentioned above, as used in this product are not hazardous as defined under current Department of Labor regulations, or are present in de-minimus concentrations (less than 0.1% for carcinogens, less than 1.0% for other hazardous materials).

SECTION 4 - FIRST AID MEASURES

Description of First Aid Measures

General: PETN is a known coronary vasodilator, and ingestion or inhalation may result in a lowering of blood pressure, headache or faintness, and a decreased tolerance for grain alcohol. Repeated over-exposure may result in chest pains in the absence of exposure. Systemic effects by ingestion include dermatitis.

Inhalation: If inhaled and symptoms occur: supply fresh air; consult doctor in case of complaints.

Skin Contact: Remove contaminated clothing and rinse affected area with water. If skin irritation is experienced, consult a doctor.

Eye Contact: If contact with eyes, remove contact lenses if worn, rinse opened eye for several minutes. If symptoms persist, consult a doctor.

Ingestion: Do NOT induce vomiting; call for medical help immediately.

SECTION 5 - FIRE-FIGHTING MEASURES

Extinguishing Media

Suitable Extinguishing Media: DO NOT fight fires involving explosive materials.

Unsuitable Extinguishing Media: DO NOT FIGHT FIRES INVOLVING EXPLOSIVES. Evacuate all personnel to a predetermined safe location, no less than 2,500 feet in all directions. Water may be applied via sprinklers remotely as long as evacuation distances are maintained.

Special Hazards Arising From the Substance or Mixture

Fire Hazard: In case of fire involving explosive materials: Evacuate area. DO NOT fight fires involving explosive materials. Consult the most current Emergency Response Guidebook (ERG), Guide 112 for additional information. Extreme risk of explosion from shock, friction, fire or other sources of ignition.

Explosion Hazard: Explosive. Heat may build pressure, rupturing closed containers, spreading fire and increasing risk of burns and injuries. Extreme risk of explosion by shock, friction, fire, impact, heat or other sources of ignition.

Reactivity: Unstable explosives.

Advice for Firefighters

Precautionary Measures Fire: Do not attempt to fight fires involving explosive materials. Evacuate all personnel to a predetermined safe location, no less than 2,500 feet in all directions. Water may be applied via sprinklers remotely as long as evacuation distances are maintained.

Firefighting Instructions: DO NOT fight fires involving explosive materials. In case of fire: Evacuate area.

Protection During Firefighting: Likely to detonate under fire conditions. Burning material may produce toxic vapors.

Hazardous Combustion Products: Toxic fumes are released. Nitrogen oxides.

Reference to Other Sections: Refer to section 9 for flammability properties.

SECTION 6 - ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment and Emergency Procedures

General Measures: Protect from all ignition sources. In case of fire evacuate area not less than 2,500 feet in all directions. Notify authorities in accordance with emergency response procedures. Only personnel trained in emergency response should respond. If no fire danger is present, confine spill and **keep wet**. Pick up spilled material with non-metallic dust pan, using whisk brooms, damp sponges or damp rags as aids. If product is uncontaminated, repackage product in original packaging or other clean DOT approved container. Contamination of PETN with sand, grit or dirt will render the material more sensitive to detonation. If contaminated with sand, dirt or grit, do not repackage with uncontaminated material. ALL SPILLED PETN MUST BE RECOVERED. Follow applicable Federal, State and local spill reporting requirements.

For Non-Emergency Personnel
Protective Equipment: Use appropriate personal protection equipment (PPE).
Emergency Procedures: Evacuate unnecessary personnel.

For Emergency Personnel
Protective Equipment: Equip cleanup crew with proper protection.
Emergency Procedures: Evacuate unnecessary personnel. Stop leak if safe to do so. Eliminate ignition sources. Ventilate area.

Environmental Precautions
Prevent entry to sewers and public waters. Hazardous waste due to potential risk of explosion.

SECTION 7 - HANDLING AND STORAGE

Precautions for Safe Handling
Additional Hazards When Processed:
Store in cool, dry location. Store in compliance with all Federal, State and local regulations. Only properly qualified and authorized personnel should handle and use explosive materials. Keep away from heat, flame, friction, impact, ignition sources, electrostatic discharge or strong shock.

Do not allow to dry out. Re-wet if necessary prior to handling.

Precautions to be taken during use: Avoid breathing the fumes or gases from detonation of explosives. Use accepted safe industry practices when using explosive materials. Unintended detonation of explosives or explosive devices can cause serious injury or death.
Other Precautions: It is recommended that users or explosives material be familiar with the Institute of Makers of Explosives Safety Library publications.

Hygiene Measures: Handle in accordance with good industrial hygiene and safety procedures. Wash hands and other exposed areas with mild soap and water before eating, drinking, or smoking and again when leaving work.
Incompatible Materials: Corrosives (strong acids and bases or alkalis).
Specific End Use(s) Not available

SECTION 8 - EXPOSURE CONTROLS/PERSONAL PROTECTION

Control Parameters
No Occupational Exposure Limits (OELs) have been established for this product or its chemical components.

Exposure Controls
Appropriate Engineering Controls: Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure, but are not required. Product to be handled under strictly controlled conditions. Ensure all national/local regulations are observed. Provide adequate ventilation to minimize dust concentrations.
Personal Protective Equipment: Safety glasses, gloves and general work clothing.



Materials for Protective Clothing: Wear suitable work clothing to reduce skin contact.
Hand Protection: Suitable hand protection.
Eye Protection: Safety glasses.
Skin and Body Protection: Wear suitable protective clothing.
Respiratory Protection: Use NIOSH-approved air-purifying or supplied-air respirator where airborne concentrations of vapor or mist are expected to exceed exposure limits.
Other Information: When using, do not eat, drink or smoke.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

Information on Basic Physical and Chemical Properties

Physical State	:	Solid
Appearance	:	White, granular crystalline material
Odor	:	Slightly acidic
Odor Threshold	:	Not available
pH	:	Not available
Evaporation Rate	:	Not available
Melting Point	:	Not available
Freezing Point	:	Not available
Boiling Point	:	Not available
Flash Point	:	Not available
Auto-ignition Temperature	:	Not available
Decomposition Temperature	:	Not available
Flammability (solid, gas)	:	Not available
Lower Flammable Limit	:	Not available
Upper Flammable Limit	:	Not available
Vapor Pressure	:	Not available
Relative Vapor Density at 20 °C	:	Not available
Relative Density	:	Not available
Density	:	1.77 g/cm^3
Specific Gravity	:	Not available
Solubility	:	Insoluble in water.
Partition coefficient: n-octanol/water	:	Not available
Viscosity	:	Not available
Explosive properties	:	Unstable explosives
Explosion Data – Sensitivity to Mechanical Impact	:	Sensitive to mechanical impact
Explosion Data – Sensitivity to Static Discharge	:	Sensitive to static discharge

Safety Data Sheet

SECTION 10 - STABILITY AND REACTIVITY

Reactivity: It is recommended that users or explosives material be familiar with the Institute of Makers of Explosives Safety Library publications.

Chemical Stability: Store in cool, dry location. Store in compliance with all Federal, State and local regulations. Only properly qualified and authorized personnel should handle and use explosive materials. Keep away from heat, flame, friction, impact, ignition sources, electrostatic discharge or strong shock. **Do not allow to dry out.** Re-wet if necessary prior to handling.

Possibility of Hazardous Reactions: Not available

Conditions to Avoid: Heat. Sparks. Open flame or overheating.

Incompatible Materials: Strong acids. Strong bases. Strong oxidizers.

Hazardous Decomposition Products: Carbon oxides (CO, CO_2). Toxic fumes. Nitrogen oxides.

SECTION 11 - TOXICOLOGICAL INFORMATION

Information on Toxicological Effects - Product

Acute Toxicity: Not classified

LD50 and LC50 Data: Not available

Skin Corrosion/Irritation: Not classified

Serious Eye Damage/Irritation: Not classified

Respiratory or Skin Sensitization: Not classified

Germ Cell Mutagenicity: Not classified

Teratogenicity: Not available

Carcinogenicity: Not classified

Specific Target Organ Toxicity (Repeated Exposure): Not classified

Reproductive Toxicity: Not classified

Specific Target Organ Toxicity (Single Exposure): Not classified

Aspiration Hazard: Not classified

Symptoms/Injuries After Inhalation: Prolonged inhalation of dust may cause respiratory irritation.

Symptoms/Injuries After Skin Contact: May cause skin irritation.

Symptoms/Injuries After Eye Contact: May cause eye irritation.

Information on Toxicological Effects - Ingredient(s)

LD50 and LC50 Data: Not available

SECTION 12: ECOLOGICAL INFORMATION

Toxicity Not classified

Persistence and Degradability

PETN, Recrystallized; PETN, Crude	
Persistence and Degradability	Not established.

Bioaccumulative Potential

PETN, Recrystallized; PETN, Crude	
Bioaccumulative Potential	Not established.

Mobility in Soil Not available

Other Adverse Effects

Other Information: Avoid release to the environment.

SECTION 13 - DISPOSAL CONSIDERATIONS

Waste Disposal Recommendations: Dispose of waste material in accordance with all local, regional, national, provincial, territorial and international regulations.

Additional Information: Hazardous waste due to potential risk of explosion.

DYNO Dyno Nobel Groundbreaking Performance

SECTION 14 - TRANSPORT INFORMATION

14.1 In Accordance with DOT

Proper Shipping Name : PENTAERYTHRITOL TETRANITRATE, WETTED with not less than 25 percent water, by mass
Hazard Class : 1.1D
Identification Number : UN0150
Label Codes : 1.1D



Packing Group : II

14.2 In Accordance with IMDG

Proper Shipping Name : PENTAERYTHRITE TETRANITRATE (PENTAERYTHRITOL TETRANITRATE; PETN), WETTEDwith not less than 25 percent water, by mass
Hazard Class : 1.1D
Identification Number : UN0150
Label Codes : 1.1D
EmS-No. (Fire) : F-B
EmS-No. (Spillage) : S-Y



14.3 In Accordance with IATA

Proper Shipping Name : PENTAERYTHRITOL TETRANITRATE, WETTED with not less than 25 percent water, by weight
Identification Number : UN0150
Hazard Class : 1
Label Codes : 1.1D



ERG Code (IATA) : 1L

14.4 In Accordance with TDG

Proper Shipping Name : PENTAERYTHRITOL TETRANITRATE, WETTED with not less than 25 per cent water, by weight
Packing Group : II
Hazard Class : 1.1D
Identification Number : UN0150
Label Codes : 1.1D



SECTION 15 - REGULATORY INFORMATION

US Federal Regulations

PETN, Recrystallized; PETN, Crude	
SARA Section 311/312 Hazard Classes	Sudden release of pressure hazard

Pentaerythrite tetranitrate (78-11-5)	
Listed on the United States TSCA (Toxic Substances Control Act) inventory	
EPA TSCA Regulatory Flag	T - T - indicates a substance that is the subject of a Section 4 test rule under TSCA.

US State Regulations

Pentaerythrite tetranitrate (78-11-5)
U.S. - New Jersey - Right to Know Hazardous Substance List

Canadian Regulations

Pentaerythrite tetranitrate (78-11-5)	
WHMIS Classification	**Note: Explosives are not regulated under WHMIS. They are subject to the regulations of the Explosives Act of Canada.**

Listed on the Canadian DSL (Domestic Sustances List)
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the SDS contains all of the information required by CPR.

SECTION 16: OTHER INFORMATION, INCLUDING DATE OF PREPARATION OR LAST REVISION

Revision date : 05/20/2015

Other Information : This document has been prepared in accordance with the SDS requirements of the OSHA Hazard Communication Standard 29 CFR 1910.1200.

GHS Full Text Phrases:

Unst. Expl	Unstable explosives
H200	Unstable explosives

Party Responsible for the Preparation of This Document

Dyno Nobel Inc.
2795 East Cottonwood Parkway, Suite 500
Salt Lake City, Utah 84121
Phone: 801-364-4800

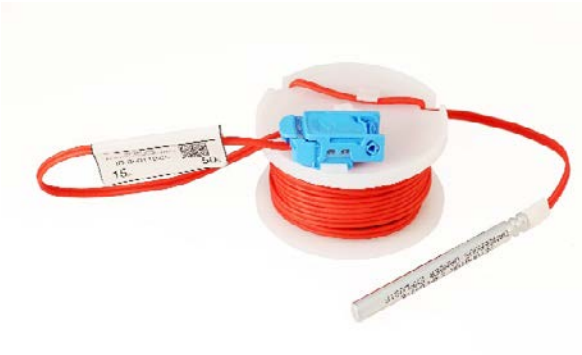
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TECHNICAL DATA SHEET

i-kon™ III Electronic Detonator

Australia



Description

Orica's premium i-kon™ III system is the most sophisticated Electronic Blasting System on the market.

i-kon™ III electronic detonators have multiple safety features that are inherent in the design of the product including spark gaps, input and bleed resistors, and the chip itself. The i-kon™ III detonator is used in conjunction with the following hardware:

- i-kon™ Logger
- i-kon™ Blaster 400, 2400S or 3000
- i-kon™ Surface Remote Blaster System (SURBS hardware)
- i-kon™ Centralised Electronic Blasting System including Lock Box and Remote Blasting Box (CEBS hardware compatible with Blaster 400, 2400S)

Application

i-kon™ III detonators are the most advanced electronic detonators in the market and are particularly suitable for high value and complex blasts at large open cut and underground operations and in the most challenging environments.

Key Benefits

- Robust communication between i-kon™ III hardware and detonator
- Inherently safe dual voltage design
- World's most accurate electronic detonator, combined with the longest delay time window (30 seconds), allows blasts to be designed for a wide variety of blast outcomes.
- Reliable performance in the most challenging blasting environments with corrosion resistant alloy shell.
- i-kon™ III is ideal for large blasts as delay times can be pre-programmed in ShotPlus 5, speeding up logging.
- Programmable i-kon™ III detonators simplifies inventory management at the site

Technical Properties

Wire Colour	Red
Tensile strength (kg)	25
Explosives charge weight (mg)	900 mg (# 8* strength)
Connector colour	Blue
Shell length x diameter	89 x 7.6 mm
Shell material	Bimetallic (aluminium and copper alloy)
Programmability (ms) Standard	1ms to 30s
Max delay time (seconds)	30
Precision as coefficient of variation	0.005%

Recommendations for Use

- i-kon™ III detonator delays are defined with the i-kon™ Loggers and programmed and initiated through the use of the i-kon™ Blasters.
- i-kon™ III detonators can only be tested, programmed and fired with i-kon™ Loggers and Blasters. Do not use any other programming or blasting equipment.
- Damage to the legwire insulation is the most common cause of problems with electronic blasting systems; exercise care and protect the wires when loading and stemming holes.
- i-kon™ III detonators are explosive devices and should be handled with care.
- i-kon™ Loggers and Blasters are electronic devices designed to withstand normal mine, quarry and construction environments but submersion in water and excessive impact should be avoided.
- Never open i-kon™ blasting equipment. It should be serviced or repaired only by Orica or approved agents.
- High quality i-kon™ Harness Wire is used to connect up the i-kon™ III System in the field. Other wire may look similar, but will not offer the same critical performance characteristics and is not recommended.

i-kon™ III Electronic Detonator

Australia

Sleep-Time within Blastholes

The recommended maximum sleep time is 60 days. Sleep time is dependent on environmental conditions. An Orica Technical Services Representative should be consulted to assess the appropriate maximum sleep times for your conditions.

Packaging

i-kon™ III detonators are available in the following lengths and packaging:

i-kon™ III RX detonators (all spooled)

	1.1B packaging		1.4S packaging	
Length m (Spool)	Units / Case	Weight per Case (Kg)	Units / Case	Weight per Case (Kg)
10	60	10.0	32	8.4
15	60	13.0	32	10.0
20	48	13.1	32	11.4
30	30	11.8	16	8.2
40	25	12.5	16	9.8
60	18	13.0	12	9.9
80	12	11.5	12	12.3

Storage and Handling

Product Classification

Authorised Name: i-kon™ III

Proper Shipping Name: Detonators, Electric for blasting

Hazard Class	1.1B	1.4S
UN Number	0030	0456

All regulations pertaining to the handling and use of such explosives apply.

Storage

Store i-kon™ III detonators in a suitably licensed magazine for Class 1.1B explosives. The cases should be stacked in the manner designated on the cases.

i-kon™ III detonators have a storage life of up to 5 years in an approved magazine.

Temperature Limits

Activity		Temperature
Operating	min	-20ºC
	max	70ºC
Storage	min	-20ºC
	max	50ºC
Transport	min	-40ºC
	max	65ºC

Disposal

The i-kon™ III electronic initiating systems provide a high level of safety against initiation by static electricity, stray electrical currents and radio frequency transmissions. However, i-kon™ III detonators contain pyrotechnics and molecular explosives, which can initiate under intense impact, friction or heat. As with all high explosives, these detonators must be handled and stored with care. i-kon™ III detonators may only be used at temperatures up to 70ºC. Seek advice from Orica for priming systems suitable for higher temperatures.

See Safety Data Sheet for more information

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Emergency Telephone Numbers

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TECHNICAL DATA SHEET

Electric Instantaneous II Detonators

Australia



Description

Electric Instantaneous II Detonators are rated as 8* Strength. These detonators contain a sleeved fusehead, a priming composition and a PETN base charge inside a cylindrical aluminium alloy shell. A pair of copper lead-wires, covered by PVC closure plug, are soldered to the fuse-head and crimped into the detonator shell with a PVC closure plug. A T&T label indicating the detonator “0” delay is attached on the leg wires. The lead-wires are kept shorted by a twisted section, at a bared area, near the free ends.

Electric Instantaneous II Detonators are distributed in Australia by Orica.

Application

Electric Instantaneous II Detonators provide effective initiation for general purpose blasting, pipeline and utility trenching, underground development and construction operations. Electric Instantaneous II Detonators can be used in wet conditions if adequate precautions are taken to insulate the lead-wire connections.

Recommendations for Use

Electric Instantaneous II Detonators should only be used by personnel who have been correctly trained in the handling and use of explosives. Electric Instantaneous II Detonators contain sensitive components and must be handled with care and respect at all times. Electric Instantaneous II Detonators used inside blastholes should always be secured inside suitable primers which fully enclose the detonator shell to protect it from abrasion or impact damage during charging.

Technical Properties

Detonator	
Shell	Aluminium Alloy
Base Charge	800mg PETN
Fusehead resistance	0.8 Ohms
All fire current	0.55 Amps
No fire current	0.3 Amps
Min fire current	4.1 mJ/ohm
Lead-Wires	
PVC Colours	Yellow / White
Conductor	Copper
Wire diameter	0.57mm
Length	3.6m
Resistance	0.14 ohm/m

Each unit should be checked before use, as required by local Statutory Regulations. An approved circuit tester and a suitable container, to enclose the detonator, should be used when testing detonators. The resistance of the circuit should be measured, using an approved tester, to confirm that the exploder or firing equipment available can supply sufficient energy to reliably initiate all detonators in the circuit. Single series connections are recommended to simplify hook-up and avoid the need to "balance" parallel circuits.

Electric Instantaneous II Detonators are supplied with the leg-wires shorted together, and should remain this way until final hook-up. Before touching bare leg wires, operators should make contact with an effective earthed point to disperse any static electrical charges, which may have accumulated during charging. After joining the detonator leg-wires together, the bare connections should be insulated to minimise the possibility of current leakage from the circuit.

Electric Instantaneous II Detonators have proven to be robust in a wide variety of applications, but reasonable care should be taken to prevent damage to the leg-wires during handling.

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Electric Instantaneous II Detonators

Australia

If the plastic insulation is damaged in any way which exposes the wire core within, misfires may result due to current leakage to earth.

Electric Instantaneous II Detonators can be safety used in the vicinity of radio frequency transmitters in accordance with the "safe distances" specified in Australian Standard 2187, Part 2 – 2006.

Packaging

Electric Instantaneous II Detonators are packed in UN certified cardboard cases. A case contains a total of 256 detonators. Within each case are 8 boxes each containing 32 detonators. A case has dimensions 430mm x 400mm x 320mm and weighs 13.5kg gross

Storage and Handling

Product Classification

Authorised Name:	ELECTRIC INSTANTANEOUS II
Proper Shipping Name:	DETONATORS, ELECTRIC
UN No:	0456, 0030 or 0255
Classification:	1.4S, 1.1B or 1.4B

Storage

Electric Instantaneous II Detonators should be stored in a cool, dry, ventilated magazine licensed for Class 1.1B products.

The shelf life of Electric Instantaneous II detonators is 2 years from the date of manufacture.

Disposal

Disposal of explosive materials can be hazardous. Methods for safe disposal of explosives may vary depending on the user's situation. Please contact a local Orica representative for information on safe practices.

Safety

Electric Instantaneous II Detonators incorporate a plastic shield around the fusehead to minimise the possibility of static discharge between the fusehead and the detonator shell.

Electric Instantaneous II Detonators are supplied in tight coils with the ends of the lead-wires shorted. This configuration safeguards against accidental initiation by stray currents or radio frequency transmissions.

Note that Electric Instantaneous II Detonators will initiate if the lead-wires touch the aerial of a radio transmitter (including mobile telephones). Normal blasting procedures must ensure that radio transmitters are not allowed near electric detonators.

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TECHNICAL DATA SHEET

Carrick II Detonators

Australia

Description

Carrick II Detonators are low incendive, short delay detonators approved for use in underground coal mines. They are an electric delay detonator, containing a sleeved fusehead, a delay element (except for 0 delay), a priming composition and a tetryl base charge inside a cylindrical copper shell. A pair of copper leg-wires, covered by PVC insulation, are soldered to the fusehead and crimped into the detonator shell with a PVC closure plug. A T&T label indicating the detonator delay number and the length of wires is attached on the leg wires. The leg-wires are kept shorted by a twist at a bared section near the free ends.

Carrick II Detonators are distributed in Australia by Orica.

Application

Carrick II Detonators are especially designed to be used in gaseous environments like those found in underground coal mines. Carrick II Detonators are compatible with all permitted types of explosives. Carrick II Detonators can be used in wet conditions under moderate heads of water, if adequate precautions are taken to insulate leg-wire connections.

Recommendations for Use

Carrick II Detonators should only be used by personnel who have been correctly trained in the handling and use of explosives. Carrick II Detonators contain sensitive components and must be handled with care and respect at all times. Carrick II Detonators used inside blastholes should always be secured inside suitable primers, which fully enclose the detonator shell to protect it from abrasion or impact damage during charging. Carrick II Detonators are tested for continuity and resistance after assembly, but each unit should be checked before use, as required by local Statutory Regulations.

An approved circuit tester and a suitable container, to enclose the detonator, should be used when testing detonators. The resistance of the circuit should be measured using an approved tester to confirm that the exploder or firing equipment available can supply sufficient energy to reliably initiate all detonators in the circuit. Single series connections are recommended to simplify hook-up and avoid the need to "balance" parallel circuits.

Carrick II Detonators are supplied with the leg-wires shorted together and should remain this way until final hook-up. Before touching bare leg wires, operators should make contact with an effective earthed point to disperse any static electrical charges which may have accumulated during charging. After joining the detonator leg-wires together, the

Technical Properties

Delay Detonator	
Shell	Copper
Base Charge	0.4 g Tetryl
Fusehead	Low intensity N34 TB
Fusehead resistance	1 ohm
No fire current (I_0)	0.26 A
All fire current (I_1)	0.8 A
Minimum firing energy	3 mJ / ohm

Leg Wires	
Conductor	Copper
Diameter	0.57mm
Insulation	PVC
Resistance	0.14 ohm/m
Colours	Pink and orange
Length	3.6 m

Delay Times

Delay #	**0**	**1**	**2**	**3**
Time (ms)	0	25	50	75
Delay #	**4**	**5**	**6**	**7**
Time (ms)	100	125	150	175
Delay #	**8**	**9**	**10**	
Time (ms)	200	225	250	

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Carrick II Detonators

Australia

bare connections should be insulated to minimise the possibility of current leakage from the circuit. Reasonable care should be taken to prevent damage to the leg-wires during handling. If the plastic insulation is damaged in a way which exposes the wire core within, misfires may results due to current leakage to earth.

Carrick II Detonators are compatible with all types of permitted explosives. For security the leg wires should be "half-hitched" around the primer cartridge to prevent separation during charging. Carrick II Detonators can be safely used in the vicinity of radio frequency transmitters in accordance with the "safe distances" specified in Australian Standard 2187, Part 2 - 2006.

Packaging

Carrick II Detonators are packed into inner cardboard cartons. Each inner carton contains 40 detonators. All detonators within a carton have the same delay. Ten inner cartons are enclosed in an UN certified outer fibreboard case. External case dimensions are 430mm x 400mm x 320mm.

Storage and Handling

Carrick II Detonators should be stored in a cool, dry magazine licensed for Class 1.1B explosives. The shelf life of Carrick II detonators is 2 years from the date of manufacture.

Product Classification

Authorised Name:	ELECTRIC DETONATORS CARRICK II
Proper Shipping Name:	DETONATORS, ELECTRIC for blasting
UN No:	0456, 0030 or 0255
Classification:	1.4S, 1.1B or 1.4B

All regulations pertaining to the handling and use of such explosives apply.

Storage

Carrick II Detonators should be stored in a cool, dry magazine licensed for Class 1.1B explosives. The shelf life of Carrick II detonators is 2 years from the date of manufacture.

Disposal

Disposal of explosive materials can be hazardous. Methods of safe disposal of explosives may vary depending on the user's situation. Please contact an Orica Technical Services Representative for information on safe practices.

Safety

Carrick II Detonators incorporate a polyethylene sleeve around the fusehead to minimise the possibility of static discharge between the fusehead and the detonator shell.

Carrick II Detonators are supplied in tight coils with the ends of the leg-wires shorted. This configuration safeguards against accidental initiation by stray currents or radio frequency transmissions. However Carrick II detonators used in the vicinity of radio frequency transmitters must comply with the "Safe distances" specified in Australian Standard 2187, Part- 2 2006.

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Emergency Telephone Numbers

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TECHNICAL DATA SHEET

eDev™ II Electronic Detonator

Australia



Description

The eDev™ II electronic detonator is one of Orica's exciting Next Generation products. These detonators are used in conjunction with:

- SHOTPlus™ blast design software
- Blast Box 610 or 610C
- Scanner 120 or Scanner 125
- eDev™ II Test Box or Tester for inherently safe at face testing of all detonators
- Duplex harness wire

Application

This system is specifically for easy use in tunnelling. eDev™ II detonators have a bar code printed on the flag tag which contains the detonator's unique ID. The user scans this tag to capture the ID and links it with a firing time derived from SHOTPlus™. Once all detonators are connected to the harness wire at the face the Test Box can be used to test all detonators.

Key Benefits

- Reliable, effective and safe blasting is achieved because of the rugged, proven construction of the eDev™ detonator, with testability at the face.
- Efficient operations at the face are afforded by the convenient packaging, glove-friendly connector and duplex harness wire.
- Predictable blasting results with minimal vibration and overbreak and improved advance per round are achievable because of the programmability and high precision of eDev™ II electronic detonators.
- Reliable initiation of boosters and explosives is achieved by the full strength base charge in the eDev™ II detonator.

Technical Properties

Wire Colour	Yellow
Tensile strength (kg) / (lbs)	20/ 55
Explosives charge weight (mg)	900
Connector colour	Orange
Shell length x diameter	89 x 7.6 mm
Shell material	Copper alloy
Max delay time (seconds)	20
Precision (Std Dev / Mean)	+- 0.01%

- Reduced inventory frees up working capital because eDev™ II detonators are fully programmable; any delay between 0 and 20,000ms is always in your magazine

Recommendations for Use

eDev™ II detonators can only be tested, programmed and fired using dedicated eDev™ equipment. Do not use any other programming or blasting equipment.

The recommended operating temperature range of eDev™ II detonators is -20°C to 70°C.

Sleep-Time within Blastholes

The recommended maximum sleep time is 21 days. Sleep time is dependent on ground water conditions.

Orica Technical Services Representative should be consulted if special conditions exist.

TECHNICAL DATA SHEET

eDev™ II Electronic Detonator

Australia

Packaging

eDev™ II detonators are available in the following lengths and packaging:

	1.1B		1.4S	
Leg wire Lengths	**Units / Case**	**Gross Weight kg**	**Units / Case**	**Gross Weight kg**
2 m	120	4.8	Not Available	
3 m	100	4.9		
4 m	90	5.0		
5 m	85	5.5		
6 m	80	5.8	40	6.12
8 m	70	6.23	35	5.9

Storage and Handling

Product Classification

Authorised Name: eDev™ II

Proper Shipping Name: Detonators, Electric for blasting

Hazard Class	1.1B	1.4S
UN Number	0030	0456
EX Number	EX2010060239	EX2010080324

All regulations pertaining to the handling and use of such explosives apply.

Storage

Store eDev™ II detonators in a suitably licensed magazine for Class 1.1B explosives. The cases should be stacked in the manner designated on the cases. eDev™ II detonators have a storage life of up to 5 years in an approved magazine.

Storage and use temperatures

Activity		**Temperature**
Operating	min	-4ºF / -20ºC
	max	158ºF / 70ºC
Storage	min	-4ºF / -20ºC
	max	120ºF / 50ºC
Transport	min	-40ºF / -40ºC
	max	150ºF / 65ºC

Disposal

Disposal of explosive materials can be hazardous. Methods for safe disposal of explosives may vary depending on the user's situation. Please contact a local Orica representative for information on safe practices.

Safety

eDev™ II detonators provide a high level of safety against initiation by static electricity, stray electrical currents and radio frequency transmissions. However, eDev™ II detonators contain pyrotechnics and molecular explosives, which can initiate under intense impact, friction or heat. As with all high explosives, these detonators must be handled and stored with care. eDev™ II detonators may only be used at temperatures up to 70ºC. Seek advice from Orica for priming systems suitable for higher temperatures. See Safety Data Sheet for more information.

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TECHNICAL DATA SHEET

Exel™ Long Period Detonators

Australia



Description

Exel™ Long Period Detonators are a series of high strength non-electric detonators with Long Period (LP) delay intervals between successive firing times.

Exel™ LP Detonators consist of a non-electric detonator, a length of Exel™ signal tube, and a J-hook connector. The detonator incorporates delay elements and a high strength PETN base charge inside an aluminium shell. The yellow Exel™ signal tube is a high strength, high abrasion resistant tubing which transmits the initiation signal to the detonator. One end of the signal tube is crimped into the detonator shell, and the other end is closed off by a waterproof seal. The plastic J-hook provides a rapid and secure means of attaching the signal tube to detonating cord. It is colour coded and has the detonator delay and time printed on it.

The Tangle-Free F100 winding configuration is used for all lengths except 24m, which is in F80 configuration. These configurations provide tangle-free, easy to deploy leads.

Application

Exel™ LP Detonators provide a series of delay times suitable for underground development blasting in tunnelling, raising and shaft sinking operations.

Exel™ LP Detonators will directly initiate Pentex™ boosters and packaged explosives. Refer to the relevant Technical Data Sheets for details.

Technical Properties

Signal Tube	Yellow Exel™
Outer Diameter	3 mm
Nominal Tensile Strength	45 kgf
Lengths	3.6, 4.8, 6, 24 m
Standard Detonator PETN charge	790 mg (#8* strength)

Available Delay Range

Delay #	**0**	**1**	**2**	**3**
Nominal Time (s)	0.025	0.2	0.4	0.6
Delay #	**4**	**5**	**6**	**7**
Nominal Time (s)	1.0	1.4	1.8	2.4
Delay #	**8**	**9**	**10**	**11**
Nominal Time (s)	3.0	3.5	4.5	5.5
Delay #	**12**	**13**	**14**	**15**
Nominal Time (s)	6.5	7.5	8.5	9.5

Exel™ LP Detonators can be safely used when blow-loading ANFO into unlined blastholes, but semi-conductive charging hose and properly earthed charging equipment must be used.

Recommendations for Use

Exel™ signal tube is extremely robust, however if it is cut or split, moisture may enter the hollow core and cause a misfire. Exel™ LP Detonators should always be secured inside a suitable booster, which fully encloses the detonator. Exposed detonators should not be placed inside blastholes or charging hoses.

Exel™ LP Detonators used inside blastholes should normally be "reverse-primed", with the detonator base pointing towards the blasthole collar

Excessive force should not be applied to signal tubes connected to in-hole detonators and primers. If a primer becomes stuck when attempting to retrieve or reposition it, a replacement unit should be used. Exel™ LP Detonators can be reliably initiated by detonating cord, which has a PETN

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Exel™ Long Period Detonators

Australia

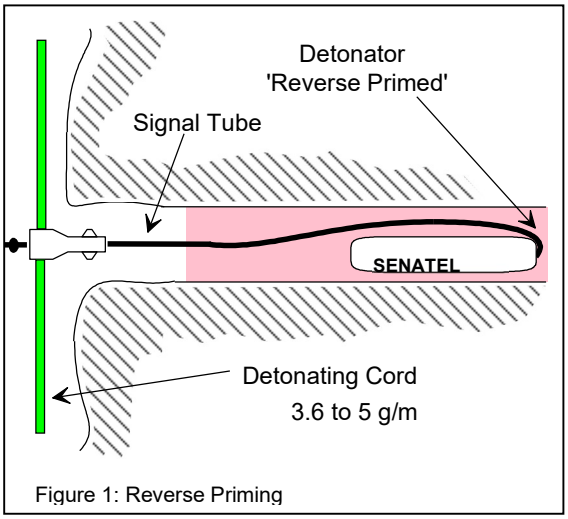


Figure 1: Reverse Priming

core charge between 3.6 and 5.0 g/m, using standard J - Hook connections. Exel™ LP Detonators should be attached to detonating cord trunklines using the J-hook. Clip each J-hook to the detonating cord trunkline, keeping the cord and signal tube at right angles. Pull the end of the signal tube through its J-hook until the tube is straight and taut between the connection and the blasthole collar. Ensure that no signal tubes cross over or lie within 200 mm of the detonating cord.

Packaging

Exel™ LP Detonators are packed into sealed "barrier bags" which are contained within an outer cardboard case. All units within a case have the same lead length and delay. The case dimensions are 0.60 x 0.32 x 0.22 m.

Lead Length (m)	Units / Case	Nominal Gross Weight * (kg)
3.6	210	10
4.8	180	10
6	150	9
24	35	7

Storage and Handling

Product Classification

Authorised Name:	Exel™ Long Period Detonators
Proper Shipping Name:	Detonator assemblies non-electric for blasting
UN No:	0360
Classification:	Class 1.1B

All regulations pertaining to the handling and use of such explosives apply.

Exel™ LP Detonators should be stored in a cool, dry detonator magazine licensed for Class 1.1B explosives. Stacks of cases should be no more than 2 metres high.

Exel™ LP Detonators should be used within 12 months of opening the sealed "barrier bag". Delay detonators deteriorate with age and should be used in order of manufacturing date (oldest first). Batches of detonators more than 4 years old should not be used.

Safety

Exel™ LP Detonators provide a high level of safety against initiation by static electricity, stray electrical currents and radio frequency transmissions. Exel™ LP Detonators incorporate sensitive components inside the detonator. Care should be taken not to cause initiation via intense impact, friction or heat. Exel™ LP Detonators maybe used in temperatures up to 70ºC.

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TECHNICAL DATA SHEET

Exel™ Connectadet™ Detonators

Australia



Description

Exel™ Connectadet™ Detonators are signal tube based detonators designed to control the millisecond delay sequence from hole to hole, across the surface of a blast. The special design of Connectadet™ Detonators allows up to six outgoing signal tubes to be initiated and provides security of tube retention. Exel™ Connectadet™ Detonators consist of a length of Exel™ signal tube and a low strength delay detonator. The free end of the tubing is closed with a waterproof seal. The delay detonator is fully enclosed in a unique colour coded connector block.

The Tangle-Free F100 winding configuration is used for tube lengths in the 3.6 to 6 m range. Tangle-Free F80 winding configuration is used for tube lengths in the 9 to 18 m range. These configurations provide tangle-free, easy to deploy leads. A plastic J-hook connector provides a rapid and secure method of attaching the signal tube to detonating cord. To simplify identification of the detonator delay time, the J-hook connector is also colour coded and has the detonator delay time printed on it.

Application

Exel™ Connectadet™ Detonators function as a surface relay system, which enables an unlimited number of blastholes to be fired in sequence. This permits large well-controlled blasts to be fired, producing better results more efficiently.

Technical Properties

Signal Tube	Pink Exel™
Outer Diameter	3 mm
Nominal Tensile Strength	45 kgf
Available Lengths	3.6, 4.8, 6, 9, 12, 15, 18 m

Available Delay Range

Delay (ms)	Block Colour
9	Green
17	Yellow
25	Red
42	White
65	Blue
100	Orange
125	Cream
150	Mustard
175	Lime Green

Exel™ Connectadet™ Detonators are commonly used in conjunction with a delay detonator in every blasthole. The normal practice is for all the in-hole detonators to have the same delay period and, as a result, the surface detonators control the firing sequence. Exel™ Connectadet™ Detonators are produced with a range of delay times matched to the needs of mines, quarries and construction projects.

Recommendations for Use

Exel™ Connectadet™ Detonators will initiate up to six 3 mm diameter signal tubes in both directions. NOTE: Connectadet™ Detonators are NOT suitable for the initiation of detonating cord. Signal tubes are attached to Exel™ Connectadet™ Detonators with the connector block. Clip each signal tube, singly into the connector block, keeping the connector and tube at right angles. Ensure that the tubes are firmly 'hooked' in place and that no signal tubes cross over or lie within 200 mm of the connector block. The signal tubes should be firmly grasped and the block should be slid down the tubes to ensure cross overs have not formed. This is referred

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Exel™ Connectadet™ Detonators

Australia

to, as the “clip and slide” technique. The connector does not require burying, as the detonator is a low shrapnel design. Care should be taken to avoid damage to signal tube and detonators. Exel™ Connectadet™ detonators can be reliably initiated by Exel™ Lead-In-Lines, #8 Strength Electric Detonators, i-kon™ III Starter detonator or detonating cords having PETN core charge 3.6 to 5.0 g/m.

Packaging

Exel™ Connectadet™ Detonators are packed into sealed "barrier bags" inside cardboard cases. All detonators within a case have the same lead length and delay. The case dimensions are 0.60 x 0.32 x 0.22 m. For short lead lengths, 3.6 to 6 m, the tubing is wound in the F100 configuration. For long lead lengths, 9 to 18 m, the tubing is wound in the F80 configuration.

Lead Length (m)	Units per case	Nominal Gross Weight (kg)	
3.6	180	10	F100
4.8	160	11	
6	140	10	
9	70	8	F80
12	50	7	
15	50	7	
18	40	7	

Storage and Handling

Product Classification

Authorised Name:	Exel™ Connectadet Detonators
Proper Shipping Name:	Detonator assemblies non-electric for blasting
UN No:	0360
Classification:	Class 1.1B

All regulations pertaining to the handling and use of such explosives apply.

Exel™ Connectadet™ Detonators should be stored in a cool, dry detonator magazine licensed for Class 1.1B explosives. Stacks of cases should be no more than 2 metres high. Exel™ Connectadet™ Detonators should be used within 12 months of opening the sealed "barrier bag". Delay detonators deteriorate with age and should be used in order of manufacturing date (oldest first). Batches of detonators more than 4 years old should not be used.

Safety

Exel™ Connectadet™ Detonators provide a high level of safety against initiation by static electricity, stray electrical currents and radio frequency transmissions. The connector block fully encloses the delay detonator and guards against accidental initiation. However, the Exel™ Connectadet™ Detonator contains sensitive explosive components. Care should be taken to avoid accidental initiation by intense impact, friction or heat. Exel™ Connectadet™ detonators may be used in temperatures up to 70ºC. The detonator is factory assembled into the connector block and no attempt should be made to disassemble it.

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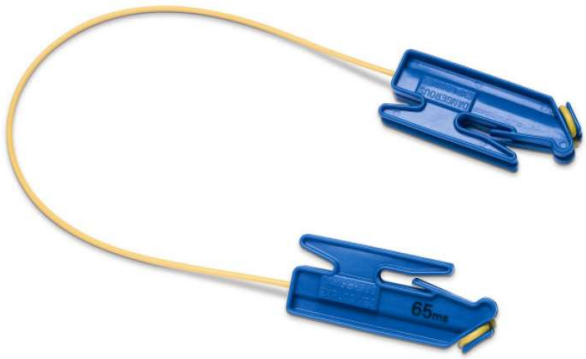
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TECHNICAL DATA SHEET

Exel™ Millisecond Connectors

Australia



Description

Exel™ Millisecond (MS) Connectors are signal tube based delay connectors designed to introduce accurate delays into surface detonating cord trunklines.

Exel™ MS Connectors consist of two delay detonators encased in separate plastic cleats, connected by a length of Exel™ signal tube. The detonators incorporate delay elements and a high strength PETN base charge inside an aluminium shell. The detonators are encased in colour coded plastic cleats printed with the delay time. The cleats are designed to securely attach to detonating cord.

The yellow Exel™ signal tube is a high strength, high abrasion resistant tubing which transmits the initiation signal to the detonator. The ends of the signal tube are crimped into the detonator shells.

Application

Exel™ MS Connectors allow millisecond delay timing to be introduced into detonating cord surface trunklines.

Exel™ MS Connectors operate in both directions to simplify hookup and permit layouts which provide multiple paths of initiation to each blasthole.

Recommendations for Use

Exel™ signal tube is extremely robust, however if it is cut or split, moisture may enter the hollow core and cause a misfire. To attach the Exel™ MS Connector, start by cutting the detonating cord in the desired location using approved single bladed cord cutters.

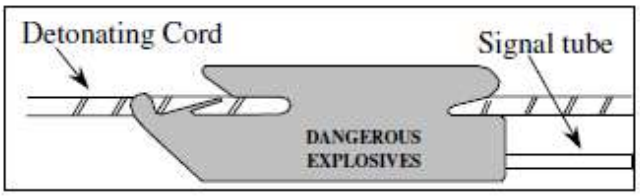
Technical Properties

Signal Tube	Yellow Exel™
Outer Diameter	3 mm
Nominal Tensile Strength	45 kgf
Length	80 cm
Standard Detonator PETN charge	(#8 strength)

Available Delay Range

Nominal Delay Time (ms)	Cleat Colour
9	Green
17	Yellow
25	Red
33	Black
42	White
65	Blue
100	Orange

Place one end of the detonating cord through the first block, leaving around 200 mm of cord pointing towards the centre of the unit.



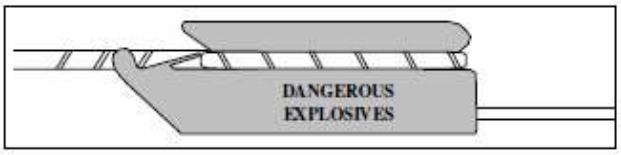
Loop the tail round one side of the block and draw it through the retaining clip. Loop the tail around both sides of the block and draw it through the retaining clip a second time.

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TECHNICAL DATA SHEET

Exel™ Millisecond Connectors

Australia



Packaging

Exel™ MS Connectors are packed into sealed "barrier bags" which are contained within an outer cardboard case. A case contains 125 units of the same delay. The case dimensions are 0.60 x 0.32 x 0.22 m and a case weighs 9.0 kg gross.

Storage and Handling

Product Classification

Authorised Name:	Exel™ Millisecond Connectors
Proper Shipping Name:	Detonator assemblies non-electric for blasting
UN No:	0360
Classification:	Class 1.1B

All regulations pertaining to the handling and use of such explosives apply.

Exel™ MS Connectors should be stored in a cool, dry detonator magazine licensed for Class 1.1B explosives. Stacks of cases should be no more than 2 metres high. Exel™ MS Connectors should be used within 12 months of opening the sealed "barrier bag". Delay detonators deteriorate with age and should be used in order of manufacturing date (oldest first). Batches of detonators more than 4 years old should not be used.

Safety

Exel™ MS Connectors provide a high level of safety against initiation by static electricity, stray electrical currents and radio frequency transmissions.

Exel™ MS Connectors incorporate sensitive components inside the detonators. Care should be taken not to cause initiation via intense impact, friction or heat. Exel™ MS Connectors may be used in temperatures up to 70ºC. The detonator is factory assembled into the connector block and no attempt should be made to disassemble it.

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TECHNICAL DATA SHEET

i-kon™ III Extreme Electronic Detonator

Australia



Description

Orica's premium i-kon™ III system is the most sophisticated Electronic Blasting System on the market.

i-kon™ III electronic detonators have multiple safety features that are inherent in the design of the product including spark gaps, input and bleed resistors, and the chip itself. The i-kon™ III Extreme detonator is used in conjunction with the following hardware:

- i-kon™ Logger or Logger II
- i-kon™ Blaster 400, 2400S (Compatible with Logger I only)
- i-kon™ Blaster 3000
- i-kon™ Surface Remote Blaster System (SURBS hardware compatible with Logger I only)
- i-kon™ Centralised Electronic Blasting System including Lock Box and Remote Blasting Box (CEBS hardware compatible with Blaster 400, 2400S and Logger I)

Application

The i-kon™ III system is the most advanced Electronic Blasting System on the market, designed for use in high value and complex blasts at large surface and underground operations. i-kon™ III Extreme electronic detonators have premium leg wire insulation for harsh mining conditions experienced in long sleep time, long hole applications in underground, large surface coal and open-cut metal mining

Key Benefits

- The very tough insulation unique to i-kon™ III Extreme leg wires performs reliably in metal mines where hard, sharp and abrasive rock is prevalent.

Technical Properties

Wire colour	Purple
Tensile strength (kg)	45
Explosives charge weight (mg)	900 mg (# 8* strength)
Connector colour	Green
Shell length x diameter	89 x 7.6 mm
Shell material	Bimetallic (aluminium and copper alloy)
Programmability (milliseconds)Standard	1ms to 30s
Max delay time (seconds)	30
Precision as coefficient of variation	0.005%

- The i-kon™ III Extreme leg wires remain flexible even at very low temperatures.
- Robust communication between i-kon™ III hardware and detonator
- Inherently safe dual voltage design.
- World's most accurate electronic detonator, combined with the longest delay time window (30 seconds), allows blasts to be designed for a wide variety of blast outcomes.
- Reliable performance in the most challenging blasting environments with corrosion resistant bimetallic shell.
- i-kon™ III is ideal for large blasts as delay times can be pre-programmed in ShotPlus 5, speeding up logging.
- Programmable i-kon™ III detonators simplify inventory management at the site

Recommendations for Use

- i-kon™ III Extreme detonator delays are defined with the i-kon™ Loggers and programmed and initiated through the use of the i-kon™ Blasters.

i-kon™ III Extreme Electronic Detonator

Australia

- i-kon™ III Extreme detonators can only be tested, programmed and fired with i-kon™ Loggers and Blasters. Do not use any other programming or blasting equipment.
- Damage to the legwire insulation is the most common cause of problems with electronic blasting systems; exercise care and protect the wires when loading and stemming holes.
- i-kon™ III Extreme detonators should always be secured inside a suitable booster, which fully encloses the detonator shell to protect it from abrasion or damage during charging.
- i-kon™ III Extreme detonators are explosive devices and should be handled with care.
- i-kon™ Loggers and Blasters are electronic devices designed to withstand normal mine, quarry and construction environments but submersion in water and excessive impact should be avoided.
- Never open i-kon™ blasting equipment. It should be serviced or repaired only by Orica or approved agents.
- High quality i-kon™ Harness Wire is used to connect up the i-kon™ III System in the field. Other wire may look similar, but will not offer the same critical performance characteristics and is not recommended.

Sleep-Time within Blastholes

The recommended maximum sleep time is 60 days. Sleep time is dependent on environmental conditions. An Orica Technical Services Representative should be consulted to assess the appropriate maximum sleep times for your conditions.

Packaging

i-kon™ III Extreme detonators are available in the following lengths and packaging:

Length	i-kon™ III Extreme 1.1B		i-kon™ III Extreme 1.4S	
metres	Units / Case	Gross Weight per case (kg)	Units / Case	Gross Weight per case (kg)
10	54	12.5	36	11.0
15	36	11.5	30	12.2
20	30	12.5	24	11.8
30	18	11.7	18	12.5
40	12	10.7	12	11.4
60	8	10.8	8	11.3
80	8	12.8	8	13.3

Storage and Handling

Product Classification

Authorised Name:	i-kon™ III Extreme	
Correct Shipping Name:	Detonator, Electric	
UN No:	1.1B	1.4S
Classification:	0030	0456

All regulations pertaining to the handling and use of such explosives apply.

Storage

Store i-kon™ III Extreme detonators in a suitably licensed magazine for Class 1.1B explosives. The cases should be stacked in the manner designated on the cases.
i-kon™ III Extreme detonators have a storage life of up to 5 years in an approved magazine.

Temperature Limits

Activity		Temperature
Operating	min	-40ºC
	max	70ºC
Storage	min	-40ºC
	max	50ºC
Transport	min	-40ºC
	max	50ºC

Disposal

The i-kon™ III electronic initiating systems provide a high level of safety against initiation by static electricity, stray electrical currents and radio frequency transmissions. However, i-kon™ III Extreme detonators contain pyrotechnics and molecular explosives, which can initiate under intense impact, friction or heat. As with all high explosives, these detonators must be handled and stored with care. i-kon™ III Extreme detonators may only be used at temperatures up to 70ºC. Seek advice

from Orica for priming systems suitable for higher temperatures.
See Safety Data Sheet for more information.

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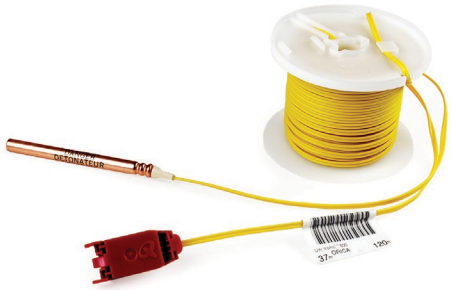
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TECHNICAL DATA SHEET

uni tronic™ 600 Electronic Detonator

Australia



Description

The uni tronic™ 600 electronic detonator is one of Orica's exciting Next Generation products. The uni tronic™ 600 detonator is used in conjunction with:

- Blast Box 310 (with Bluetooth) or 310R (with wireless Remote firing), both with new firmware
- Scanner 120/125/200
- uni tronic™ 600 Test Box or Tester for safe on-bench communication with and testing of detonators duplex harness wire.

Application

uni tronic™ 600 detonators can be used in most surface mining applications but are particularly suitable for small and medium open cut coal mines, quarries and for construction.

Key Benefits

- Reliable, effective and safe blasting is achieved because of the rugged, proven construction of the uni tronic™ 600 detonator, with inherently safe testability on the blast pattern
- Efficient operations on the blast pattern are afforded by the convenient packaging and excellent, glove-friendly connector and duplex harness wire
- Predictable blasting results with minimal environmental impact are achievable because of the high precision of uni tronic™ 600 electronic detonators
- Reliable initiation of all boosters is achieved by the full strength base charge in the detonator

Technical Properties

Wire Colour	Yellow
Tensile strength (kg) / (lbs)	20 / 44
Explosives charge weight (mg)	900
Connector colour	Red
Shell length x diameter	89 x 7.6 mm
Shell material	Copper or alloy
Programmability (ms)	+/- 1
Max delay time (seconds)	10
Precision as coefficient of variation	+/-0.03%

Recommendations for Use

uni tronic™ 600 detonators can only be tested, programmed and fired using dedicated uni tronic™ equipment. Do not use any other programming or blasting equipment.

Damage to the legwire insulation is the most common cause of problems with electronic blasting systems; exercise care and protect the wires when loading and stemming holes.

Sleep-Time within Blastholes

The recommended maximum sleep time is 21 days. Sleep time is dependent on ground water conditions. An Orica Technical Services Representative should be consulted if special conditions exist that may reduce the allowed sleep time, or if sleep times longer than 21 days are needed.

Storage and Handling

Product Classification

Authorised Name: uni tronic™ 600

Proper Shipping Name: Detonators, Electric for blasting

Hazard Class	1.1B	1.4S
UN Number	0030	0456
EX Number	EX2010060240	EX2010080322

unitronic™600 Electronic Blasting System

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uni tronic™ 600 Electronic Detonator

Australia

All regulations pertaining to the handling and use of such explosives apply.

Store uni tronic™ 600 detonators in a suitably licensed magazine for Class 1.1B explosives. The cases should be stacked in the manner designated on the cases.

uni tronic™ 600 detonators have a storage life of up to 5 years in an approved magazine.

Storage and use temperatures

Activity		Temperature
Operating	min	-4ºF / -20ºC
	max	158ºF / 70ºC
Storage	min	-4ºF / -20ºC
	max	120ºF / 50ºC
Transport	min	-40ºF / -40ºC
	max	150ºF / 65ºC

Disposal

Disposal of explosive materials can be hazardous. Methods for safe disposal of explosives may vary depending on the user's situation. Please contact a local Orica representative for information on safe practices.

Safety

uni tronic™ 600 electronic initiating systems provide a high level of safety against initiation by static electricity, stray electrical currents and radio frequency transmissions.

However, these detonators contain pyrotechnics and molecular explosives, which can initiate under intense impact, friction or heat. As with all high explosives, uni tronic™ 600 detonators must be handled and stored with care. These detonators may only be used at temperatures up to 70ºC.

uni tronic™ 600 detonators can only be tested, programmed and fired using dedicated uni tronic™ 600 equipment. Do not use any other programming or blasting equipment.

See Safety Data Sheet for more information.

Available Lengths / Packaging

uni tronic™ 600 detonators are available in the following lengths and packaging

	1.1B packaging		1.4S packaging	
Length m	Units / Case	Weight per Case kg	Units / Case	Weight per Case kg
* 6 coil	80	5.8	40	6.1
9 coil	60	5.9	35	6.2
spool	66	8.1	32	6.3
15 spool	66	11.3	32	8.6
20 spool	66	13.5	32	9.8
25 spool	54	13.2	32	10.7
30 spool	36	10.6	32	11.9
* 37 spool	30	10.7	16	7.7

***non-standard lengths requiring a longer lead time**

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Appendix C

Explosion calculations

Hopkinson-Cranz scaling law

The online UN SaferGuard quantity distance (QD) calculator was used for section 7.2.3 [2].

The quantity distance calculator is based on the Hopkinson-Cranz scaling law [12].

Free field Trinitrotoluene (TNT) air blast has thoroughly been studied by extensive trials in the past. Free field air blast follows a QD-rule, which is also well known as the Hopkinson-Cranz cube-root scaling law (table C.1).

It is the basis of much of the work on the estimation of appropriate quantity and separation distances. Many United States (US) use rules based upon the explosives, their quantity, and the distance from the explosive to where people are at risk. For HD 1.1. ammunition the QD-concept is based on a pressure-related correlation.

Certain effects are associated with a certain scaled distance, which is directly related to a certain level of overpressure, determined by the Hopkinson-Cranz Scaling law (table C.2). This approach is used in the QD-siting concept described in Allied Ammunition Storage and Transport Publication (AASTP) 1.

Table C.1 Hopkinson-Cranz scaling law

$(R1/R2) = (W1/W2)^{1/3}$ $R = Z.W^{1/3}$	R = Range (m) Z = Constant of Proportionality (dependent on acceptable blast overpressure) W = Explosive Weight (kg)

Examples of the constant ‘Z’ used in explosive storage safety4 are shown in table 2:

Table C.2 Examples of Constant ‘Z

Z	Purpose	Remarks
8	Used to predict separation distances between ammunition process buildings (APB) within an explosive storage area (ESA).	Additionally, minimum safe distances further apply if R is below a certain level, which differs for each ‘Z’ function
14.8	Used to predict separation distances between an explosive storehouse (ESH) and a public traffic route with civilian access.	
22.2	Used to predict separation distances between an explosive storehouse (ESH) and a building inhabited by civilians.	
44.4	Used to predict separation distances between an explosive storehouse (ESH) and a vulnerable building inhabited by civilians (e.g., a school).	

GHD Advisory

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→ The Power of Commitment

Appendix K

Biodiversity Development Assessment Report, OzArk, 2024



BIODIVERSITY DEVELOPMENT ASSESSMENT REPORT

TOCUMWAL EXPLOSIVE MAGAZINE STORAGE UPGRADE

BERRIGAN SHIRE LOCAL GOVERNMENT AREA, NSW

SEPTEMBER 2024

Report prepared by

OzArk Environment & Heritage

for GHD on behalf of Orica Australia Pty Ltd

OzArk
Environment & Heritage

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Proponent	Orica Australia Pty Ltd		
Client	GHD		
Purchase order number			
Document description	Tocumwal Explosive Magazine Storage Upgrade		
	Name	**Signed**	**Date**
Client's reviewing officer			

Client's representative managing this document	**OzArk representatives managing this document**
Rochelle Barclay	Dr Crystal Graham (CG), Dr David Orchard (DO)
Location	**OzArk job number**
S:\OzArk EHM Data\Clients\GHD Tamworth\Tocumwal July 2023\Ecology\Reporting	#3688

Document status: FINAL DRAFT	**Version**	**Date**	**Action**
Internal Draft Series	V1.0 V1.1 V1.2	17/05/2024 20/05/2024 20/05/2024	DO to CG CG to DO DO to CG
First Draft for Client Review	V2.0 V2.1	20/05/2024 09/09/2024	CG to client Refinalised
Final Draft for Client	V3.0	10/09/2024	DO to Client

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Enquiries would be addressed to OzArk Environment & Heritage.

ABN: 29 675 720 564

CERTIFICATION

I certify that I have prepared this BDAR and, to the best of my knowledge, it is in accordance with the NSW *Biodiversity Conservation Act* 2016 and the Biodiversity Assessment Method 2020 (BAM 2020). The information it contains is neither false nor misleading. It addresses, to the fullest extent possible, all matters affecting or likely to affect biodiversity as a result of the proposed activity.

BDAR prepared by	**Dr David Orchard**
Signed	
Date	10 September 2024
Organisation	OzArk Environment & Heritage
Position	Ecologist
Qualification	Doctor of Philosophy
Accreditation number	BAAS21028

Executive summary

OzArk Environment & Heritage (OzArk) has been engaged by GHD on behalf of Orica Australia Pty Ltd (the proponent) to prepare a Biodiversity Development Assessment Report (BDAR) for the proposed upgrade of the existing Explosives Reserve Magazine Compound at 431 Newell Highway (Lot 2 DP225459), near Tocumwal, NSW (the Project). The Project is to be known as the Tocumwal Explosive Magazine Storage Upgrade and is located in the Berrigan Shire Local Government Area (LGA). The Project will be assessed as a State Significant Development (SSD-64923965).

The proposal would occupy up to 7.05 ha, of which 4.50 ha possesses remnant native vegetation. The remaining extent of the subject land has been cleared for existing infrastructure or contains non-native vegetation. The proposal triggers entry into the NSW Biodiversity Offsets Scheme (BOS) by virtue of its status as a State Significant Development (SSD); consequently, the proponent is required to prepare a Biodiversity Development Assessment Report (BDAR) and to offset impacts to biodiversity. This report documents the assessment, which has been completed in accordance with the Biodiversity Assessment Method 2020 (BAM 2020) and details the proponent's biodiversity offset requirement (measured by the number of ecosystem and species credits).

The native vegetation present in the disturbance footprint consists of three Plant Community Types (PCTs):

- PCT 9 – River Red Gum - wallaby grass tall woodland wetland on the outer River Red Gum zone mainly in the Riverina Bioregion.
- PCT 45 – Plains Grass grassland on alluvial mainly clay soils in the Riverina Bioregion and NSW South Western Slopes Bioregion.
- PCT 74 – Yellow Box - River Red Gum tall grassy riverine woodland of NSW South Western Slopes Bioregion and Riverina Bioregion.

Each PCT was recorded in a single condition state and assigned to a single vegetation zone: 9_Remnant, 45_Moderate, and 74_Remnant.

PCT 74 was found to belong to the Threatened Ecological Community (TEC) *White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions*, listed as a Critically Endangered Ecological Community (CEEC) under the NSW *Biodiversity Conservation Act* 2016 (BC Act). Up to 0.10 ha of this community would be impacted by the proposal.

PCT 45 was found to belong to the CEEC *Natural Grasslands of the Murray Valley Plains*, listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act). Up to 3.9 ha of this community would be impacted by the proposal.

In total, 34 ecosystem credit species were generated by the Biodiversity Assessment Method Calculator (BAM-C). The habitat suitability of the subject land for these species was assessed. Three species was removed from the list due to habitat constraints; consequently, 31 species were assumed present as ecosystem credit species, generating a total of 183 Ecosystem Credits.

In total, 25 species credit species were generated by the BAM-C. After consideration of geographical and habitat constraints, six species could be discounted due either to distribution or to the absence of features necessary for breeding and one (Sloane's Froglet, *Crinia sloanei*) due to the lack of suitable plant communities within the specified buffer distance of a waterbody. A further 17 species were eliminated by targeted survey. One species – the Southern Myotis (*Myotis macropus*) – could not be ruled out by constraints or surveys and has been assumed present, generating a total of two (2) species credits.

The proponent intends to satisfy their offset obligations by buying and retiring the necessary credits from the open market or, if appropriate credits are not available, by paying directly into the Biodiversity Conservation Fund.

The significance of the proposed impact to EPBC Act-listed threatened, migratory, wetland and marine species, populations and communities predicted to occur within a 10 km search area was assessed. No significant impact to any threatened entity likely to result in the extinction of a local population was identified. The residual ecological impacts of the proposal would be adequately mitigated and offset using the management actions recommended and the offset requirements detailed within this BDAR. Therefore, a referral of the proposal to the Federal Department of Climate Change, Energy, the Environment and Water (DCCEEW) for these matters is not required.

This assessment covers the current form of the proposal. Any change to the scope of work may require re-assessment.

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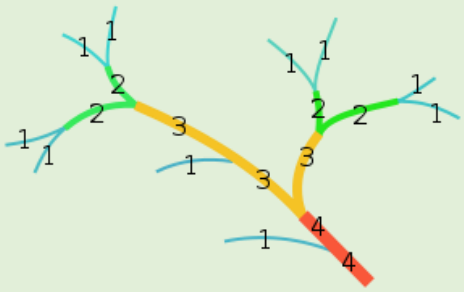
Abbreviations

Term	Description
^{0}C	Degrees Celsius
AOBV	Areas of Outstanding Biodiversity Value
APZ	Asset Protection Zone
ASL	Above Sea Level
BAM	Biodiversity Assessment Method 2020
BAR	Biodiversity Assessment Report
BCR	NSW *Biodiversity Conservation Regulation* 2017
BDAR	Biodiversity Development Assessment Report
BC Act	NSW *Biodiversity Conservation Act* 2016
BOS	NSW Biodiversity Offsets Scheme
CAMBA	China-Australia Migratory Bird Agreement
CEEC	Critically Endangered Ecological Community
CEMP	Construction Environmental Management Plan
DCCEEW, Cth	Commonwealth Department of Climate Change, Energy the Environment and Water
DoE	Department of Environment
DNVRM	Draft Native Vegetation Regulatory Map
DPE	Department of Planning and Environment
DPI	NSW Department of Primary Industries
DPIE	NSW Department of Planning, Industry and Environment
EEC	Endangered ecological community
EIS	Environmental Impact Statement
EP&A Act	NSW *Environmental Planning and Assessment Act* 1979
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999
ESCP	Erosion and Sediment Control Plan
FM Act	NSW *Fisheries Management Act 1994*
GDEs	Groundwater dependent ecosystems
GPS	Global Positioning System
ha	Hectare
HTE	High Threat Exotic

Term	Description
IBRA	Interim Biogeographic Regionalisation of Australia.
JAMBA	Japan-Australia Migratory Bird Agreement
KFH	Key Fish Habitat
KTP	Key Threatening Process
LEP	Local Environmental Plan
LGA	Local Government Area
LLS	Local Land Services
mm/cm/m/m^2/km	Millimetre/centimetre/metre/square metre/kilometre
MNES	Matters of National Environmental Significance
NPW Act	NSW *National Parks and Wildlife Act 1974*
NSW	New South Wales
OEH	NSW Office of Environment and Heritage
NSW DCCEEW	NSW Department of Climate Change, Energy the Environment and Water
PCT	Plant Community Type
PMST	Protected Matters Search Tool
PRL	Protected Riparian Land
PW	Priority Weed
RAMSAR	Convention on Wetlands of International Importance
REF	Review of Environmental Factors
ROKAMBA	Republic of Korea-Australia Migratory Bird Agreement
SEARs	Secretary's Environmental Assessment Requirements
SEPP	State Environmental Planning Policy
SIS	Species Impact Statement
SSD	State Significant Development
TBDC	Threatened Biodiversity Data Collection
TECs	Threatened Ecological Communities
TSPD	Threatened Species Profile Database
VIS	Vegetation Information System
VRZ	Vegetated Riparian Zone
WoNS	Weed of National Significance

Glossary of terms

Term	Description
Areas of outstanding biodiversity	An area of outstanding biodiversity value is: ❖ an area important at a State, national or global scale, and ❖ an area that makes a significant contribution to the persistence of at least one of the following: o multiple species or at least one threatened species or ecological community o irreplaceable biological distinctiveness o ecological processes or ecological integrity o outstanding ecological value for education or scientific research. The declaration of an area may relate, but is not limited, to protecting threatened species or ecological communities, connectivity, climate refuges and migratory species (BC Act).
Cumulative impact	The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. Refer to Clause 228(2) of the EP&A Regulation 2000 for cumulative impact assessment requirements.
Direct impacts	Are those that directly affect the habitat of species and ecological communities and of individuals using the study area. They include, but are not limited to, death through predation, trampling, poisoning of the animal/plant itself and the removal of suitable habitat (OEH 2018).
Habitat	The area occupied or used, including areas periodically or occasionally occupied or used, by any threatened species or ecological community and includes all the different aspects (both biotic and abiotic) used by species during the different stages of their life cycle (OEH 2018).
Important population	Is a population that is necessary for a species' long-term survival and recovery; this may include populations identified as such in recovery plans, and/or that are: ❖ key source populations either for breeding or dispersal ❖ populations that are necessary for maintaining genetic diversity, and/or ❖ populations that are near the limit of the species range (DE 2013).
Indirect impact	Occur when project-related activities affect species or ecological communities in a manner other than direct loss within the subject land. Indirect impacts may sterilise or reduce the habitability of adjacent or connected habitats. Indirect impacts can include loss of individuals through starvation, exposure, predation by domestic and/or feral animals, loss of breeding opportunities, loss of shade/shelter, reduction in viability of adjacent habitat due to edge effects, deleterious hydrological changes, increased soil salinity, erosion, inhibition of nitrogen fixation, weed invasion, noise, light spill, fertiliser drift, or increased human activity within or directly adjacent to sensitive habitat areas (OEH 2018).
Invasive species	Is an introduced species, including an introduced (translocated) native species, which out-competes native species for space and resources, or which is a predator of native species. Introducing an invasive species into an area may result in that species becoming established. An invasive species may harm listed threatened species or ecological communities by direct competition, modification of habitat or predation.
Local occurrence (EEC)	The ecological community present within the study area. However, the local occurrence may include adjacent areas if the ecological community on the study area forms part of a larger contiguous area of the ecological community and the movement of individuals and exchange of genetic material across the boundary of the study area can be clearly demonstrated.
Local population **(in regard to a threatened or migratory species)**	A local population of a threatened plant species comprises those individuals occurring in a defined area or a cluster of individuals extends into habitat adjoining and contiguous with the study area where the individuals could reasonably be expected to cross-pollinate. A local population of fauna species comprises those individuals known or likely to occur in a defined area, as well as any individuals occurring in adjoining areas (contiguous or otherwise) that are known or likely to utilise habitats in the study area.

Term	Description
	The local population of migratory or nomadic fauna species comprises those individuals likely to occur in the study area from time to time (DECC 2007).
Low condition (vegetation)	Either: a) woody native vegetation with native over-storey percent foliage cover less than 50% of the lower value of the over-story percent foliage cover benchmark for that vegetation type, and where either: ❖ less than 50% of ground cover vegetation is indigenous species, or ❖ greater than 90% of ground cover vegetation is cleared or b) native grassland, wetland or herb field where either: ❖ less than 50% of ground cover vegetation is indigenous species, or ❖ more than 90% of ground cover vegetation is cleared. Note: The percentages for the ground cover calculations must be made in a season when the proportion of native ground cover vegetated compared to non-native ground cover vegetation is likely to be at its maximum.
Moderate to good condition (vegetation)	If native vegetation is not in low condition (above), it is in moderate to good condition.
Mitigation	Action to reduce the severity of an impact.
Mitigation measure	Any measure that prevents, reduce or controls adverse environmental effects of a project.
NSW (Mitchell) landscape	Landscapes with relatively homogeneous geomorphology, soils and broad vegetation types, mapped at a scale of 1:250,000 (OEH 2018).
Proposal	Is considered to include 'all activities likely to be undertaken within the subject land to achieve the objective of the proposed development' (DECC 2007).
Risk of extinction	The likelihood that the local population will become extinct either in the short-term or in the long-term as a result of direct or indirect impacts on the viability of that population.
Search area	Is considered to 'include the lands that surround the subject land for a distance of 10 km' (DECC 2007). The search area has been used to search information sources to establish the landscape context of the subject land.
Significant impact	A 'significant impact' is an impact which is important, notable, or of consequence, having regard to its context or intensity.
Strahler stream order	Strahler stream orders are used to define stream size based on a hierarchy of tributaries, based on the diagram below. 
Study area	Means the subject land and any additional areas which are likely to be affected by the proposal, either directly or indirectly. The study area should extend as far as is necessary to take all potential impacts into account (OEH 2018). In this instance, the study area extends 1,500 m from the site.
Subject land	Means the area directly affected by the proposal. The subject land includes the footprint of the proposal and any ancillary works, facilities, accesses or hazard reduction zones that support

Term	Description
	the construction or operation of the development or activity (OEH 2018).
Target species	A species that is the focus of a study or intended beneficiary of a conservation action or connectivity measure.

1 Introduction

1.1 Background

OzArk Environment & Heritage (OzArk) has been engaged by GHD on behalf of Orica (the proponent) to prepare a Biodiversity Development Assessment Report (BDAR) for the proposed upgrade of the existing Explosives Reserve Magazine Compound (ERMC) at 431 Newell Highway (Lot 2 DP225459), near Tocumwal, NSW (the Project). The Project is to be known as the Tocumwal Explosive Magazine Storage Upgrade and is located in the Berrigan Shire Local Government Area (LGA). The Project will be assessed as a State Significant Development (SSD). The Planning Secretary's Environmental Assessment Requirements (SEARs) were issued for the Project on 18 December 2023 (SSD-64923965).

This BDAR documents the biodiversity assessment, which has been completed in accordance with the Biodiversity Assessment Method 2020 (BAM 2020) and details the proponent's biodiversity offset requirement (measured by the number of ecosystem and species credits).This BDAR will form part of an Environmental Impact Statement (EIS) being prepared by GHD to accompany an application for development consent under Division 5.2 of the *Environmental Planning and Assessment Act* 1979 (EP&A Act).

1.2 Project Overview

The proponent operates an ERMC which is fenced, has an office and some basic machinery/storage sheds. The current facilities were originally constructed in 1956 and has been modified several times during its lifetime.

ERMC's primary function is to store cast boosters and cord locally produced and imported from overseas. It is a staging point to supply the full range of explosive product for NSW, Victoria, South Australia, and Tasmania.

However, the buildings are not compliant to Australian Standard (AS) 2187 Explosives – Storage, Transport and Use. Whilst current exemptions allow the plant to operate, Orica wishes to upgrade facilities to all Australian standards and code of practice and remove the need for the exemption.

Consequently, Orica intends to build four new 250 tonne HE magazines and a new detonator magazine in new locations (**Figure 1-1**). These new locations will be cleared, hardstands created, concrete slabs laid, and new sealed roads will be built to service the new magazines. Existing buildings will be either repurposed or demolished at the completion of the new build.

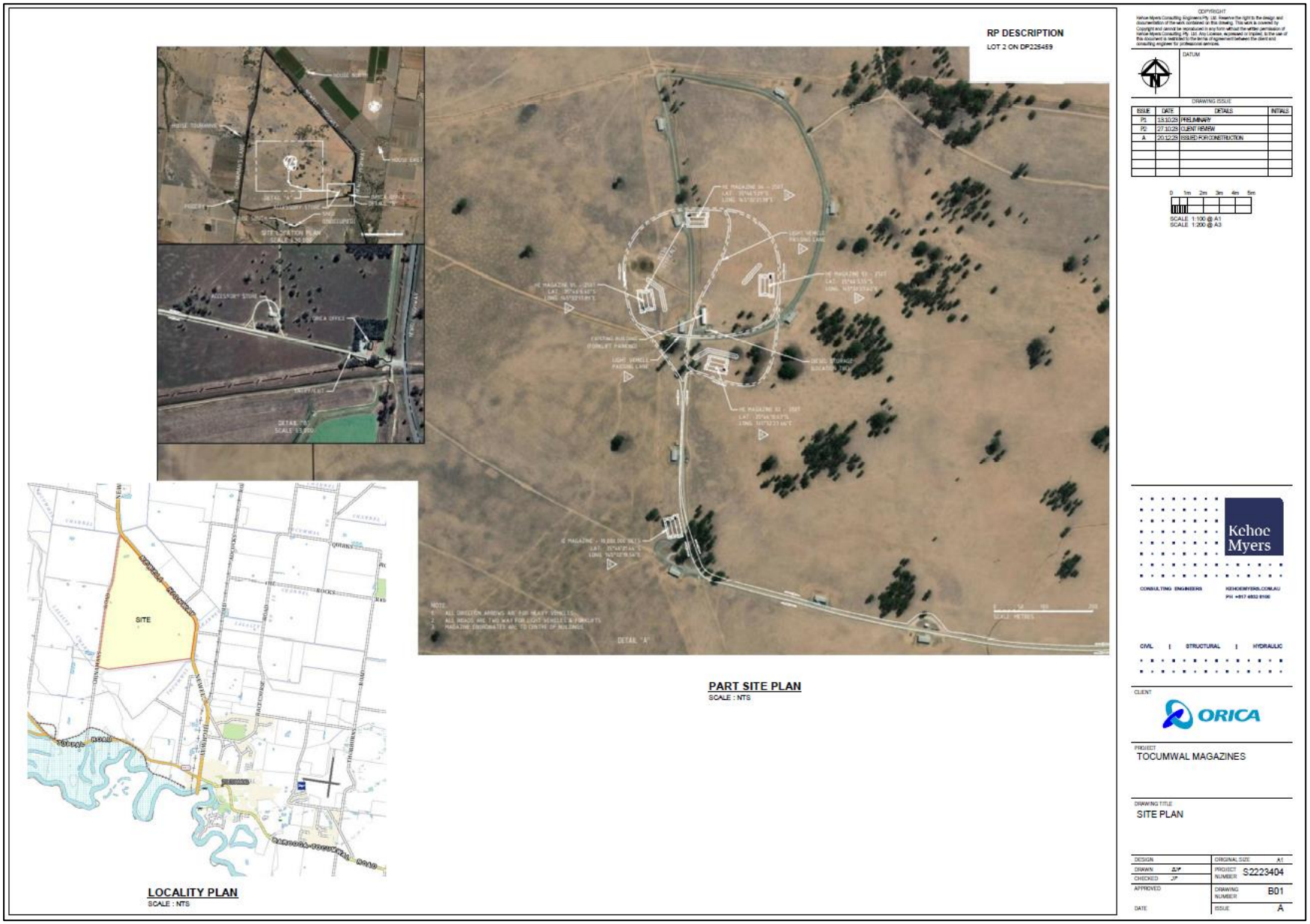


Figure 1-1. Proposed site layout for the Project.

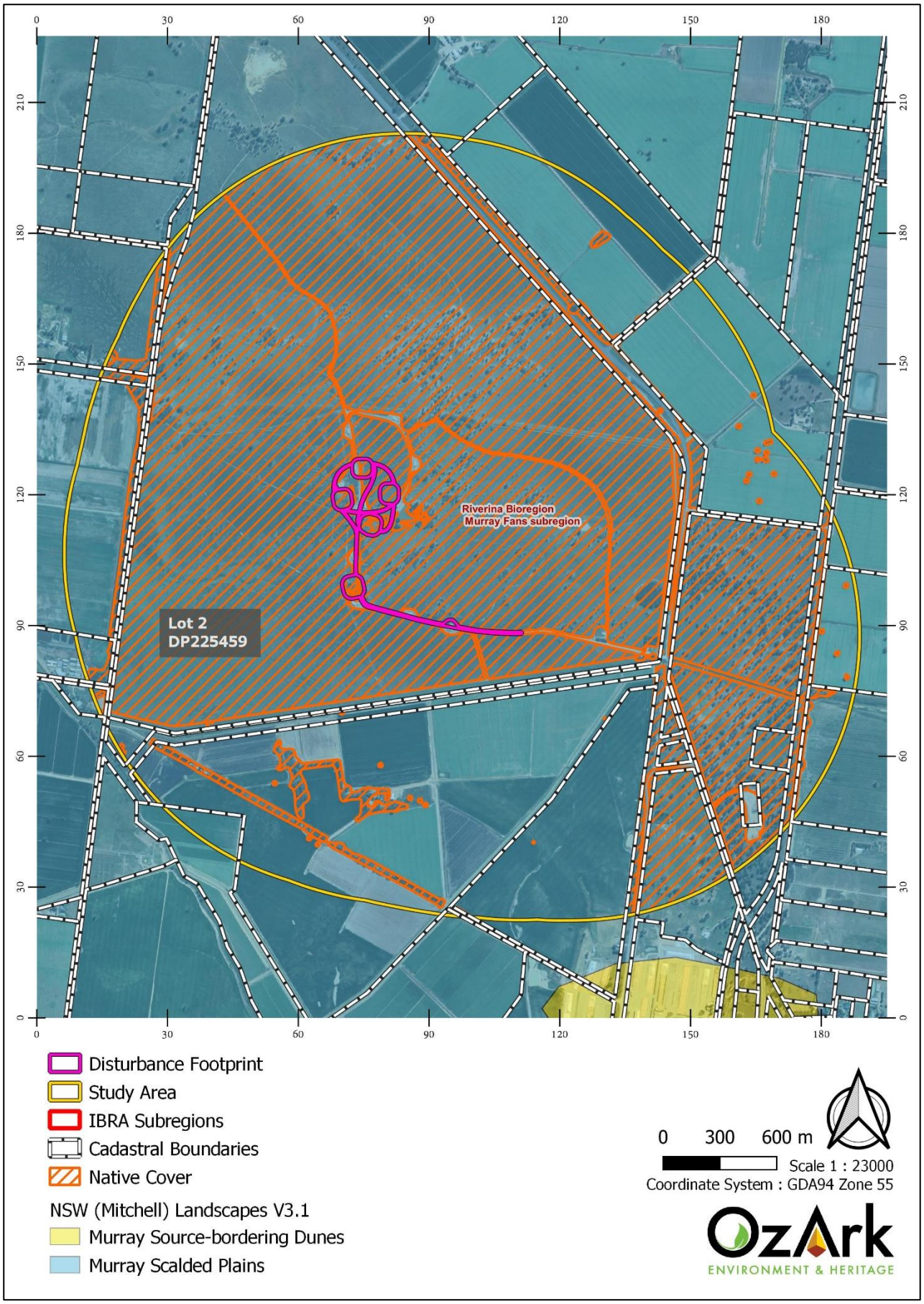


Figure 1-2. Location map showing the disturbance footprint, subject land, study area and key features required by the BAM (2020).

1.3 Relevant Terms

The following terms and definitions are used to describe the land assessed in this study.

Subject land – In a development assessment, the land proposed for development and related activities.

Disturbance footprint – The area of land that is directly impacted by the proposed development (including construction compound/stockpile/laydown areas and Asset Protection Zones [APZs]).

Study area – Land within a 1,500 m buffer from the outside edge of the subject land. The study area is assessed for the purpose of establishing landscape context including native vegetation cover and associated threatened species.

10 km search area – The area within a 10 km radius of the subject land. This 10 km buffer has been used to search information sources, including the Protected Matters Search Tool (PMST) (Department of Climate Change, Energy, the Environment and Water, 2024) and BioNet Atlas (DPE, 2024) threatened species sightings.

1.4 Site Identification

The site is identified under the *Berrigan Local Environment Plan* 2013 and on the NSW Planning Portal as follows.

- **Lot/Section/Plan No:** 2/-/DP225459.
- **Land Zoning:** RU1 Primary Production.
- **Minimum Lot Size:** 120 ha
- **Terrestrial Biodiversity:** The disturbance footprint falls largely within an area mapped as containing terrestrial biodiversity in the Berrigan LEP (see figure in **Appendix A**).

The location of the proposal is shown on the location map (**Figure 1-2**).

1.5 Regulatory Context

The proposal constitutes an SSD. In the case of SSD, entry into the BOS is automatic. Consequently, it has been determined that the BOS applies to this proposal irrespective of the extent of clearing necessitated by the works.

1.6 Report Purpose

The purpose of the BDAR is to determine the biodiversity assets, including flora, fauna, threatened species, threatened communities and habitat values, of the subject land.

The BDAR also identifies any constraints on the proposal according to relevant Federal and NSW environmental legislations and includes the calculation of ecosystem and/or species credits requiring offset.

1.7 Legislation

1.7.1 International legislation

- Japan-Australia Migratory Bird Agreement (JAMBA)
- China-Australia Migratory Bird Agreement (CAMBA)
- Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA)
- Ramsar Convention on Wetlands (Ramsar).

1.7.2 Commonwealth legislation

***Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act)**

To assist with nationally listed matters assessments, the Matters of National Environmental Significance, the Significant impact guidelines 1.1. Environment Protection and Biodiversity Conservation Act 1999 (Fairfull [2013]) are followed.

Matters which fall under this legislation are addressed in **Section 6.8** and **Appendix D**.

1.7.3 NSW legislation

***Environmental Planning and Assessment Act* 1979 (EP&A Act)**

The EP&A Act provides the legal framework for the assessment and approval of the proposed activities. Part 4 of the EP&A Act requires the proponent to examine and consider to the fullest extent possible all matters affecting or likely to affect the environment by reason of that activity.

***Biodiversity Conservation Act* 2016 (BC Act)**

Under the BC Act, the proponent has an obligation to consider impacts to all threatened species, populations and ecological communities listed in NSW, as well as ensuring the proposal does not exacerbate a Key Threatening Process (KTP). Entry to the BOS is triggered automatically for SSDs, as in the present case.

***Biodiversity Conservation Regulation* 2017 (BCR)**

The BCR defines the triggers and entry thresholds for the BOS. It also provides the rules for meeting offset obligations, triggers for authorities to refuse development applications and compliance provisions.

Biosecurity Act 2015

Schedule 1 of the *Biosecurity Act* 2015 contains the special provisions relating to weeds and duty to control weeds which pose a biosecurity risk. The Department of Primary Industries (DPI) maintains a list of 'Priority Weeds' (previously referred to as noxious weeds) in NSW for the State and each region which impose an obligation on landholders to prevent, eliminate or minimise, so far as is reasonably practicable, any biosecurity risk they may pose. In addition, Local Government Areas may include their own priority weeds.

Fisheries Management Act 1994 (FM Act)

The objects of the FM Act are to:

- Conserve fish stocks and key fish habitats.
- Conserve threatened species, populations and ecological communities of fish and marine vegetation.
- Promote ecologically sustainable development, including the conservation of biological diversity.

Section 201 of the FM Act states that a person other than a government authority must seek a permit from NSW DPI – Fisheries for dredging or reclamation in a waterway. Dredging work means any work that involves excavating water land. Reclamation work means any work that involves depositing any material on water land. However, this legislation does not apply for a SSD as per Section 4.4.1(1)(b) of the EP&A Act.

Matters relating to watercourses are discussed in detail in **Section 3.9** of this report.

Local Land Services Act 2013 (LLS Act)

The objects of the Act include '*to ensure the proper management of natural resources in the social, economic and environmental interests of the State, consistently with the principles of ecologically sustainable development*'. Briefly, the LLS Act applies to rural land, it does not apply to wilderness areas, National Parks, State Forests, flora reserves, areas of outstanding biodiversity value (under the BC Act), critical habitat under the FM Act, or land dedicated or reserved under the *Crown Lands Act 1989*.

Under the LLS Act, native vegetation means any of the following types of plants (including dead plants) native to NSW:

- trees (including any sapling or shrub or any scrub),
- understorey plants,
- groundcover (being any type of herbaceous vegetation),
- plants occurring in a wetland.

A plant is native to NSW if it was established prior to European settlement.

Clearing native vegetation means: cutting down, felling, uprooting, killing, destroying, poisoning, ringbarking or burning or otherwise removing native vegetation.

Land defined as Category 1 – Exempt Land (within the meaning of Part 5A of the LLS Act) is to be excluded from assessment under the BAM (according to section 6.8(3) of the BC Act). Category 1 exemption applies to rural land (zoned RU1, RU2, or RU3) that was cleared of native vegetation as of 1 January 1990 or lawfully cleared of vegetation between 1 January 1990 and 25 August 2017.

State Environmental Planning Policy (Biodiversity and Conservation) 2021

The *SEPP (Biodiversity and Conservation)* 2021 (SEPPBC 2021) is the collation of biodiversity and conservation related SEPPs. Chapters 3 and 4 aim to encourage the 'proper conservation and management of areas of natural vegetation that provide habitat for Koalas to ensure a permanent free-living population over their present range and reverse the current trend of Koala population decline'.

Chapter 3 of the SEPPBC 2021 applies to the subject land as the Berrigan LGA is listed in Schedule 2 of the SEPPBC 2021 and the land is zoned RU1.

Assessment of the subject land according to the provisions of Chapter 3 of the SEPPBC 2021 determined that areas of PCT 9 (0.5 ha) within the site (see **Section 4.2**) constitute potential koala habitat for the Koala as a feed tree listed under Schedule 1 of the SEPP, River Red Gum (*Eucalyptus camaldulensis*), is the sole canopy tree in these areas. The site does not constitute core koala habitat, however, as there are no historical records of a resident population within the site and targeted surveys conducted as part of the present assessment did not identify any evidence of ongoing or recent occupancy. No further consideration is required for this area.

The proposal's potential impacts to Koalas have been further considered in this BDAR under the EPBC Act (**Appendix D**).

1.7.4 Berrigan Local Environmental Plan (2013)

A Local Environmental Plan (LEP) is a legal document prepared by Council and approved by the State Government to regulate land use and development. LEPs guide planning decisions for local governments. The plan allows Council to regulate the ways in which all land both private and public may be used and protected through zoning and development controls.

The key aims of the Berrigan LEP (2013) are as follows:

> *(aa) to protect and promote the use and development of land for arts and cultural activity, including music and other performance arts,*
>
> *(a) to encourage development that complements and enhances the unique character and scenic values of Berrigan, offering a diverse economy, significant natural resources and an attractive rural lifestyle,*

(b) to provide for a range of development opportunities that contribute to the social, economic and environmental resources of Berrigan in a way that allows the needs of present and future generations to be met by implementing the principles of ecologically sustainable development,

(c) to recognise and manage valued environmental and cultural heritage, landscape and scenic features of Berrigan,

(d) to promote the efficient and equitable provision of public services, infrastructure and amenities.

Sections of the subject land have been mapped as possessing terrestrial biodiversity values under the Berrigan LEP (see figure in **Appendix A**).

2 Methods

The ecological assessment was carried out in three stages:

1. Desktop searches and review of ecological databases and information to identify threatened species, populations or ecological communities listed in the BC Act, FM Act or the EPBC Act that have the potential to occur in the study area.
2. Field survey of the subject land to conduct BAM plots, identify vegetation communities and habitat features present and target predicted threatened species and ecological communities. Where a threatened species or community or habitat feature is identified, document the nature and extent of the protected matter and describe its 'viable local population' or occurrence.
3. Preparation of a BDAR that describes the impacts of the proposed activity on native vegetation and threatened species, populations and ecological communities, and provides recommendations to avoid, minimise and mitigate these impacts. The BDAR also includes a biodiversity credit summary that identifies the number of ecosystem credits and species credits required to offset the development.

2.1 Personnel

OzArk operates under NSW Department of Planning, Industry and Environment (DPIE) Scientific License 101908, NSW Department of Primary Industries (DPI) Accreditation as an Animal Research Establishment (accreditation number 53103), and the Secretary's Animal Care and Ethics Committee Animal Research Authority RVF21/954. The role and key details of personnel involved in the project are provided in **Table 2-1**.

Table 2-1. Summary of OzArk personnel qualifications and roles in the assessment.

Name	Position	Role	CV Details
Dr David Orchard	Senior Ecologist	Initial survey, BAM plots, vegetation mapping, BAM calculations, October targeted surveys, reporting	• Accredited BAM assessor – Accreditation # BAAS21028 • Doctor of Philosophy – Charles Sturt University • Graduate Diploma in Science (Botany) – University of New England • Bachelor of Arts – Australian National University • 4WD Training • First aid training • WH&S Induction Training for Construction Work
Dr Crystal Graham	Senior Ecologist	Reporting, quality control, technical review	• Accredited BAM assessor – Accreditation # BAAS22024 • Doctor of Philosophy – Biology – University of Sydney • Honours 1 – Biology – University of Sydney • Bachelor of Advanced Science – University of Sydney • 4WD Training • WH&S Induction Training for Construction Work
Lucca Brozler	Ecologist	Reporting	• Masters in Conservation Biology – The University of Queensland • Bachelor of Biological Science – The University of Queensland • WH&S Induction Training for Construction Work

Name	Position	Role	CV Details
Paris Hughes	Ecologist	Initial survey, January targeted surveys	• Honours (Animal Behaviour) – Flinders University • Bachelor of Science (Biodiversity and Conservation) – Flinders University • First Aid Training • WH&S Induction Training for Construction Work

2.2 Desktop Review

Existing information sources were reviewed to contextualise the study area, identify entities for targeted surveys, predict possible constraints, refine field survey methodology and assist with assessing the impacts of the proposal. Information sources consulted included:

- NSW Government Web Map Service (WMS) layers for NSW Imagery (compiled imagery, NSW Property, NSW Base Map and NSW Topographic Map) (https://www.spatial.nsw.gov.au/).
- EPBC Protected Matters Search Tool (https://www.environment.gov.au/epbc/protected-matters-search-tool)
- NSW State Vegetation Type Map C1.1.M1.1 (https://datasets.seed.nsw.gov.au/dataset/nsw-state-vegetation-type-map)
- NSW DPI threatened fish indicative distribution maps (www.dpi.nsw.gov.au/fishing/species-protection/threatened-species-distributions-in-nsw/freshwater-threatened-species-distribution-maps)
- NSW BioNet Wildlife Atlas Vegetation classification (https://www.environment.nsw.gov.au/research/Visclassification.htm)
- NSW BioNet Threatened Biodiversity Data Collection (www.bionet.nsw.gov.au/)
- NSW BioNet Atlas (www.bionet.nsw.gov.au/)
- Register of Declared Areas of Outstanding Biodiversity Value (www.environment.nsw.gov.au/topics/animals-and-plants/threatened-species/about-threatened-species/critical-habitats)
- PlantNET, NSW Flora Online (www.plantnet.rbgsyd.nsw.gov.au/)
- NSW Department of Planning and Environment *Biodiversity Values Map* (https://www.lmbc.nsw.gov.au/Maps/index.html?viewer=BOSETMap)
- Vulnerable Lands – Steep or Highly Erodible, Protected Riparian and Special Category land Mapping (https://datasets.seed.nsw.gov.au/dataset/vulnerable-land-protected-riparian73a9e)
- Acid Sulphate Soils Risk mapping (https://datasets.seed.nsw.gov.au/dataset/acid-sulfate-soils-risk0196c)

- Directory of Important Wetlands of Australia (DIWA) (https://www.environment.gov.au/water/wetlands/australian-wetlands-database/directory-important-wetlands)
- NSW wetlands mapping (https://datasets.seed.nsw.gov.au/dataset/nsw-wetlands047c7)
- Important area mapping for the Regent Honeyeater and Swift Parrot available from the Biodiversity Offsets and Agreement Management System (BOAMs).

All databases were searched in July 2023, prior to conducting the initial fieldwork, and reviewed (and updated where applicable) in March and May 2024 prior to completing the draft BDAR. Results of the database searches are provided in **Appendix A**.

2.3 Field Survey

2.3.1 BAM Survey Methodology

Vegetation communities are identified in accordance with the online NSW Plant Community Type Classification (DPE, 2023d), which is the current state-wide vegetation classification system for Plant Community Types (PCTs). This classification system is used for vegetation mapping, development assessment and site planning purposes. It describes over 1,500 PCTs across the state, and groups the vegetation communities into vegetation Class and Formation / Sub-formation as per Keith (2004).

In this study, PCTs were identified on the basis of the following inputs:

- NSW State Vegetation Map C1.1.M1.1 (DPE 2022), which provides predictive mapping of PCTs in and around the subject land. This mapping is indicative only. It is not necessarily accurate at a fine scale for the purposes of the current study.
- Professional ecological knowledge about locally occurring vegetation types and landscape, soil and topographic patterns, including transitions from one community to another and potential for intergrades between plant communities.
- Field survey results to confirm the flora species present, vegetation structure, landscape position and soil type on the subject land and the extent and condition of native vegetation.
- The BioNet Vegetation Classification database, this being used to identify the candidate vegetation communities likely to be present based on the site conditions (flora species present, vegetation structure, bioregion, and landscape position and soil type) and the relevant published PCT descriptions.

If any of the PCTs were identified as having potential to be part of a Threatened Ecological Community (TEC), the relevant identification guidelines (NSW Scientific Committee listing criteria and Commonwealth identification guides) were consulted to determine the status of the vegetation

community present. These guidelines provide the identification criteria used to positively identify the community as being part of the TEC. The criteria include location, species present, overstory species, weed cover, number and type of native species including whether certain 'important' native species are present.

Plant identification followed nomenclature in the Royal Botanic Gardens PlantNET online database (Royal Botanic Gardens and Domain Trust, 2023).

In total, eight BAM plots were completed on the 19th of July 2023. The plot locations were randomly selected whilst ensuring adequate survey effort within each vegetation zone (**Table 2-2**; **Figure 4-3**). According to the BAM (2020), a minimum of four BAM plots would be required for this site, which contains three vegetation zones of 0.1-3.9 ha in size (see **Section 4.3.1** for a description of these zones). The location of BAM plots is shown in **Figure 4-3.** Plot data and site photographs are included in **Appendix B**.

Note that the initial survey covered a much wider area than the final footprint; consequently, most BAM plots fell outside of the final impact area. BAM plots which were considered to be unrepresentative of the vegetation within the final footprint (TO02, TO04, TO05) were omitted from the assessment. One additional plot, designated NN01, was conducted with a view to supporting the mapping of certain sections of the site as non-native. NN01 was not conducted as a full BAM plot but as an approximately 15 m × 15 m floristics-only plot.

Table 2-2. Minimum number of plots and transects required per zone area (DPIE, 2020b).

Vegetation zone area (ha)	Minimum number of plots/transects
<2	**1 plot/transect**
>2 – 5	**2 plots/transects**
>5 – 20	3 plots/transects
>20 – 50	4 plots/transects
>50 – 100	5 plots/transects
>100 – 250	6 plots/transects
>250 – 1000	7 plots/transects; more plots may be needed if the condition of the vegetation is variable across the zone
>1000	8 plots/transects; more plots may be needed if the condition of the vegetation is variable across the zone

Plots were surveyed according to the BAM (2020) as follows:

- The native survey plot consisted of nested 20 metres (m) × 50 m and 20 m × 20 m plots.

- Species composition and structure (species and percent cover) data collected from within 20 m × 20 plot.
- Vegetation function data (size and number of trees, presence of hollow-bearing trees and woody debris) collected from within the 20 m × 50 m plot.
- Percent of litter cover data collected within five 1 m x 1 m squares positioned at 5 m, 15 m, 25 m, 35 m and 45 m points of the 50 m plot.
- The plots were positioned within the subject land and their GPS locations were recorded (GDA 94 / MGA Zone 55).

The remainder of the subject land was traversed by foot to confirm the nature of vegetation (i.e. native or non-native) and search for habitat features such as hollow bearing trees, rock outcrops, and nests.

2.3.2 Incidental Surveys

Incidental flora and fauna sightings were recorded while undertaking the BAM plots and searching the subject land for hollow-bearing trees and other potential habitat features. Potential habitat such as rock, loose bark and coarse woody debris was recorded and examined for signs of cryptic species. Tracks and other areas of suitable substrate were searched for animal tracks. Other evidence of fauna presence on the subject land, such as scats, feathers and sloughed skins were also recorded.

2.3.3 Targeted Surveys

Vegetation mapping for Plant Community Types was conducted on the 19th of July 2023. Some fauna species were targeted while undertaking this initial fieldwork (**Table 2-3**). One Song Meter SM4 Acoustic Recorder was installed at the site (**Figure 2-1**) on the 19th of July 2023 at 08:30 and left in place until 18:30 on the 26th of July 2023 (eight days, eight dusks and seven nights of recording). Audio files were analysed by Kristy Peters at Wingbeat Ecology. Targeted flora surveys were undertaken on the 10th of October 2023 and the 10-11 January 2024. These surveys involved walking parallel transects across the subject land at 10 m spacings as per the guidelines for surveying flora species under the BAM (DPIE, 2020a; **Figure 2-3**). October is the appropriate survey period for the species credit flora species *Austrostipa wakoolica, Brachyscome muelleroides, Lepidium monoplocoides, Pilularia novae-hollandiae, Swainsona sericea*. January is the appropriate survey period for the species credit flora species *Cullen parvum*. The flora survey effort is depicted in **Figure 2-3** and all detected flora species are listed in **Appendix B**.

Targeted fauna surveys were conducted on the 19th of July 2023, 10th of October 2023, 10-12th of January 2024, and 29th of August-3rd of September. The targeted fauna methodology followed the Biodiversity Assessment Method Survey Guide where available (i.e., for Koalas; DPE, 2022a) and

where not available the Australian Government Guidelines were followed (DEWHA 2010, DSEWPC, 2011). Camera traps were baited with a mixture of honey, peanut butter and oats or sardines and confined within a gauze bait cannister and sprayed with honey water as an attractant. The targeted survey effort is summarized in **Figure 2-1**, **Figure 2-2**, **Figure 2-3**, and **Table 2-3** and all detected fauna species are listed in **Appendix C**.

Potential habitat for Sloane's Froglet (*Crinia sloanei*) was observed in the wider landscape, meeting the constraints identified for this species in the BAM-C:

- Containing relatively shallow sections with submergent and emergent vegetation, or within 500 m of wet area.
- Swamps within 500 m of swamps.
- Waterbodies within 500 m of waterbody.
- Semi-permanent/ephemeral wet areas.

Despite this, the species polygon for the species identified in the relevant survey guide (DPIE 2020c) is instead defined as comprising associated PCTs within 100 metres of the top of the bank of a suitable waterbody. No habitat meeting this description occurs within the disturbance footprint and it has not been possible to define a species polygon within this footprint. To reflect this, habitat for this species has been identified as degraded within the BAM-C and the species excluded from the final credit obligation.

Further detail concerning targeted survey effort is given in **Section 5.3.**

Table 2-3. Summary of Targeted Fauna Survey Effort (July 2023-January 2024).

Species	SURVEY MONTH J	F	M	A	M	J	J	A	S	O	N	D	TOTAL
Ardeotis australis Australian Bustard	• 3 person hours of birding	-	-	-	-	-	• 2 person hours of birding • 8 days & 7 nights of audio recording	-	• 11 person hours of birding	• 2 person hours of birding • 15.4 km diurnal transects	-	-	• 7 hours of birding (4 days) • 15.4 km transects • 8 days audio recording • 7 nights audio recording
Burhinus grallarius Bush Stone-curlew	• 3 person hours of birding • 2 nights of call playback • 7 person hours spotlighting (2 nights)	-	-	-	-	-	• 2 person hours of birding • 8 days & 7 nights of audio recording	-	• 11 person hours of birding	• 2 person hours of birding • 15.4 km diurnal transects	-	-	• 7 hours of birding (4 days) • 15.4 km transects • 8 days audio recording • 7 nights audio recording • 2 nights call playback • 7 hours of spotlighting (2 nights)
Crinia sloanei Sloane's Froglet							• 7 nights of audio recording	-					• 7 nights of audio recording
Hieraaetus morphnoides Little Eagle								-	• 11 person hours of birding	• 2 person hours of birding			• 2 person hours of birding (1 day)
Lophochroa leadbeateri Major Mitchell's Cockatoo									• 11 person hours of birding	• 2 person hours of birding	-	-	• 2 person hours of birding (1 day)

Species	SURVEY MONTH J	F	M	A	M	J	J	A	S	O	N	D	TOTAL
Lophoictinia isura Square-tailed Kite	• 3 person hours of birding								• 11 person hours of birding	• 2 person hours of birding	-	-	• 5 person hours of birding (3 days)
Myotis macropus Southern Myotis	-	-	-							-	-	-	• None
Ninox connivens Barking Owl	• 2 hollow watches (2 nights) • 7 hours spotlighting (2 nights)	-	-	-	-	-	• 7 nights of audio recording	6 nights of call playback					• 7 nights of audio recording • 2 hollow watch nights • 7 hours spotlighting (2 nights)
Petaurus norfolcensis Squirrel Glider	• 2 hollow watches (2 nights) • 7 hours spotlighting (2 nights) • 10 camera trap nights (5 cameras)	-	-	-	-	-	• 7 nights of audio recording	-	-	-	-	-	• 7 nights of audio recording • 2 hollow watch nights • 7 hours spotlighting (2 nights) • 10 camera trap nights
Phascogale tapoatafa Brush-tailed Phascogale	• 2 hollow watches (2 nights) • 7 hours spotlighting (2 nights) • 10 camera trap nights (5 cameras)	-	-	-	-	-	• 1 day of diurnal searches for deceased males after male die off					-	• 2 hollow watches (2 nights) • 7 hours spotlighting (2 nights) • 10 camera trap nights

Species	SURVEY MONTH J	F	M	A	M	J	J	A	S	O	N	D	TOTAL
Phascolarctos cinereus Koala	• 3 hours diurnal searches • 4 koala SAT surveys • 7 hours spotlighting (2 nights)	-	-	-	-	-	• 8 days & 7 nights of audio recording	-	-	• 2 hours of diurnal searches	-	-	• 8 days & 7 nights of audio recording • 5 hours diurnal searches • 4 koala SAT surveys • 7 hours spotlighting (2 nights)
Polytelis swainsonii Superb Parrot									• 11 person hours of birding (3 days)	• 2 person hours of birding (1 day)	-		• 2 person hours of birding (1 day)
Tyto novaehollandiae Masked Owl	• 2 hollow watches (2 nights) • 7 hours spotlighting (2 nights)	-	-	-	-	-	• 7 nights of audio recording	• 6 nights of call playback					• 7 nights of audio recording • 2 hollow watch nights • 7 hours spotlighting (2 nights)

Green shading = approved survey month.

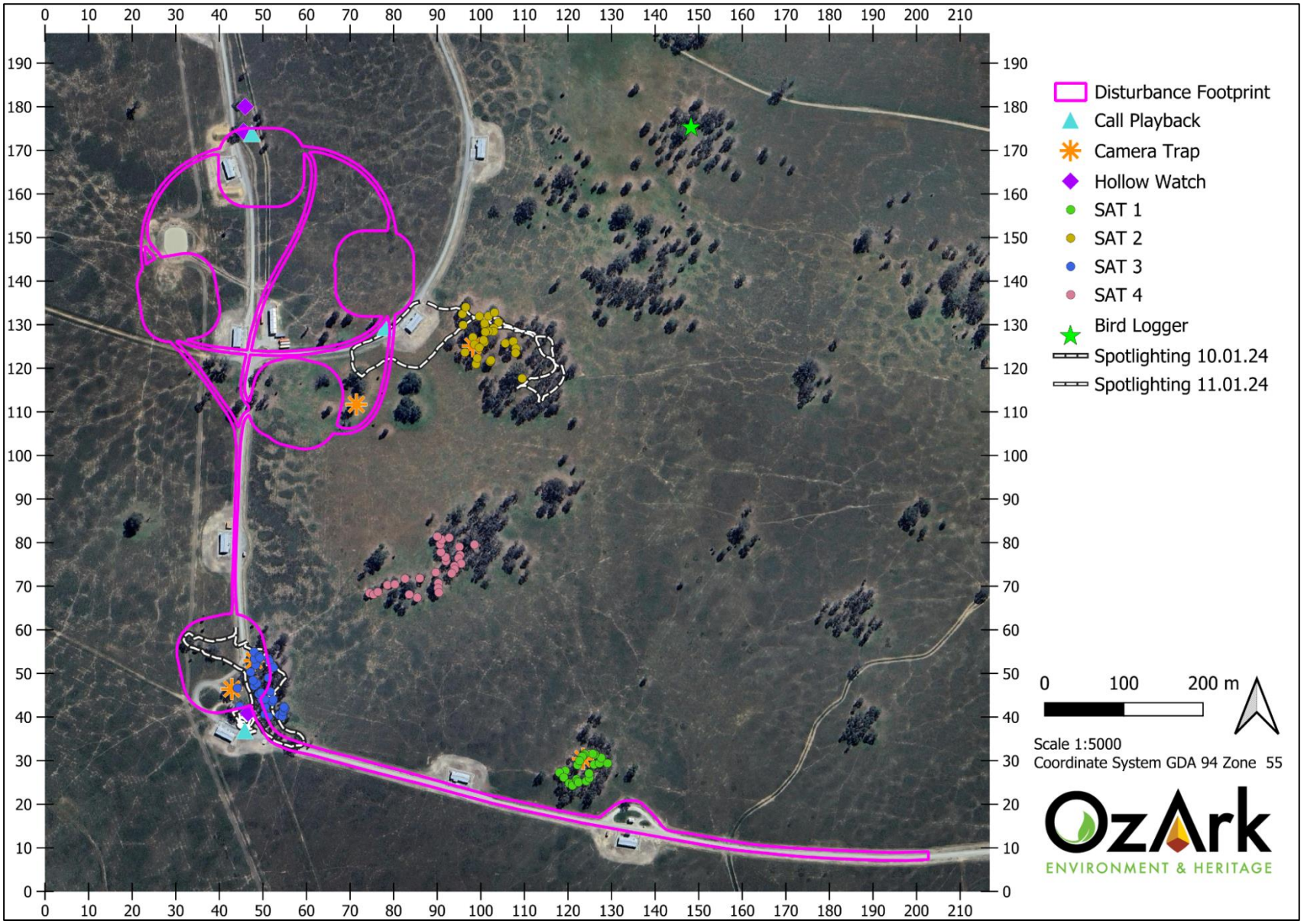


Figure 2-1. Summary of targeted fauna survey effort (July 2023, October 2023, January 2024).

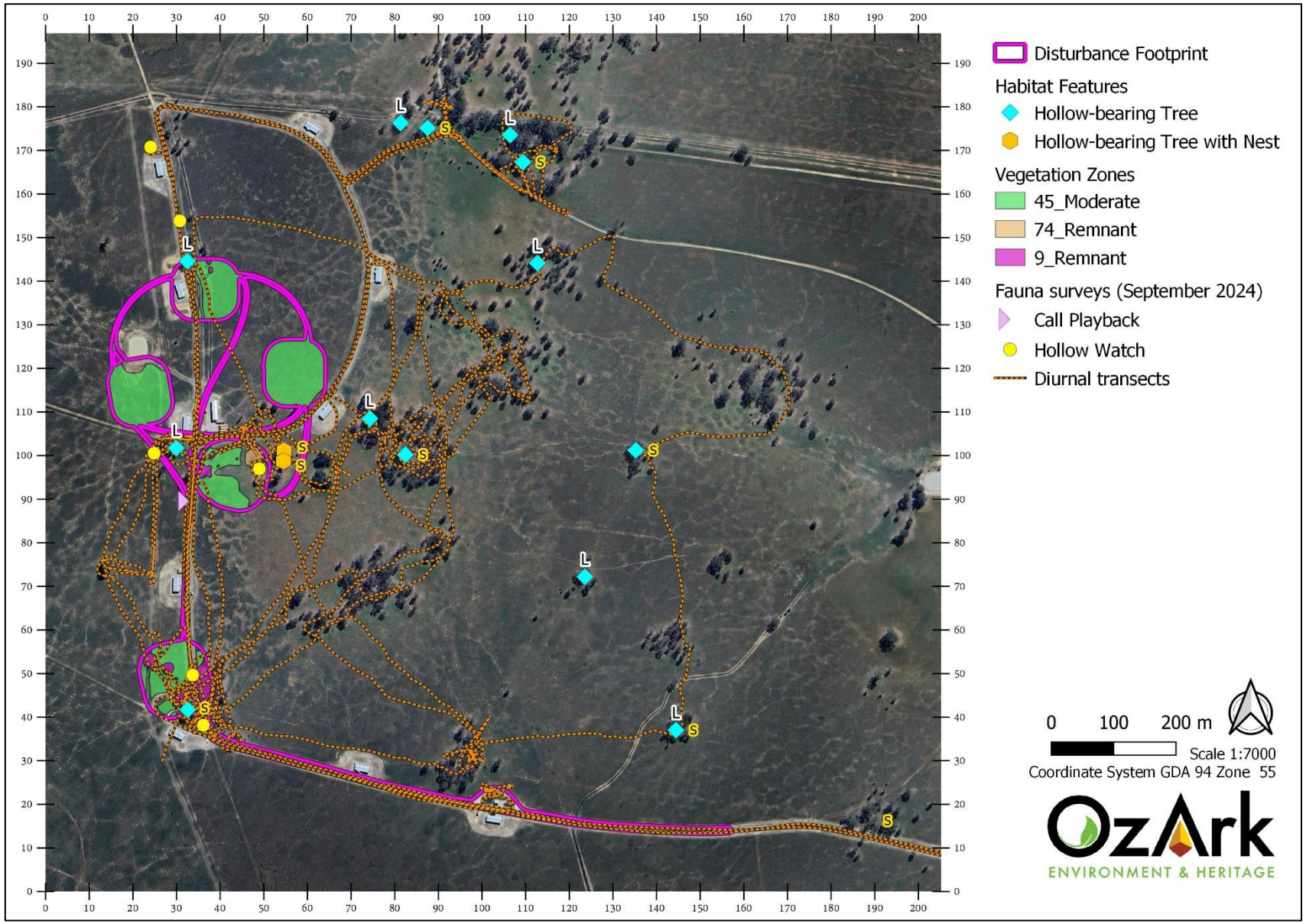


Figure 2-2. Summary of targeted fauna survey effort (September 2024).

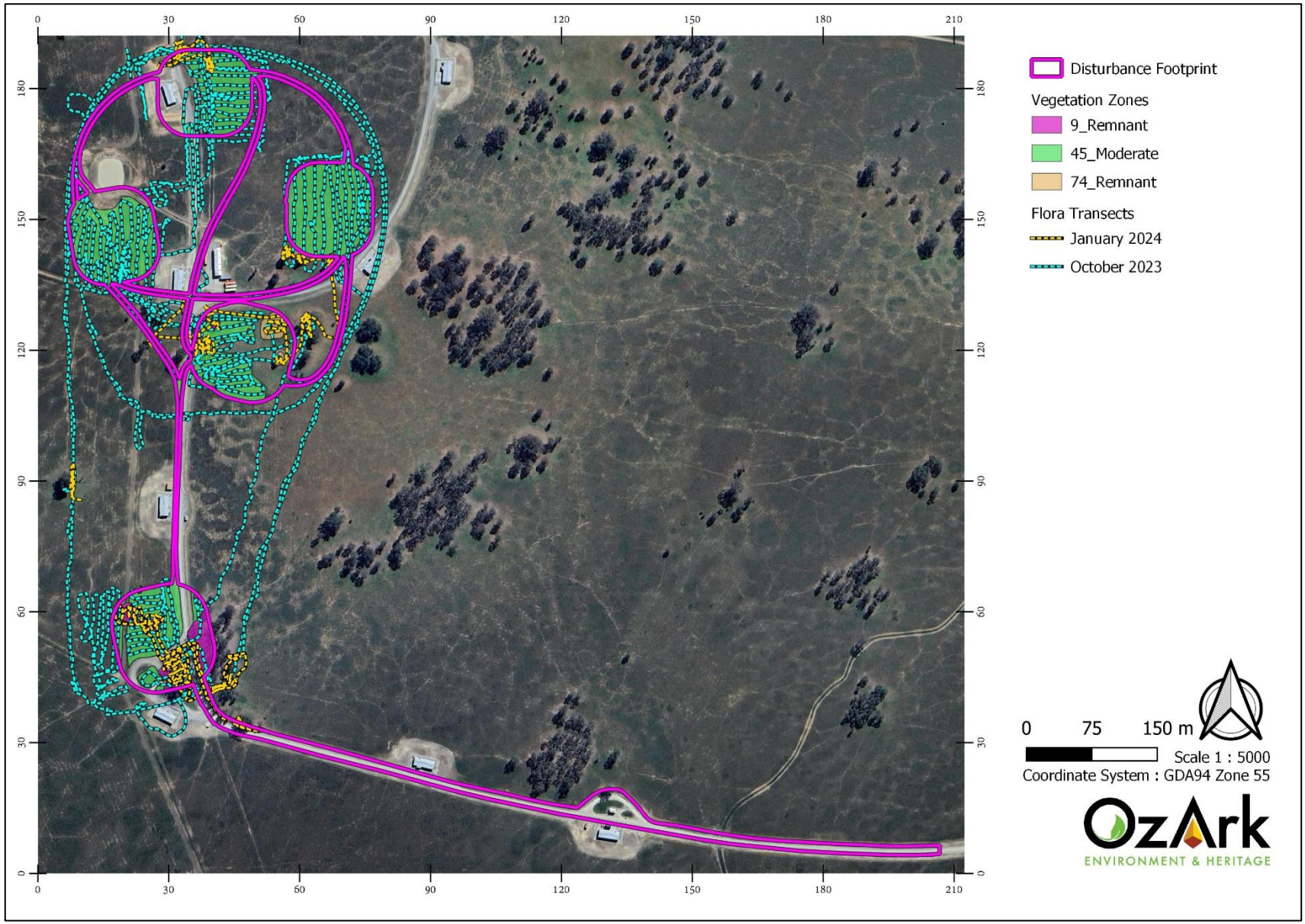


Figure 2-3. Summary of targeted flora survey effort.

2.4 Habitat Suitability

The suitability of the subject land as habitat for all species credit species generated by the BAM-C was assessed (**Section 5.2** and **5.3**).

The presence / absence of threatened species was categorised as follows:

- 'Assumed present' – the species was predicted to occur by the BAM-C, suitable habitat features occur on the subject land for that species and no targeted survey or expert report was commissioned.
- 'Absent' constraint – None of the habitat constraints or geographic limitations are present, the habitat is degraded or the species is a vagrant.
- 'Absent' surveyed – Targeted surveys undertaken during the time period specified for the species in the Threatened Biodiversity Data Collection (TBDC) and following DPIE threatened species survey guidelines (DEWHA, 2010b). Where no relevant published guidelines exist, the survey must be undertaken using best practice methods.

EPBC Act-listed fauna that were predicted to occur within 10 km of the subject land were also assessed for their presence or absence on site (**Appendix D**).

2.5 Limitations

This study is based upon the species data available at the time of the study, and the environmental conditions, season, and time constraints imposed by the project for the field survey. Specific limitations on this study include the following:

- BAM plots were conducted in the winter, therefore flora species diversity may have been lower than if plots were conducted in the spring.
- Flora fieldwork was conducted on five days from July 2023-January 2024; therefore, some flora and fauna species likely went undetected.
- Specific targeted survey methods for bats were not employed; consequently, the species list is likely to underrepresent mammals.

To overcome some of these limitations, a 'precautionary approach' for species presence has been adopted where required.

The above-mentioned limitations were also considered when preparing the recommendations of avoiding, minimising and mitigating potential impacts.

3 Landscape Features

3.1 Overview

A series of background searches were performed to comply with legal standards (**Table 3-1**).

Table 3-1. Environmental protection areas within the study area.

Environmental Protection Areas	Presence in the Study Area
Land identified on the Biodiversity Values Map under the NSW *BC Act* 2016	No (**Appendix A**).
Area of Outstanding Biodiversity Value (AOBV) under the NSW *BC Act* 2016	No.
A World Heritage Area.	No.
An area reserved or dedicated under the *National Parks and Wildlife Act 1974* or *Wilderness Act 1987*.	No.
Land subject to a conservation agreement under the *National Parks and Wildlife Act 1974.*	No.
Land identified as State Forest under the *Forestry Act 1916.*	No.
Is the proposal located within land reserved or dedicated within the meaning of the *Crown Lands Act 1989* for preservation of other environmental protection purposes?	No.
Lands protected under NSW *State Environmental Planning Policy (Biodiversity and Conservation) 2021*	Yes. (See **Section 1.7.3**).
Environmental Protection Zones in environmental planning instruments.	No.
Wetland areas dedicated under the Ramsar Wetlands Convention.	No.
Aquatic reserves dedicated under the *Fisheries Management Act 1994.*	No.
Watercourse mapped as Key Fish Habitat (KFH) and/or within the extent of an aquatic Endangered Ecological Community, listed under the *Fisheries Management Act* 1994.	No.
Acid sulphate area.	No.

3.2 Bioregion

The subject land falls within the Murray Fans Subregion of the Riverina Bioregion (**Figure 1-2**) as per the Interim Biogeographic Regionalisation of Australia (IBRA) (Thackway & Cresswell, 1995). The subregion is characterised by geology, landforms, soil types and vegetation as described in **Table 3-2**.

Table 3-2. Description of the Murray Fans subregion (NSW NPWS 2003).

Bioregion	Riverina
Subregion	Murray Fans
Geology	Quaternary alluvial sediments. Clay and sand with source bordering dunes, lakes and swamps.
Landforms	Relatively confined alluvial fan constrained by sediments from northern Victorian rivers, the Murrumbidgee fan and the Cadell fault. Meandering channels, floodplains, source-bordering dunes, overflow lakes and swamps.
Soils	Red brown earths, grey clays and deep sands.
Vegetation	Extensive river red gum forests with river cooba on channels and low floodplains. Yellow Box and black box with saltbush on high floodplains and terraces. White cypress pines on dunes, sandy levees and lunettes. Common reed, cumbungi and grasses in swamps.

3.3 NSW (Mitchell) Landscapes

Landscapes with relatively homogenous geomorphology, soils and broad vegetation types in NSW have been classified and mapped at a 1:250,000 scale. These landscapes are referred to as NSW (Mitchell) Landscapes (Mitchell, 2002).

The subject land falls within the Murray Scalded Plains landscape (**Figure 3-1**). The characteristics of these landscapes are described below.

Murray Scalded Plains

Murray Scalded Plains Quaternary alluvial plains with extensive scalding interpreted as relic floodplains, terraces or part of the Cadell tilt block. Red brown texture-contrast soils with extensive scalds. Prior stream channels of deep coarse sands with sandy levees and grey, brown and red cracking clays in depressions, relief 5 to 15m. Murray Lakes, Swamps and Lunettes ecosystem includes parts of two land systems: Leaghur and Victoria.

Over-clearing status: Over-cleared. In total, 92% of this landscape is estimated to have been cleared.

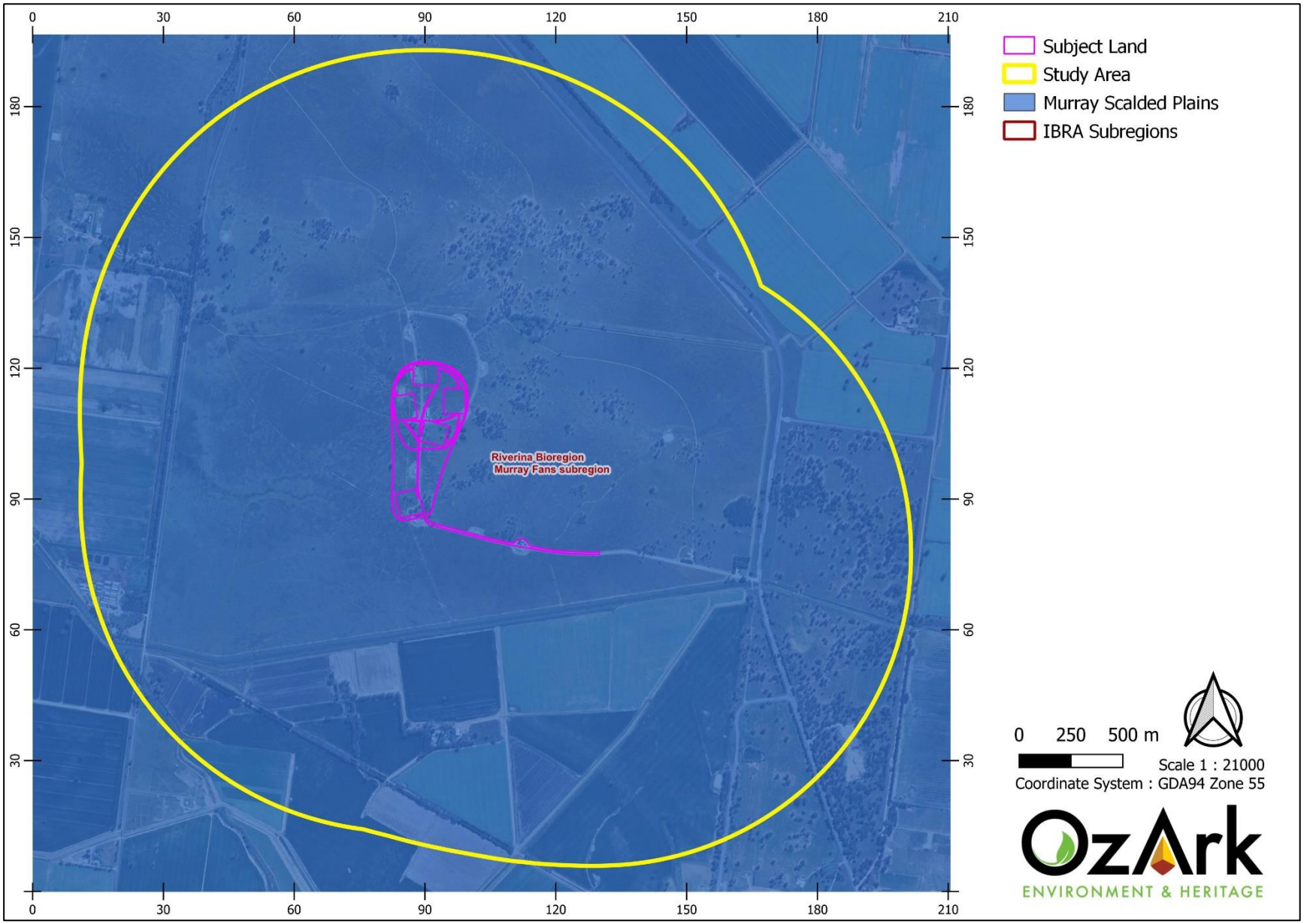


Figure 3-1. NSW (Mitchell) Landscapes within the study area.

3.4 Geology, Cave, Karst and Soil Features

The underlying geology and soil typical of the subject land and wider study area has been described in **Table 3-2** and above. No outcropping rock, surface rock, caves or karst formations were detected on the subject land.

3.5 Climate and Weather Data

The nearest weather station is located at the Tocumwal Airport (station 074106), which is approximately 6.8 km from the subject land. Rainfall records commenced at this station in 1897, while temperature records commenced in 1970. The latest available data from this weather station is from the 12th of May 2022.

The area experiences hot summers, with the highest average maximum temperature of 32.0°C experienced in January (**Figure 3-2**). Temperatures in winter are cool to mild with the coldest temperatures being recorded in July, having an average minimum of 3.4°C and an average maximum of 13.9°C.

The average annual rainfall at this station is 449.0 mm. Rainfall occurs year-round, peaking during the winter months. June records the highest average rainfall of 44.0 mm, followed by August (42.7 mm) and October (42.4 mm). The lowest monthly rainfall occurs in February (28.9 mm), followed by April (32.2 mm) and January (33.4 mm).

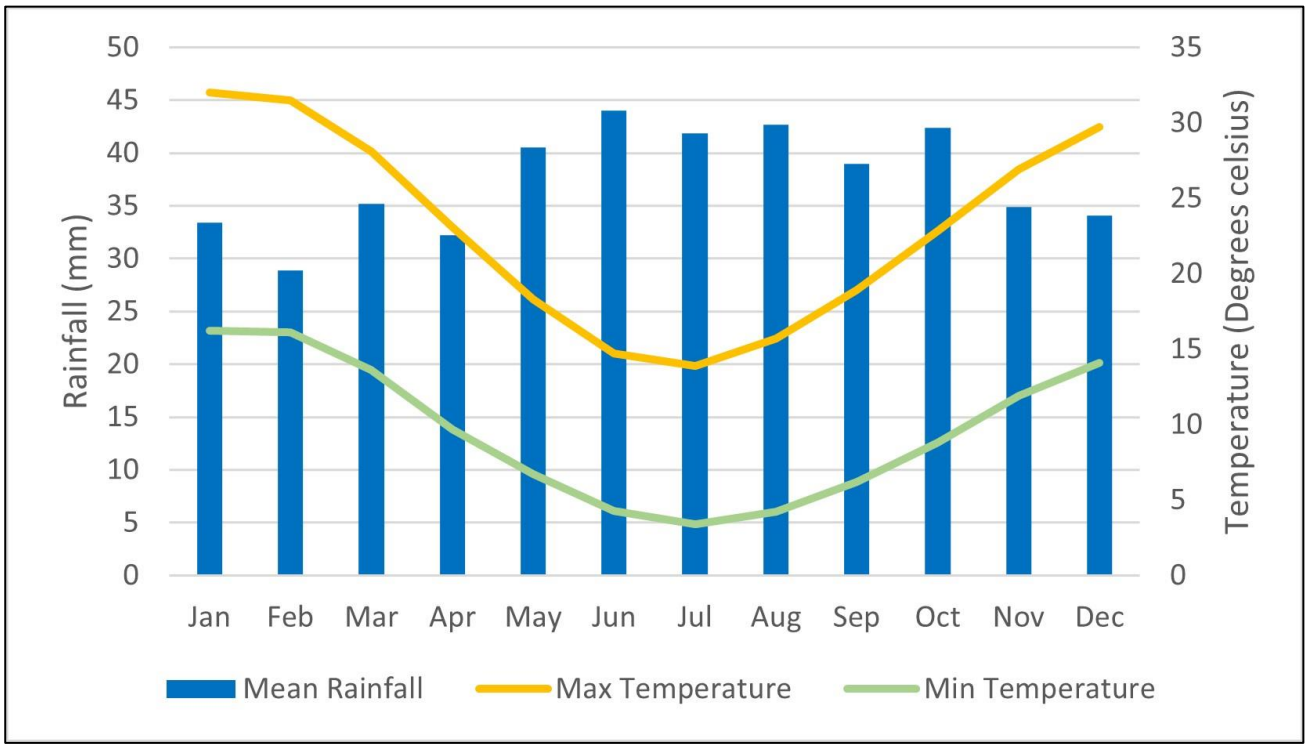


Figure 3-2. Climate statistics for Tocumwal Airport Weather Station (ID 074106) showing mean minimum and maximum temperatures, and mean rainfall (Bureau of Meteorology, 2022).

3.6 Biodiversity Values Map

The Biodiversity Values Map (BV Map) identifies land with high biodiversity value, as defined by the *Biodiversity Conservation Regulation* 2017. The subject land does not contain land identified on the BV Map (**Appendix A**).

3.7 Areas of Outstanding Biodiversity Value

The site does not contain any currently listed Areas of Outstanding Biodiversity Value (AOBV).

3.8 Native vegetation cover

Native vegetation cover, assessed as the proportion of the study area retaining native vegetation, was assessed by consulting aerial imagery of the surrounding landscape and ground-truthing this where possible to determine whether native vegetation persists. Native vegetation is defined to include woody vegetation and non-woody vegetation, including regrowth and plantations, comprised of plants native to New South Wales. Native cover is mapped in **Figure 1-2**. Areas excluded from the estimate of cover include built infrastructure (chiefly roads and residences) and cropped land. A summary of the vegetation cover estimate is provided in **Table 3-3**. For the purposes of the BAM, the native vegetation cover class has been determined as 30-70%.

Table 3-3. Native vegetation cover estimates in the study area.

Vegetation Cover Type	Description	Cover Within Study Area (ha)	Total Area of Study Area (ha)	Native Cover within Study Area (%)
Native vegetation	Remnant woodland and associated derived grassland, planted native vegetation, remnant natural grassland	844.5	1352.2	62

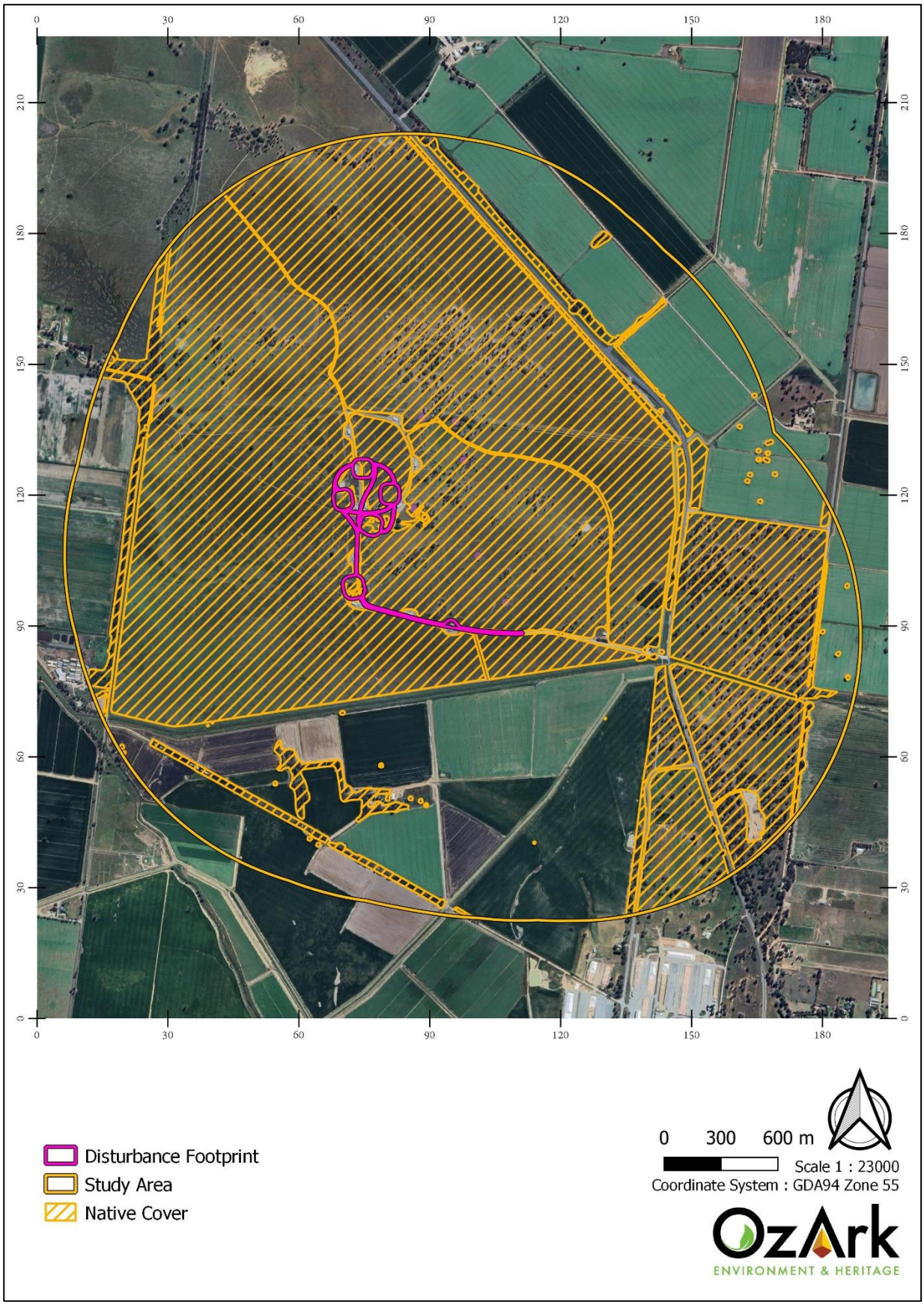


Figure 3-3. Native vegetation cover within the study area.

3.9 Rivers, Streams, Wetlands and Key Fish Habitat

An artificial dam occurs partially within the subject land. However, this was not observed to possess native flanking vegetation and is likely to offer only limited habitat for wetland flora and fauna.

One natural watercourse occurs within the study area (**Figure 3-4**). This watercourse is an unnamed Strahler 1st order minor, non-perennial stream. A further three manmade irrigation channels also occur within the study area. No watercourses mapped as Key Fish Habitat by DPI – Fisheries occur within the study area. Similarly, no areas of Protected Riparian Land (PRL), as recognised by the NSW Department of Climate Change, Energy, the Environment and Water (NSW DCCEEW), occur within the study area.

No watercourses within the study area are mapped as containing distributions of threatened fish species or populations listed under the FM Act.

3.10 Groundwater Dependent Ecosystems

Groundwater plays an important ecological role in directly and indirectly supporting terrestrial and aquatic ecosystems. Groundwater sustains terrestrial and aquatic ecosystems by supporting vegetation and providing discharge to channels, lacustrine and palustrine wetlands, and both the estuarine and marine environment.

The degree of groundwater dependence of ecosystems can be categorised into three broad categories:

- Non-dependent ecosystems that occur mostly in recharge areas and have no connection with groundwater.
- Facultative GDEs that require groundwater in some locations but not in others, particularly where an alternative source of water can be accessed to maintain ecological function. Minor changes to the groundwater regime in facultative GDEs with proportional or opportunistic groundwater dependence may not have any adverse impacts but these ecosystems can be damaged or destroyed if a lack of access to groundwater is prolonged.
- Obligate GDEs that are restricted to locations of groundwater discharge and ecosystems located within aquifers (e.g. subterranean cave and stygofauna communities). Aquifer ecosystems are inherently groundwater dependent.

Groundwater dependent ecosystems have been classified into seven types under two broad categories as follows (Serov *et al*. 2012):

- Subsurface ecosystems – Underground ecosystems
    - Karst systems and caves (limestone geology)
    - Subsurface aquifer (phreatic) ecosystems

    - Baseflow streams (hyporheic or subsurface component)
- Surface ecosystems – Above ground ecosystems
    - Groundwater dependent wetlands
    - Baseflow surface streams (surface/free-water component)
    - Estuarine and near shore marine ecosystems
    - Groundwater dependent terrestrial ecosystems; dependent on subsurface groundwater (phreatophytic).

The Bureau of Meteorology Atlas of Groundwater Dependent Ecosystems identifies areas of low-potential terrestrial GDEs within the subject land (**Figure 3-4**; BOM, 2017). Further areas of high potential terrestrial GDEs and low potential aquatic GDEs occur within the wider study area. However, no moderate- or high-potential GDEs are predicted to occur within the subject land.

The proposal does not include the extraction of groundwater; however, contamination from construction operations could impact on the quality of groundwater if adequate mitigation measures are not taken. Mitigation measures to reduce the impacts of erosion and runoff, which may adversely affect groundwater, have been provided in **Section 6.7.**

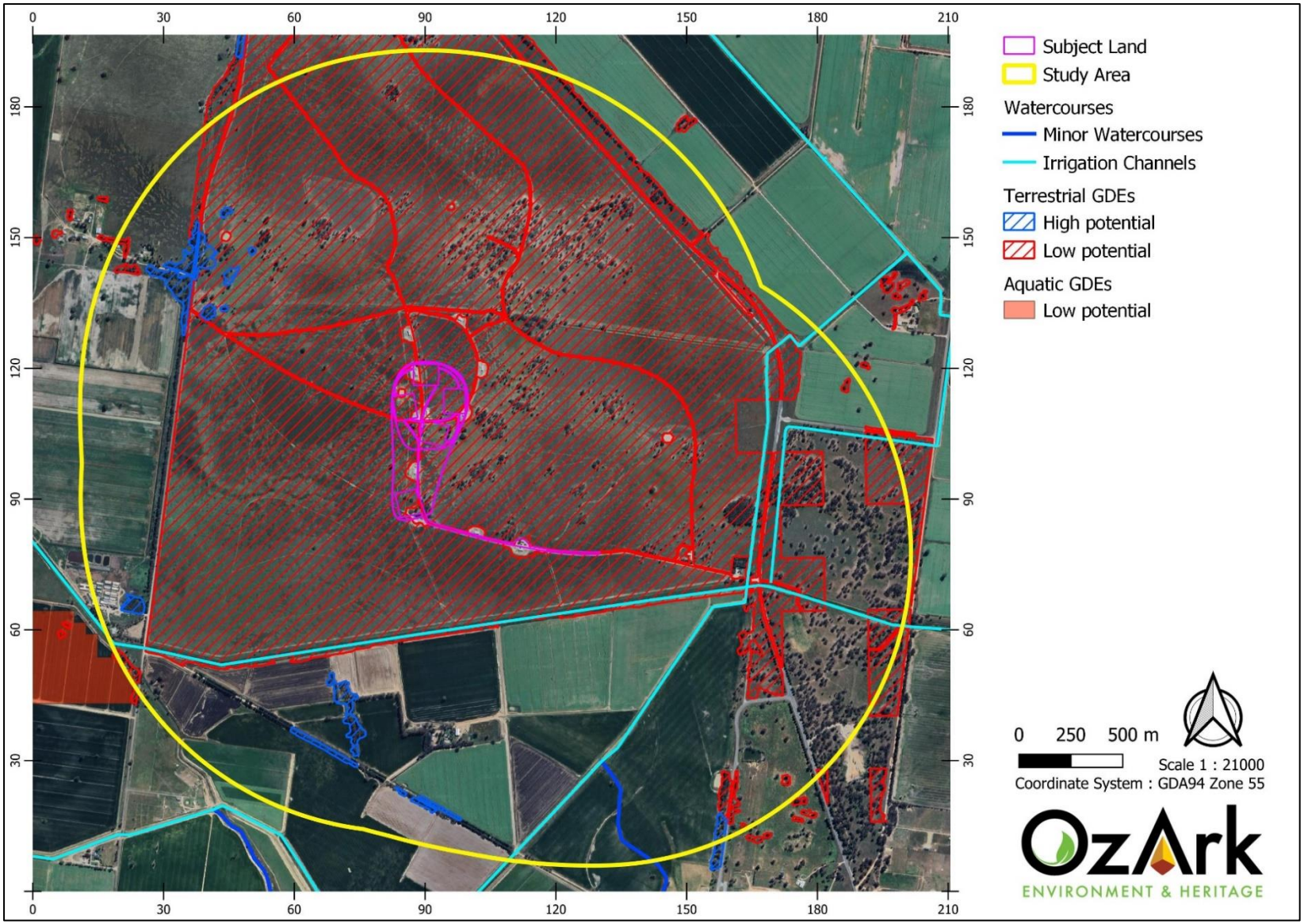


Figure 3-4. Watercourses and groundwater-dependent ecosystems within the study area.

3.11 Connectivity Features

The development footprint contains a mixture of grasslands presumed to be natural and small, scattered woodland remnants. The only remnant wildlife corridors for woodland-dependent species within the study area are:

1) Vegetation along Chinamans Road to the west of the site
2) A remnant patch east of the Newell Highway which is narrowly connected to the eastern edge of the subject land; however, the Newell Highway severs this connectivity.

As the development footprint overlaps the edge of this latter wildlife corridor, it will be slightly narrowed by the project. Considering the Newell Highway already severs connectivity in the study area, any additional impacts on wildlife connectivity associated with the project are considered negligible.

The natural grasslands may provide connectivity for species adapted to grassland habitats. The disturbance footprint is situated within a patch of natural grassland that may exceed 700 ha and may provide some connectivity to grasslands in adjacent paddocks to the northwest. Outside of this area, connectivity is likely to be significantly disrupted by cropping, and grassland species are unlikely to be able to move significantly beyond this patch.

4 Native Vegetation

4.1 Land Category Assessment

According to section 6.8(3) of the BC Act, land defined as Category 1 – Exempt Land (within the meaning of Part 5A of the LLS Act) is to be excluded from assessment under the BAM. Category 1 exemption applies to rural land (zoned RU1, RU2, or RU3) that was cleared of native vegetation as of 1 January 1990 or lawfully cleared of vegetation between 1 January 1990 and 25 August 2017. The Draft Native Vegetation Regulatory Map (DVNRM) provides preliminary mapping of land categories for the subject land and identifies much of the site as Category 1 land, excluding areas of remnant woodland (**Figure 4-1**). However, this mapping is not binding and does not supersede the results of an *in situ* assessment.

The likely categorisation of land can be determined by consulting the following sources of information:

- Land zoning maps in the applicable Local Environment Plan.
- Public land use mapping (DPIE, 2017).
- NSW woody vegetation extent mapping (NSW DCCEEW, 2015).
- The Transitional Native Vegetation Regulatory Map (NSW DCCEEW, 2024h).
- Historical aerial photographs accessed via the NSW Government Spatial Services platform (NSW DCCEEW, 2024i).
- Vegetation surveys conducted during the field assessment.
- Determining native vegetation land categorisation for application in the Biodiversity Offsets Scheme (DPE, 2023).

4.1.1 Land Zoning

The whole of the subject land is zoned RU1 – Primary Production, which is compatible with Category 1 classification.

4.1.2 Land Use

The whole of the subject land is mapped to 5.5.4 Defence facilities - urban. This land use is compatible with Category 1 listing.

4.1.3 Draft Native Vegetation Regulatory Map (DNVRM)

The DNVRM identifies areas of regulated land within the site, aligning with remnant woody vegetation (see **Figure 4-1**). The remainder of the site has been provisionally mapped in the DNVRM as Category 1 land, but this is subject to groundtruthing in the field.

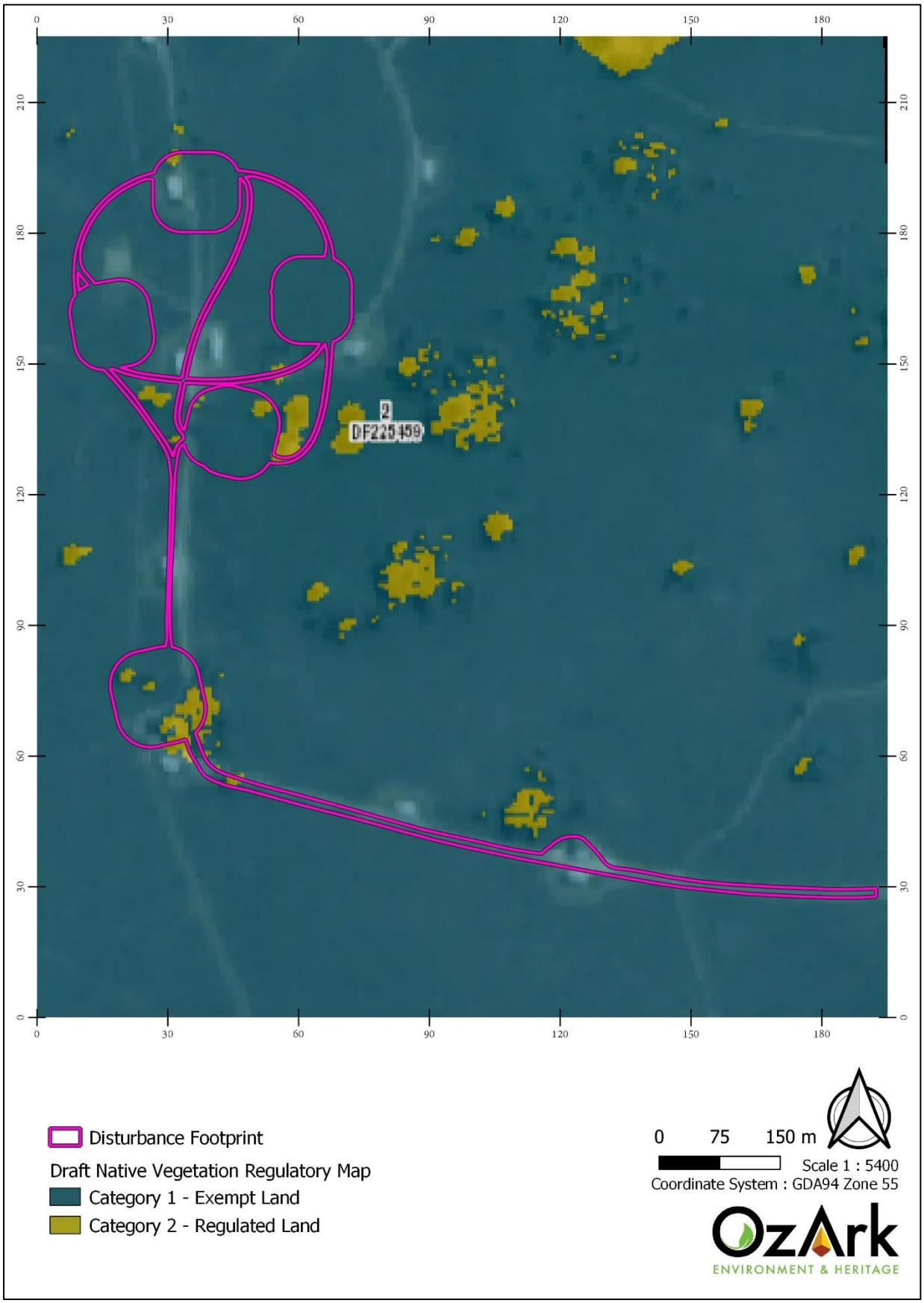


Figure 4-1. View of the subject land as dispayed on the Draft Native Vegetation Regulatory Map.

4.1.4 Historical Aerial Photography

Historical aerial imagery suggests that there has been significant regrowth of woody vegetation within the site since 1976 (**Figure 4-2**). Certain areas that now support woodland communities are likely to have been grasslands at the time of the 1990 cutoff.

4.1.5 Vegetation Surveys

Most of the treeless land within the site now supports native grasslands (see **Section 4.2**). Only minor areas were noted in which native vegetation made up less than 50% of total vegetative cover. These areas, which were dominated by exotic grasses, may constitute Category 1 land as they comprise low conservation value grassland. These areas correspond to areas mapped as non-native vegetation in this assessment (see **Section 4.2**).

4.1.6 Conclusion

As most of the site supports woodlands or moderate to high conservation value grasslands, the majority of the site is likely to constitute Category 2 – Regulated Land. The only exception to this may be minor areas of low conservation value grassland, which are treated in this assessment as non-native.

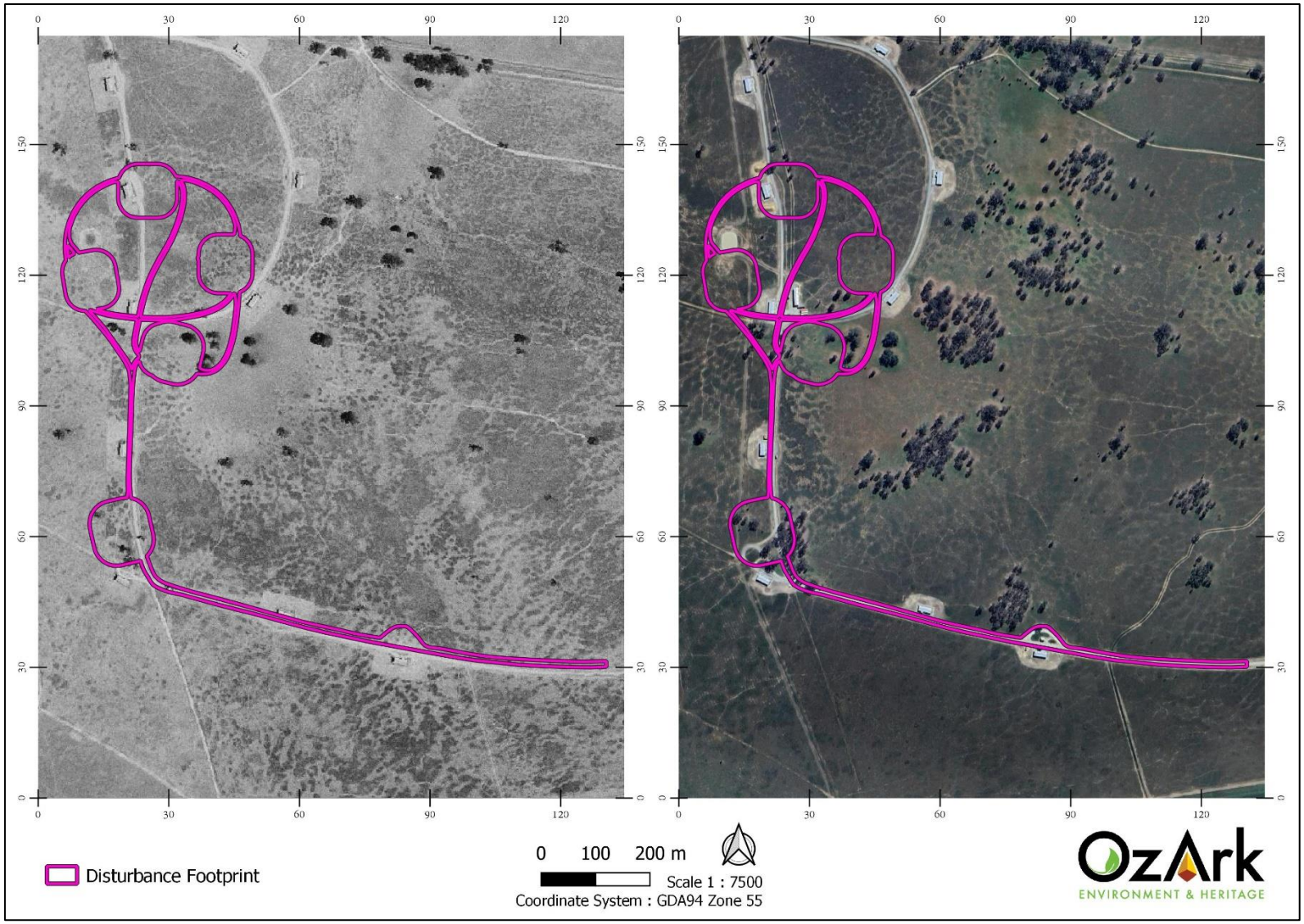


Figure 4-2. View of the subject land in 1976 (left) and in the most recent available aerial photographs (right), suggesting that extensive regrowth – particularly of River Red Gum (*Eucalyptus camaldulensis*) – has occurred within the landscape.

4.2 Plant Community Types (PCTs)

The subject land is dominated by native grasslands in which speargrasses (*Austrostipa aristiglumis*, *A. scabra*, and *A. nodosa*), wallaby grasses (*Rytidosperma caespitosum* and *R. duttonianum*), windmill grasses (*Enteropogon ramosus* and *E. acicularis*), and panic grasses (*Walwhalleya proluta* and *Panicum effusum*) are variously dominant. Remnant "islands" of woodland occur within these grasslands, dominated either by River Red Gum (*Eucalyptus camaldulensis*) or by Yellow Box (*E. melliodora*).

Three PCTs were recorded within the development footprint:

- PCT 9 – River Red Gum - wallaby grass tall woodland wetland on the outer River Red Gum zone mainly in the Riverina Bioregion.
- PCT 45 – Plains Grass grassland on alluvial mainly clay soils in the Riverina Bioregion and NSW South Western Slopes Bioregion.
- PCT 74 – Yellow Box - River Red Gum tall grassy riverine woodland of NSW South Western Slopes Bioregion and Riverina Bioregion.

These three PCTs each occurred in a single condition state. Consequently, three vegetation zones were mapped within the site (**Figure 4-3**). PCT determination and zone descriptions are provided in **Table 4-1**. Plot data and site photographs are included in **Appendix B**. A list of all plant species observed during the field surveys is provided in **Appendix C**.

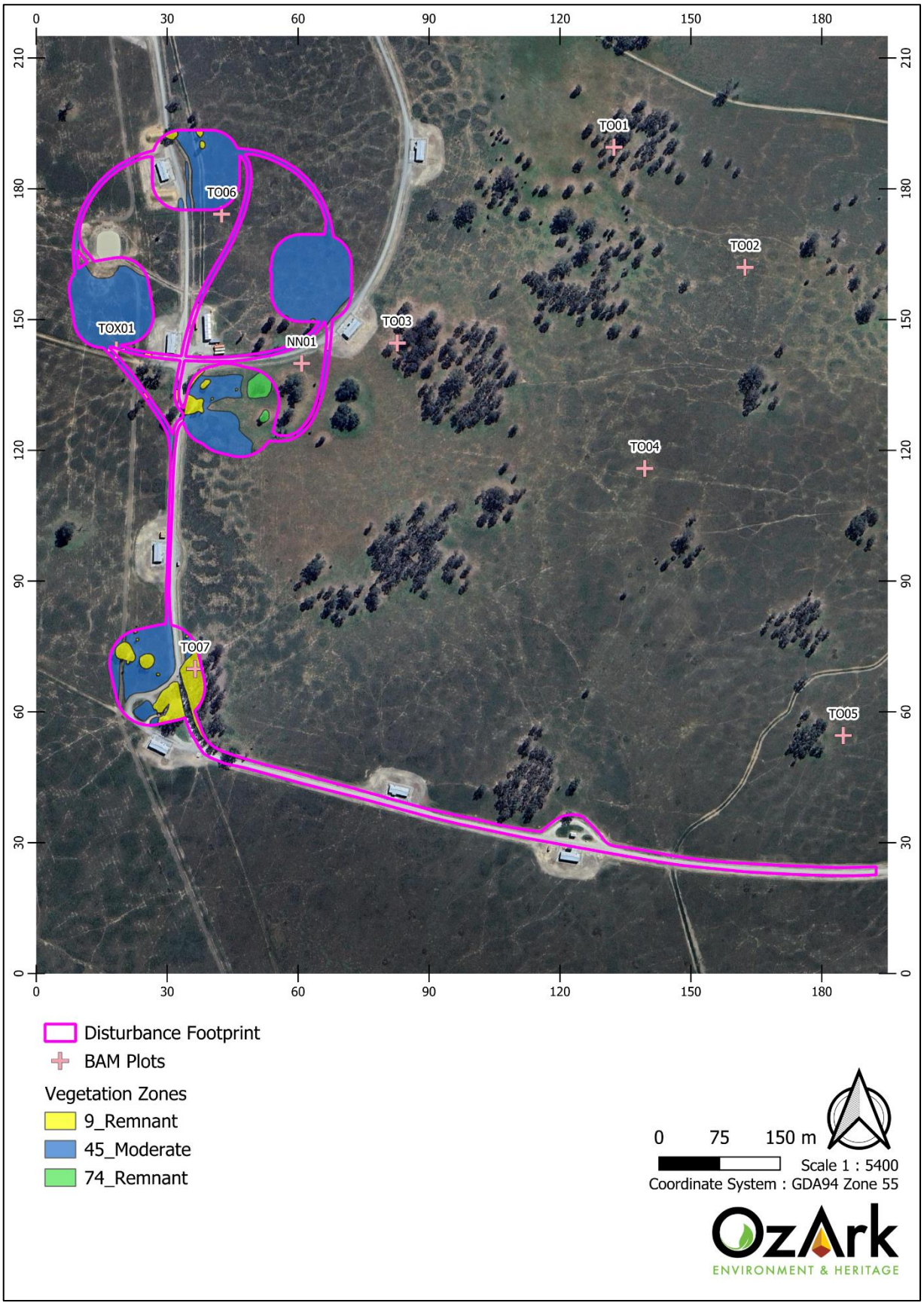


Figure 4-3. Vegetation zones and BAM Vegetation Integrity plots.

Table 4-1. PCT justification and vegetation zones present within the disturbance footprint.

PCT ID	PCT Name	Vegetation Class	TEC Status BC Act	TEC Status EPBC Act	Justification of Identification	Current NSW Extent Percent Cleared
9	River Red Gum - wallaby grass tall woodland wetland on the outer River Red Gum zone mainly in the Riverina Bioregion.	Inland Riverine Forests	No TEC	No TEC	**"Remnant" condition:** • Woodland in which River Red Gum (*Eucalyptus camaldulensis*) is the sole canopy species. Many local stands of this community appear to consist of a single mature tree or a small number of mature trees surrounded by regeneration. • No shrub layer was recorded in any local occurrence of this community. • Understorey is predominantly grassy. While the dominant grasses are often non-native (chiefly *Hordeum* and *Lolium* species), the wallaby grasses *Rytidosperma caespitosum* and *R. duttonianum* are also common. Rough Speargrass (*Austrostipa scabra*) is also common in places. The community grades into the background grassland, in which Rigid Panic (*Walwhalleya proluta*), Plains Grass (*Austrostipa aristiglumis*), wallaby grasses (*Rytidosperma* spp.), Windmill Grass (*Chloris truncata*), and Curly Windmill Grass (*Enteropogon acicularis*) are most abundant. • Native forbs are generally scarce in this community but do include native dock (*Rumex*) species and Grassland Wood-sorrel (*Oxalis perennans*). • Filtering the NSW BioNet Vegetation Classification Database by the relevant IBRA subregion and the dominant canopy and groundcover species returns strong (4/4) matches to eight PCTs. Discounting PCTs in which River Red Gum is not typically dominant (13, 26, 237) leaves five candidate PCT: 5, 7, 9, 10, and 74. PCT 10 was also discounted as it is considered ecotonal between River Red Gum and Black Box (*Eucalyptus largiflorens*) communities and no evidence of Black Box was recorded within or near the site. The use of PCT 74, while broadly appropriate, was reserved for patches in which River Red Gum was	12,000 ha 66.00% ±50%

PCT ID	PCT Name	Vegetation Class	TEC Status BC Act	TEC Status EPBC Act	Justification of Identification	Current NSW Extent Percent Cleared
					found to co-occur with Yellow Box (*Eucalyptus melliodora*). Areas in which River Red Gum was found by itself were assigned to a separate PCT. • Of the three remaining PCTs (5, 7, and 9), PCT 5 was discounted as it typically occurs on levees or other raised landform elements adjacent to watercourses, which does not describe the subject land, and PCT 7 was discounted due to its typical position on inner floodplains and the absence of Warrego Grass (*Paspalidium jubiflorum*) from the subject land. The dominance of wallaby grasses within the patch aligns the observed community more closely with PCT 9.	
45	Plains Grass grassland on alluvial mainly clay soils in the Riverina Bioregion and NSW South Western Slopes Bioregion.	Riverine Plain Grasslands	Not a TEC	Critically Endangered: Natural Grasslands of the Murray Valley Plain	**"Remnant" condition:** • Grassland forming part of a mosaic of grassland communities spanning much of the surrounding landscape. The wider grassland is variable in composition and includes elements dominated by Plains Grass (*Austrostipa aristiglumis*), Rigid Panic (*Walwhalleya proluta*), curly windmill grasses (*Enteropogon acicularis* and *E. ramosus*), wallaby grasses (*Rytidosperma caespitosum* and *R. duttonianum*), and sometimes Rough Speargrass (*Austrostipa scabra*). The occurrence of the grassland community within the subject land is dominated by Rigid Panic and wallaby grasses with Plains Grass occurring throughout. • The small chenopod shrubs Black Rolypoly (*Sclerolaena muricata*) and Ruby Saltbush (*Enchylaena tomentosa*) occur in some areas but the community generally lacks a well-defined shrub layer. • Filtering the NSW BioNet Vegetation Classification Database by the relevant IBRA subregion and the grassland vegetation formation and excluding PCTs considered to be wholly or largely derived returns five potential matches: 44, 45, 46, 50, and 242. Each community is defined by one or more key species:	100,000 ha 60.00% ±80%

PCT ID	PCT Name	Vegetation Class	TEC Status BC Act	TEC Status EPBC Act	Justification of Identification	Current NSW Extent Percent Cleared
					○ 44: *Austrostipa nodosa*, *Chloris truncata*, and *Rytidosperma caespitosum*. ○ 45: *Austrostipa aristiglumis*, often with *Walwhalleya proluta*, *Rytidosperma duttonianum*, *Enteropogon ramosus*, *Sporobolus caroli* and *Chloris truncata*. ○ 46: *Enteropogon ramosus*, *Austrostipa nodosa* and/or *Austrostipa scabra*, and *Rytidosperma* spp. ○ 50: *Cynodon dactylon*, often with rushes, sedges and other minor grasses. ○ 242: *Sporobolus mitchellii*, with other minor grasses. Of the five candidate grasslands, two (50 and 242) could be excluded as the key species were not found to be dominant or did not occur at all within the site. It is likely that elements of the remaining three all occur within the wider grassland patch; however, as the dominant species within the disturbance footprint were found to be *Walwhalleya proluta* and *Rytidosperma duttonianum*, with *Austrostipa aristiglumis* occurring in patches throughout, it was considered that PCT 45 best decribed the observed vegetation. The site is subject to ongoing disturbance by grazing, which may complicate the delineation of grassland communities. Comparison of the flora recorded on site with the species lists provided for each of the three communities also suggests a stronger match with PCT 45 (12/28 species = 42.86%) than with PCT 44 (4/17 species = 23.53%) or PCT 46 (6/26 species = 23.08%).	
74	Yellow Box - River Red Gum tall grassy riverine woodland of NSW South Western Slopes Bioregion and Riverina	Floodplain Transition Woodlands	Critically Endangered: White Box - Yellow Box -	Not a TEC	**"Remnant" condition:** • Woodland in which Yellow Box (*Eucalyptus melliodora*) dominates, rarely with a minor component of River Red Gum (*Eucalyptus camaldulensis*). Occurrences within the disturbance footprint contain Yellow Box by itself.	8,000 ha 73.00% ±50%

PCT ID	PCT Name	Vegetation Class	TEC Status BC Act	TEC Status EPBC Act	Justification of Identification	Current NSW Extent Percent Cleared
	Bioregion		Blakely's Red Gum Grassy Woodland and Derived Native Grassland		• No native shrub layer was recorded in any local occurrence of this community. • Native diversity in the understorey is generally poor, with the dominant species being exotic grasses (chiefly *Hordeum* and *Lolium* species) and a range of introduced forbs. The native grasses Ringed Wallaby Grass (*Rytidosperma caespitosum*), Rough Speargrass (*Austrostipa scabra*), and Rigid Panic (*Walwhalleya proluta*) were recorded within this zone, along with patches of the native forb Australian Stonecrop (*Crassula sieberiana*). • Filtering the NSW BioNet Vegetation Classification Database by the relevant IBRA subregion and the presence of Yellow Box and Ringed Wallaby Grass returns perfect (3/3) matches to only three PCTs: 26, 74, and 80. Of these, only PCT 74 lists Yellow Box as a dominant species. This community also accounts for the occasional presence of River Red Gum, as was noted on site. Consequently, PCT 74 was preferred for these areas.	

4.3 Vegetation Zones, Patch Size and Vegetation Integrity

4.3.1 Vegetation Zones

In order to be assessed under the BAM (2020), all native vegetation on the subject land must be assigned to a zone, based on its condition state and the patch to which it belongs.

Three PCTs were recorded within the site, each in a single condition state. Consequently, three vegetation zones were mapped within the site. A description of each is provided below:

- **9_Remnant** – Woodland in which River Red Gum (*Eucalyptus camaldulensis*) is the sole canopy species. The understorey is grassy and is dominated by exotic species, with localised patches of native species of the genera *Rytidosperma*, *Austrostipa*, *Walwhalleya*, *Chloris*, and *Enteropogon*. Area of impact: 0.5 ha.
- **45_Moderate** – Presumed natural grassland variably dominated by Rigid Panic (*Walwhalleya proluta*) and Brown-backed Wallaby Grass (*Rytidosperma duttonianum*), along with Plains Grass (*Austrostipa aristiglumis*) and other native grass species. A chenopod shrub layer is present in places and native forbs – most commonly Old Man Weed (*Centipeda cunninghamii*) – occur at low densities throughout. Area of impact: 3.9 ha.
- **74_Remnant** – A woodland in which Yellow Box (*Eucalyptus melliodora*) is the dominant and sometimes sole canopy species, occasionally co-occurring with River Red Gum. No shrub layer is present and the understorey is dominated by introduced grass species of the genera *Lolium*, *Hordeum*, and *Avena*. Native grasses and forbs are present but in low densities, with the most common species being Ringed Wallaby Grass (*Rytidosperma caespitosum*), Rough Speargrass (*Austrostipa scabra*), and Rigid Panic (*Walwhalleya proluta*). Area of impact: 0.1 ha.
- **Non-native** – Designation of vegetation as non-native was reserved for wholly cleared asset protection zones, human-made infrastructure (e.g. roads and existing magazines), and degraded areas likely to constitute low conservation value grassland. Area of impact: 2.55 ha (includes infrastructure, bare ground, dam surfaces, and c. 0.6 ha non-native vegetation).

Vegetation zones within the assessed area are described in **Table 4-1** and mapped in **Figure 4-3**. Habitat features and the locations of supporting BAM plots are also shown in **Figure 5-1**.

4.3.2 Patch Size and Vegetation Integrity Score

A patch is defined in the BAM operational manual – Stage 1 (2020) as an area of native vegetation that occurs on the subject land and includes native vegetation that has a gap of less than 100 metres from the next area of native vegetation (or ≤30 m for non-woody ecosystems). The patch may extend onto land adjoining the subject land. The patch size

should include derived communities (i.e. where one or more of the structural components or strata layers is missing, modified or new) as these are likely to provide suitable habitat for at least some species. The extent of native vegetation was determined from a combination of satellite imagery, ground-truthing and the State Vegetation Type Map (**Figure 4-4**).

The use of a single patch was appropriate for the present assessment. It should be noted that the patch extends well beyond the limits of the study area, and it was not considered necessary to map its full extent. For this reason, references to patch size should be taken to refer to the size of the patch within the study area only. Patch size falls into the >100 ha size class for all vegetation zones. Patch size and vegetation integrity score (VIS) are displayed in **Table 4-2.** Patch size is depicted in **Figure 4-4**.

Table 4-2. Vegetation zones and patch sizes of native vegetation in the disturbance footprint.

BAM-C Zone No.	PCT ID	Condition State	VI Score	HBT[1]	Area Impacted (ha)	Patch Number	Patch Size (ha)	BAM Patch Size Class	Vegetation Zone	BAM Plots	Minimum No. Plots
1	9	Remnant	57.3	Y	0.5	1	843.47	>100 ha	9_Remnant	TO01 TO07	1
2	45	Moderate	67.9	N	3.9	1	843.47	>100 ha	45_Moderate	TO06 TOX01	2
3	74	Remnant	43.5	Y	0.1	1	843.47	>100 ha	74_Remnant	TO03	1

[1]Hollow-bearing trees.

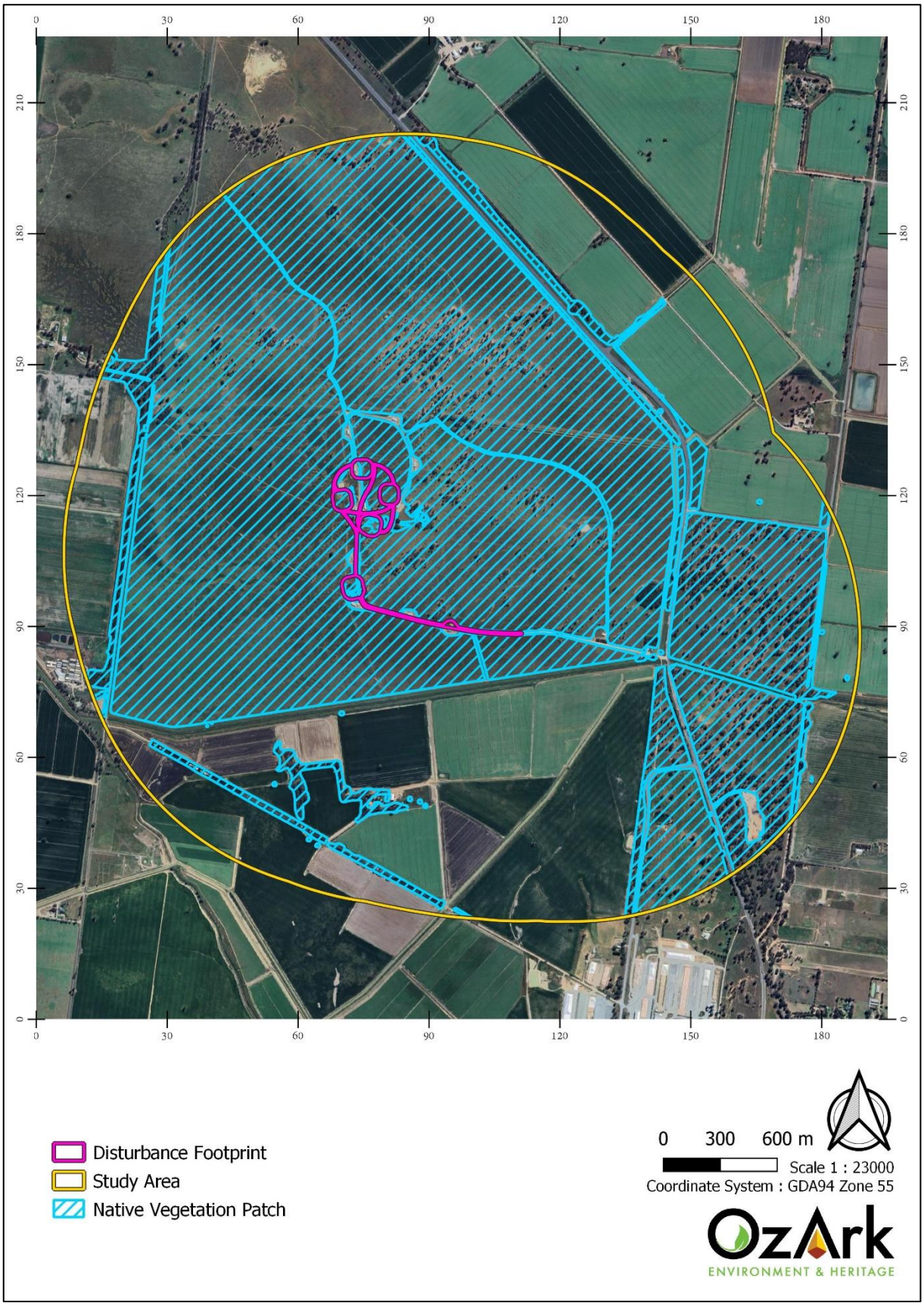


Figure 4-4. Native vegetation patch associated with the vegetation zones.

4.4 Flora Species Observed

In total, 62 plant species were detected during the initial July 2023 field survey and October 2023 targeted surveys. Of this number, 33 (53.23%) are native and 29 (46.77%) are introduced.

Three species are listed as High-threat Exotic species (HTE) under the BAM (**Table 4-3**). Of these, one species – Silver-Leaved Nightshade (*Solanum elaeagnifolium*) – is also listed as a Weed of National Significance (WoNS) and as a Priority Weed (PW) for the Murray LLS region.

No threatened flora species or populations were recorded during the surveys. Plot data, plot photographs and a list of all flora species observed during the field assessment are provided in **Appendices B** and **C**.

Table 4-3. Significant weeds recorded during the field assessment.

Scientific Name	Common Name	HTE	WoNS	PW
Eragrostis curvula	African Lovegrass	Yes	No	No
Solanum elaeagnifolium	Silver-Leaved Nightshade	Yes	Yes	Yes
Xanthium spinosum	Bathurst Burr	Yes	No	No

4.5 Fauna Species Observed

The field surveys identified 37 fauna species within, or adjacent to, the disturbance footprint, comprising 28 birds, one amphibian, and four mammals (**Appendix C**). Of these, 28 (82.35%) were native and six (17.65%) introduced. The introduced species comprised two birds and four mammals. No threatened or migratory fauna species or populations were detected.

4.6 Threatened Ecological Communities

PCT 9 is not associated with any Threatened Ecological Community (TEC).

PCT 74 is associated with the BC Act-listed Critically Endangered Ecological Community (CEEC) *White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions*. This listing applies to all grassy woodlands in which one or more of White Box (*Eucalyptus albens*), Yellow Box (*E. melliodora*), or Blakely's Red Gum (*E. blakelyi*) is dominant or co-dominant; consequently, the local occurrence of this PCT constitutes an example of this CEEC. Up to 0.10 ha of this CEEC would be impacted by the proposal.

PCT 74 is likewise associated with the EPBC Act-listed CEEC *White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland*; however, the local

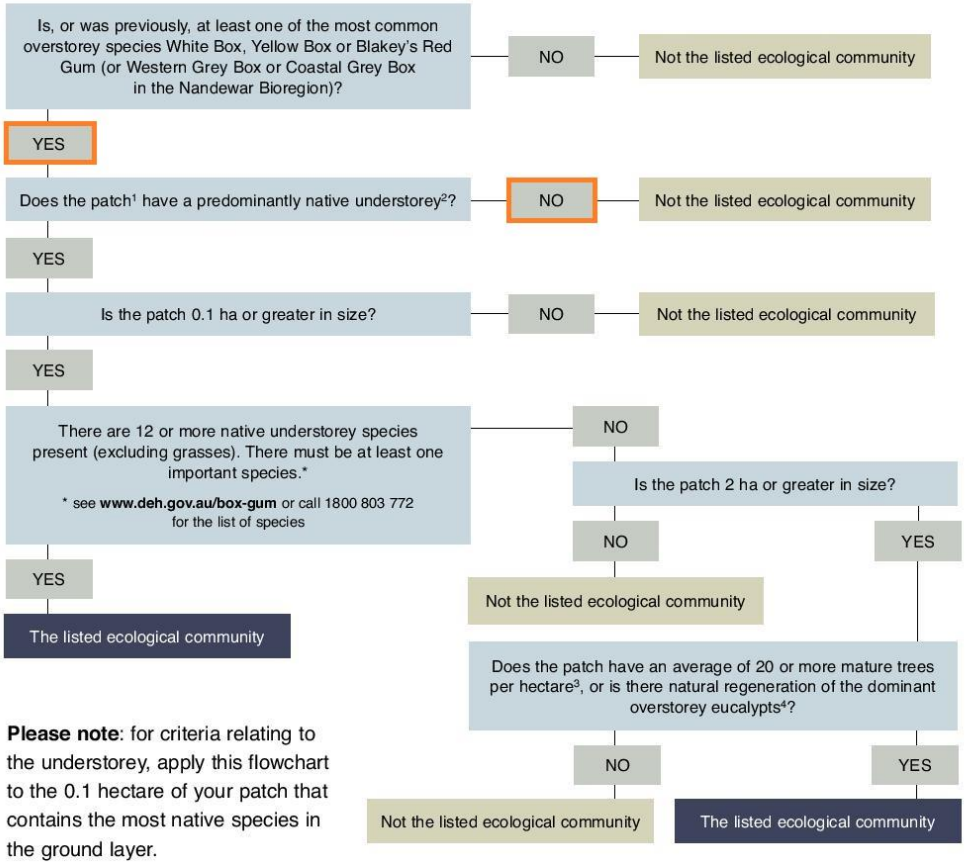
occurrence does not meet the condition threshold to be considered an example of this CEEC, owing largely to the poor condition of the understorey (**Figure 4-5**).

PCT 45 is associated with the EPBC Act-listed CEEC *Natural Grasslands of the Murray Valley Plains*. Seven indicator species for this community were detected within the grassland (*Rytidosperma duttonianum*, *Austrostipa aristiglumis*, *Austrostipa nodosa*, *Crassula decumbens*, *Leiocarpa panaetioides*, *Triptilodiscus pygmaeus*, and *Wahlenbergia gracilenta*), as were six contraindicative species (*Austrostipa scabra*, *Crassula sieberiana*, *Enchylaena tomentosa*, *Marsilea drummondii*, *Sclerolaena muricata*, and *Sporobolus caroli*). In addition, four species considered to be indicative of a high-quality remnant were noted: *Asperula conferta*, *L. panaetioides*, *T. pygmaeus*, and *W. gracilenta*. This suggests that the grassland, considered as a whole, qualifies for the CEEC listing. In total, 3.94 ha of this community would be impacted by the proposal. Considering that more than 30 ha of this community was recorded during the initial surveys, and the community extends beyond the margins of the directly assessed area, this impact is unlikely to be significant and hence unlikely to warrant EPBC referral. A test of significance is provided for this community in **Appendix D**.

PCT 45 is also associated with the BC Act-listed CEEC *Artesian Springs Ecological Community in the Great Artesian Basin*. This listing does not apply to the present occurrence of this PCT as the subject land falls outside the Great Artesian Basin and no evidence of artesian spring activity was noted.

The flowchart below represents the lowest condition at which patches are included in the listed ecological community. This is not the ideal state of the ecological community. Large patches, those that link remnants in the landscape, those that occur in highly cleared areas, those that contain rare, declining or threatened species, and those that represent the entire range of the ecological community, are important for the long-term future of the ecological community.

Determining if your land has an area of the listed ecological community



Please note: for criteria relating to the understorey, apply this flowchart to the 0.1 hectare of your patch that contains the most native species in the ground layer.

[1] Patch – a patch is a continuous area containing the ecological community (areas of other ecological communities such as woodlands dominated by other species are not included in a patch). In determining patch size it is important to know what is, and is not, included within any individual patch. The patch is the larger of:
- an area that contains five or more trees in which no tree is greater than 75 m from another tree, or
- the area over which the understorey is predominantly native.

Patches must be assessed at a scale of 0.1 ha (1000m^2) or greater.

[2] A predominantly native ground layer is one where at least 50 per cent of the perennial vegetation cover in the ground layer is made up of native species. The best time of the year to determine this is late autumn when the annual species have died back and have not yet started to regrow. (At other times of the year, you can determine whether something is perennial or not is if it is difficult to pull out of the soil. Annual species pull out very easily.)

[3] Mature trees are trees with a circumference of at least 125 cm at 130 cm above the ground.

[4] Natural regeneration of the dominant overstorey eucalypts when there are mature trees plus regenerating trees of at least 15 cm circumference at 130 cm above the ground.

5

Figure 4-5. Assessment of zone 74_Remnant against the condition criteria for the EPBC Act-listed CEEC *White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland*.

5 Threatened Species

For the purpose of credit calculations, threatened species are listed as either ecosystem credit species or species credit species:

- An ecosystem credit species is a species whose likelihood of occurrence can be predicted by vegetation surrogates and landscape features, or for which targeted survey has a low probability of detection. A targeted survey is not required for these species (DPIE, 2020b).
- A species credit species is a species whose likelihood of occurrence cannot be predicted by vegetation surrogates and/or landscape features and can be reliably detected by survey. A targeted survey or expert report is required to confirm presence/absence of these species (DPIE, 2020b).

5.1 Habitat Features Present

The subject land was assessed for its potential to provide habitat for threatened flora and fauna known or predicted to occur in the study area. Habitat features including but not limited to rock outcrops, caves, hollow-bearing trees, nests, wetlands (including dams), and watercourses were searched for and recorded, if present.

The subject land was found to be devoid of caves, outcropping rock and loose surface rock. Two hollow-bearing trees fall partly or wholly within the disturbance footprint and it is assumed that both trees would be removed by the proposal (**Figure 5-1**). One tree possessed large hollows (≥20 cm diameter) and the other only small (<20 cm diameter) hollows. Additional hollow-bearing trees were recorded outside the proposed disturbance footprint. Two of these trees were found also to support stick nests. One dam falls partly within the APZ of a proposed magazine and may be impacted. While this dam lacks any native wetland vegetation, it may still provide habitat for native fauna. All habitat features are mapped in **Figure 5-1**.



Figure 5-1. Habitat features recorded within the initial assessment area.

Hollow-bearing trees marked with 'L' contain large (≥20 cm diameter) hollows. Tree marked with 'S' contain small (<20 cm diameter) hollows. Mapping of habitat features outside of the disturbance footprint was not comprehensive owing to the limited duration of the survey.

5.2 Ecosystem Credit Species

In total, 34 ecosystem credit species were generated by the BAM-C (**Table 5-1**). The habitat suitability of the subject land for these species was assessed. Two species were removed from the list due to habitat constraints and one due to geographical constraints:

1. The Painted Honeyeater (*Grantiella picta*) requires mistletoe at a density of greater than five mistletoes per hectare; these plants were not present within the subject land.
2. The White-bellied Sea-eagle (*Haliaeetus leucogaster*) is confined to habitat within 1 km of "rivers, lakes, large dams or creeks, wetlands and coastlines." These habitat features do not occur within 1 km of the subject land.
3. The Regent Parrot (eastern subspecies; *Polytelis anthopeplus monarchoides*) is considered to be confined to the area along Wakool River west of Kyalite, which excludes the subject land.

After the exclusion of this species, 31 ecosystem credit species were assumed present (see **Table 5-1**).

Table 5-1. Ecosystem credit species predicted to occur and the nature of their presence within, or absence from, the subject land.

Scientific Name	Common Name	Presence
Anseranas semipalmata	Magpie Goose	Assumed present
Anthochaera phrygia	Regent Honeyeater	Assumed present
Artamus cyanopterus cyanopterus	Dusky Woodswallow	Assumed present
Chalinolobus picatus	Little Pied Bat	Assumed present
Chthonicola sagittata	Speckled Warbler	Assumed present
Circus assimilis	Spotted Harrier	Assumed present
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	Assumed present
Daphoenositta chrysoptera	Varied Sittella	Assumed present
Dasyurus maculatus	Spotted-tailed Quoll	Assumed present
Epthianura albifrons	White-fronted Chat	Assumed present
Falco hypoleucos	Grey Falcon	Assumed present
Falco subniger	Black Falcon	Assumed present
Glossopsitta porphyrocephala	Purple-crowned Lorikeet	Assumed present
Glossopsitta pusilla	Little Lorikeet	Assumed present
Grantiella picta	Painted Honeyeater	Absent (constraint)
Grus rubicunda	Brolga	Assumed present
Haliaeetus leucogaster	White-bellied Sea-Eagle	Absent (constraint)
Hieraaetus morphnoides	Little Eagle	Assumed present
Hirundapus caudacutus	White-throated Needletail	Assumed present
Lathamus discolor	Swift Parrot	Assumed present
Lophochroa leadbeateri	Pink Cockatoo	Assumed present
Lophoictinia isura	Square-tailed Kite	Assumed present
Melanodryas cucullata cucullata	South-eastern Hooded Robin	Assumed present

Scientific Name	Common Name	Presence
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)	Assumed present
Neophema pulchella	Turquoise Parrot	Assumed present
Nyctophilus corbeni	Corben's Long-eared Bat	Assumed present
Petroica boodang	Scarlet Robin	Assumed present
Petroica phoenicea	Flame Robin	Assumed present
Polytelis anthopeplus monarchoides	Regent Parrot (eastern subspecies)	Absent (constraint)
Polytelis swainsonii	Superb Parrot	Assumed present
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	Assumed present
Rostratula australis	Australian Painted Snipe	Assumed present
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	Assumed present
Stagonopleura guttata	Diamond Firetail	Assumed present

5.3 Species Credit Species

In total, 25 species credit species were generated by the BAM-C (**Table 5-2**). The habitat suitability of the subject land for these species was assessed. According to the BAM, if suitable habitat for these species occurs on the subject land, they must be the subject of targeted survey according to recommended guidelines, or else assumed present.

5.3.1 Species removed due to geographic or habitat constraints

After consideration of the geographical and habitat constraints identified in the TBDC and BAM-C, six species could be discounted due either to distribution or to the absence of features necessary for breeding:

1. **Regent Honeyeater (*Anthochaera phrygia*).** The subject land does not fall within areas included on the Important Habitat Map for this species.
2. **Swift Parrot (*Lathamus discolor*).** The subject land does not fall within areas included on the Important Habitat Map for this species.
3. **White-bellied Sea-eagle (*Haliaeetus leucogaster*).** This species requires living or dead mature trees within “suitable vegetation” and within 1 km of “rivers, lakes, large dams or creeks, wetlands and coastlines,” according to the TBDC. These habitat features do not occur within 1 km of the subject land.
4. **Regent Parrot (eastern subspecies) (*Polytelis anthopeplus monarchoides*).** This species is considered to be confined to the area along Wakool River west of Kyalite, which excludes the subject land.
5. **Slender Darling Pea (*Swainsona murrayana*)**. This species is considered to be confined to the Hay Plain, a region of inland NSW that is variably defined but which excludes the Tocumwal area – see, for example Porteners (1993), who defines the Hay Plain as excluding the region contained in the Berrigan 1:100,000 topographic map, which contains the subject land.

6. **Red Darling Pea (*Swainsona plagiotropis*).** This species is considered to be confined to the Hay Plain. It has been excluded for the reason given for *S. murrayana* above.

One species could also be removed owing to the absence of suitable habitat:

1. **Sloane's Froglet (*Crinia sloanei*).** The species polygon for this species includes all associated vegetation communities within 100 metres of the top of the bank of any suitable waterbody. While habitat for this species exists in the wider landscape, its polygon, if mapped, would not extend into the disturbance footprint.

5.3.2 Species eliminated via targeted survey

Targeted species surveys were conducted for the below species according to the methodologies outlined in **Section 2.3.3** and detailed further below. For reference, no threatened or migratory species or populations were detected during the targeted surveys. The BioNet species records from within 10 km of the subject land are also displayed in **Table 5-3** for site context.

1. **Australian Bustard (*Ardeotis australis*).** There are no records of this species within 10 km. There are no BAM-approved survey guidelines for this species. However, 10–20-minute area searches over 1-3 ha plots are generally considered effective survey methods for birds (DEWHA 2010). This species is associated with PCT 45, therefore, 3.9 ha of potentially suitable habitat occurs. Under the aforementioned guidance, this amounts to 39-78 minutes of area searches. As area searches were undertaken for 420 minutes over four days, and considering audio recording was also undertaken (**Figure 2-1**; **Table 2-3**), this species is considered absent surveyed. Additional diurnal bird surveys conducted in August-September 2024 (11 hours) likewise did not detect this species.
2. **A Speargrass (Austrostipa wakoolica).** There are four records of this species within 10 km. Parallel transects were conducted at 10 m spacings across all associated PCTs (**Figure 2-3**). Surveys were conducted at the appropriate time of year (October) as per the guidelines for surveying flora species under the BAM (DPIE, 2020a). Austrostipa aristiglumis and Austrostipa scabra were identified, but A. wakoolica was not.
3. **Claypan Daisy (*Brachyscome muelleroides*).** There are no records of this species within 10 km. Parallel transects were conducted at 10 m spacings across all associated PCTs (**Figure 2-3**) at the appropriate time of year (October) as per the guidelines for surveying flora species under the BAM (DPIE, 2020a). No species in the genus *Brachyscome* were encountered.
4. **Bush Stone-curlew (*Burhinus grallarius*).** There are seven records of this species within 10 km. There are no BAM-approved survey guidelines for this species. However, 10–20-minute area searches over 1-3 ha plots are generally considered

effective survey methods for birds (DEWHA 2010). This species is associated with PCT 9 and PCT 74, therefore, 0.6 ha of potentially suitable habitat occurs. Under the aforementioned guidance, this amounts to 6-12 minutes of area searches. As area searches were undertaken for 420 minutes over four days, and considering audio recording, spotlighting and call playback surveys were also undertaken (**Figure 2-1**; **Table 2-3**), this species is considered absent surveyed. Additional diurnal bird surveys conducted in August-September 2024 (11 hours) likewise did not detect this species.

5. **Small Scurf-pea (*Cullen parvum*).** There are no records of this species within 10 km. Parallel transects were conducted at 10 m spacings across all associated PCTs (**Figure 2-3**). Surveys were conducted at the appropriate time of year (January) as per the guidelines for surveying flora species under the BAM (DPIE, 2020a). No species in the genus *Cullen* were encountered.
6. **Little Eagle (*Hieraaetus morphonoides*).** There is one BioNET Atlas record of this species within 10 km. There are no BAM-approved survey guidelines for this species. However, 10–20-minute area searches over 1-3 ha plots are generally considered effective survey methods for birds (DEWHA 2010). This species is associated with all three PCTs, therefore, 4.5 ha of suitable habitat occurs. Under the aforementioned guidance, this amounts to 45-90 minutes of area searches. This species can be surveyed during the period August-October. Area searches were undertaken for 120 minutes in October, as this is towards the end of the breeding season, it is expected that a nest of this species would be visible – only two nests were observed, both were Corvid-type nests and would be too small for the Little Eagle. As no Little Eagles were observed and no suitable nests occur, this species is considered absent surveyed. Additional diurnal bird surveys conducted in August-September 2024 (11 hours) likewise did not detect this species.
7. **Winged Peppercress (*Lepidium monoplocoides*).** There are no records of this species within 10 km. Parallel transects were conducted at 10 m spacings across all associated PCTs (**Figure 2-3**) at the appropriate time of year (October) as per the guidelines for surveying flora species under the BAM (DPIE, 2020a). Only the non-native species *Lepidium africanum* was encountered.
8. **Pink Cockatoo (*Lophochroa leadbeateri*).** This species requires living or dead trees with hollows greater than 10 cm. There are no BAM-approved survey guidelines for this species. However, 10–20-minute area searches over 1-3 ha plots are generally considered effective survey methods for birds (DEWHA 2010). This species is associated with all three PCTs, therefore, 4.5 ha of suitable habitat occurs. Under the aforementioned guidance, this amounts to 45-90 minutes of area searches. As area searches were undertaken for 120 minutes in October, and considering this conspicuous species routinely nests in the same hollow year after year (Rowley and Chapman 1991), it is considered that the current survey is adequate to eliminate this

species. In addition, the subject land is outside of the core range of this species and is instead mapped as “species or species habitat *may* occur” as per the Conservation Advice for this species (DCCEEW Cth. 2023). Furthermore, there are no records of this species within 10 km of the subject land and only one record from the LGA (from 1999, at Berrigan, c. 25.8 km north of the subject land). Additional diurnal bird surveys conducted in August-September 2024 (11 hours) likewise did not detect this species.

9. **Square-tailed Kite (*Lophoictinia isura*).** There are no records of this species within 10 km. There are no BAM-approved survey guidelines for this species. However, 10–20-minute area searches over 1-3 ha plots are generally considered effective survey methods for birds (DEWHA 2010). This species is associated with PCT 9, PCT 45 and PCT 74, therefore, 4.5 ha of potentially suitable habitat occurs. Under the aforementioned guidance, this amounts to 45-90 minutes of area searches during the period September to January. As area searches were undertaken for 300 minutes over three days (**Table 2-3**), this species is considered absent surveyed. Additional diurnal bird surveys conducted in August-September 2024 (11 hours) likewise did not detect this species.
10. **Squirrel Glider (*Petaurus norfolcensis*).** There are two records of this species within 10 km, both within the township of Tocumwal. This species is associated with PCT 9 and PCT 74, therefore, 0.6 ha of potentially suitable habitat occurs. There are no BAM-approved survey guidelines for this species. This species requires tree hollows, Acacia spp. and other flowering shrubs (NSW Scientific Committee 2008). Although hollow-bearing trees occur, the only shrubs within the subject land are *Atriplex semibaccata, Enchylaena tomentosa* and *Sclerolaena muricata*, none of which would be considered flowering shrubs. All records of this species within the Berrigan LGA are exclusively within 600 m of the Murray River (**Figure 5-2**). Therefore, it is considered very unlikely that the species would occur at the site (which is c. 3.1 km from the Murray River). Nonetheless, this species was targeted using baited camera traps (8 camera trap nights), audio recording (7 nights), spotlighting (7 hours over 2 nights), and hollow watching (2 nights), therefore this species is considered absent surveyed.

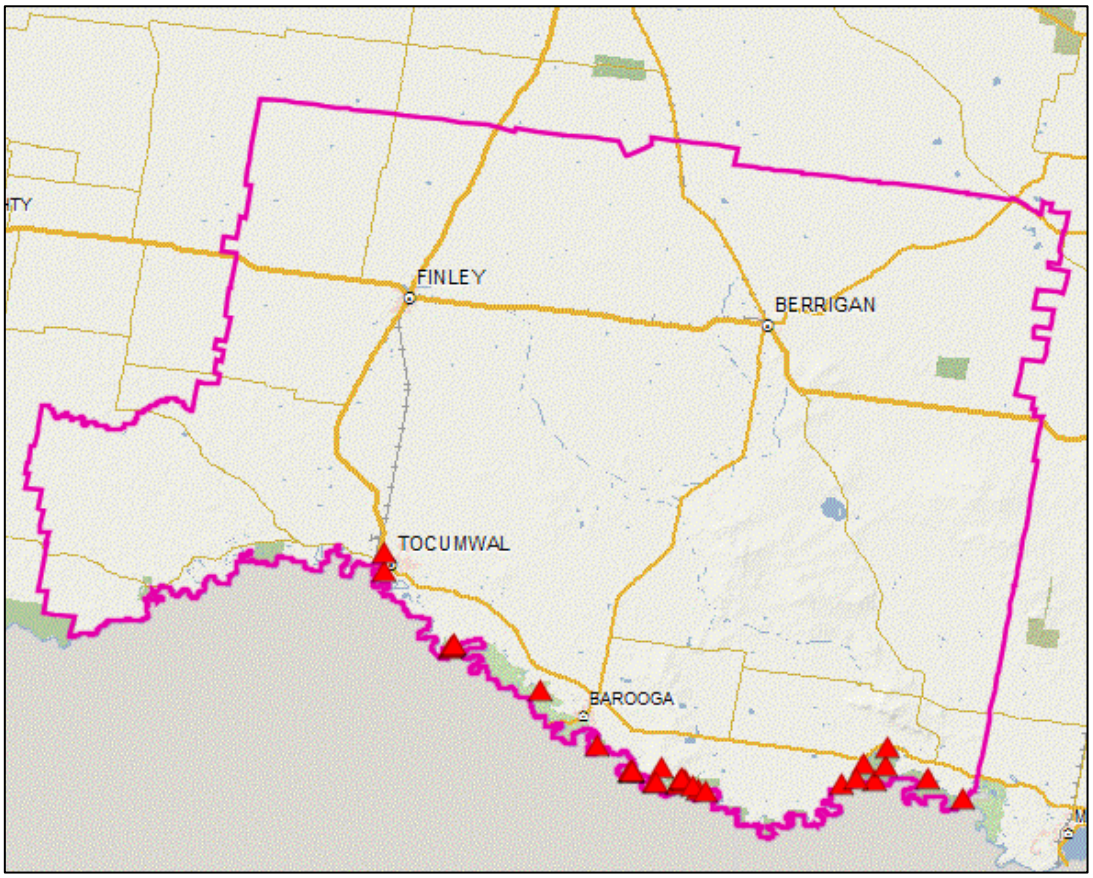


Figure 5-2. BioNET atlas records of the Squirrel Glider within the Berrigan LGA.

11. **Brush-tailed Phascogale (*Phascogale tapoatafa*).** This species can be surveyed December-June. Searches for deceased males after the male die-off period are also useful for detecting this species. The site was surveyed on 26 July and no remains of Phascogales were detected. As per the TBDC, this species can be surveyed using baited camera traps that should remain in place for a minimum of 4 weeks with cameras checked and baits replaced after 2 weeks. This species is associated with PCT 9 and PCT 74, therefore 0.6 ha of potentially suitable habitat occurs and four camera traps would be recommended; five were used in the current survey (see **Section 2.3.3**). There are no records of this species within 10 km; only three records of this species occur within the Murray LLS region, the nearest BioNET Atlas record of this species (in NSW) is in the northern extent of the Murray Valley National Park, approximately 52.2 km from the subject land. Atlas of Living Australia returns three additional records from the Murray Valley National Park in Victoria, all > 30 km from the subject land.
12. **Koala (*Phascolarctos cinereus*).** There are 58 records of this species within 10 km, the majority of which are along the Murray River. This species is associated with PCT 9 and PCT 74, therefore 0.6 ha of potentially suitable habitat occurs. According to the *Koala (Phascolarctos cinereus) Biodiversity Assessment Method Survey Guide* (DPE 2022a), 0.27 koala SAT sites are required; 4 koala SAT sites were completed (**Table 2-3**; **Figure 2-1**) and no signs of koalas were detected. In addition, two nights of spotlighting were undertaken, 8 days of audio recording, 7 nights of audio recording, and 5 hours of diurnal searches. No koalas or koala scats were detected, therefore this species is absent, surveyed.
13. **Austral Pillwort (*Pilularia novae-hollandiae*).** There are no records of this species within 10 km. Parallel transects were conducted at 10 m spacings across all associated PCTs (**Figure 2-3**) at the appropriate time of year (October) as per the guidelines for surveying flora species under the BAM (DPIE, 2020a). No species in the genus *Pilularia* were encountered.
14. **Silky Swainson-pea (*Swainsona sericea*).** There are no records of this species within 10 km. Parallel transects were conducted at 10 m spacings across all all associated PCTs (**Figure 2-3**) at the appropriate time of year (October) as per the guidelines for surveying flora species under the BAM (DPIE, 2020a). No species in the genus *Swainsona* were encountered.
15. **Barking Owl (*Ninox connivens*).** There are no records of this species within 10 km of the subject land. Six nights of hollow watches and call playback were conducted on the subject land in late August 2024. The species was not detected.
16. **Superb Parrot (*Polytelis swainsonii*).** There are four records of this species within 10 km of the subject land and suitable breeding habitat occurs on site. In total, 13 hours of

diurnal bird surveys and six nights of hollow watches were conducted during the targeted survey period. This species was not detected.

17. **Masked Owl (*Tyto novaehollandiae*).** There are no records of this species within 10 km of the subject land. Six nights of hollow watches and call playback were conducted on the subject land in late August 2024. The species was not detected.

5.3.3 Species assumed present

Due to time constraints, the targeted survey duration was considered insufficient to claim absence for one species credit species:

1. **Southern Myotis (*Myotis macropus*).** This species can be surveyed October-March using ultrasonic recorders. No ultrasonic recording devices have been placed on the site, therefore this species is assumed present and the species polygon has been drawn to incorporate all associated PCT (PCT 9 and PCT 74) within 200 m of the farm dam (**Figure 5-3**). There are no records of this species within 10 km of the subject land.

Table 5-2. Species credit species predicted to occur and the nature of their presence within or absence from the subject land.

Scientific Name	Common Name	Species presence
Anthochaera phrygia	Regent Honeyeater	Absent (habitat constraint)
Ardeotis australis	Australian Bustard	Absent surveyed
Austrostipa wakoolica	A Spear-grass	Absent surveyed
Brachyscome muelleroides	Claypan Daisy	Absent surveyed
Burhinus grallarius	Bush Stone-curlew	Absent surveyed
Crinia sloanei	Sloane's Froglet	Absent (habitat degraded)
Cullen parvum	Small Scurf-pea	Absent surveyed
Haliaeetus leucogaster	White-bellied Sea-Eagle	Absent (habitat constraint)
Hieraaetus morphnoides	Little Eagle	Absent surveyed
Lathamus discolor	Swift Parrot	Absent (habitat constraint)
Lepidium monoplocoides	Winged Peppercress	Absent surveyed
Lophochroa leadbeateri	Pink Cockatoo	Absent surveyed
Lophoictinia isura	Square-tailed Kite	Absent surveyed
Myotis macropus	Southern Myotis	Assumed present (no targeted survey conducted)
Ninox connivens	Barking Owl	Absent surveyed
Petaurus norfolcensis	Squirrel Glider	Absent surveyed
Phascogale tapoatafa	Brush-tailed Phascogale	Absent surveyed
Phascolarctos cinereus	Koala	Absent surveyed
Pilularia novae-hollandiae	Austral Pillwort	Absent surveyed
Polytelis anthopeplus monarchoides	Regent Parrot (eastern subspecies)	Absent (geographical constraint)
Polytelis swainsonii	Superb Parrot	Absent surveyed

Swainsona murrayana	Slender Darling Pea	Absent (geographical constraint)
Swainsona plagiotropis	Red Darling Pea	Absent (geographical constraint)
Swainsona sericea	Silky Swainson-pea	Absent surveyed
Tyto novaehollandiae	Masked Owl	Absent surveyed

Table 5-3. BioNet records of threatened species within 10 km of the subject land.

Scientific Name	Common Name	*NSW Status	+Comm. Status	No. records
Apus pacificus	Fork-tailed Swift	P	C,J,K	2
Artamus cyanopterus cyanopterus	Dusky Woodswallow	V,P		10
Austrostipa wakoolica	A spear-grass	E1	E	4
Burhinus grallarius	Bush Stone-curlew	E1,P		7
Calidris ferruginea	Curlew Sandpiper	E1,P	CE,C,J,K	1
Circus assimilis	Spotted Harrier	V,P		1
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	V,P	V	20
Daphoenositta chrysoptera	Varied Sittella	V,P		4
Grus rubicunda	Brolga	V,P		1
Haliaeetus leucogaster	White-bellied Sea-Eagle	V,P		6
Hieraaetus morphnoides	Little Eagle	V,P		1
Neophema chrysostoma	Blue-winged Parrot	V,P	V	2
Petaurus norfolcensis	Squirrel Glider	V,P		2
Petroica phoenicea	Flame Robin	V,P		3
Phascolarctos cinereus	Koala	E1,P	E	58
Polytelis swainsonii	Superb Parrot	V,P,3	V	4
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	V,P		13

*V=Vulnerable, E1=Endangered, P=Protected, 3=Category 3 sensitive species

+V=Vulnerable, E=Endangered, CE=Critically Endangered, C=CAMBA, J=JAMBA, K=ROKAMBA

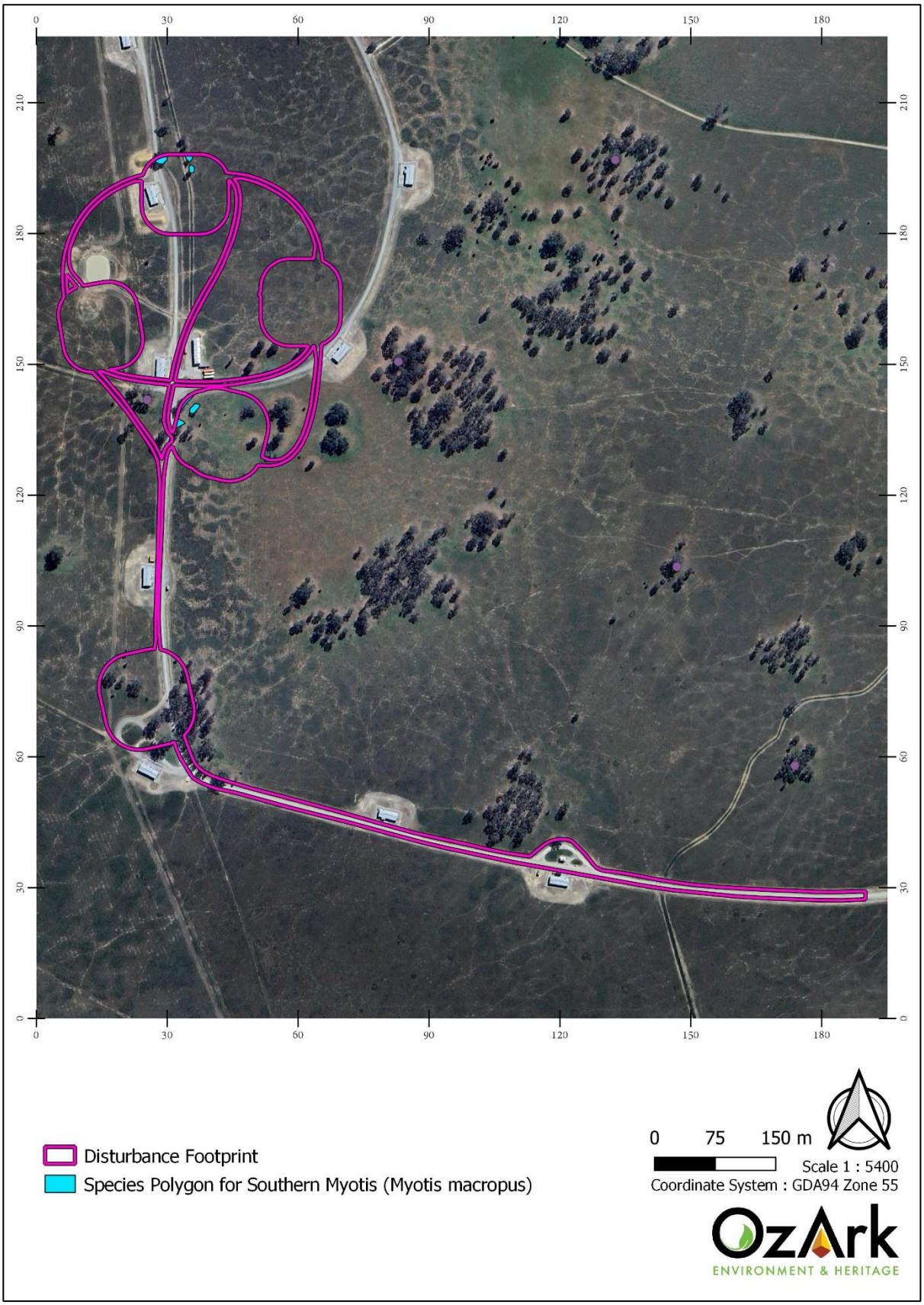


Figure 5-3. Species polygon for the Southern Myotis (*Myotis macropus*).

6 Impact Summary

6.1 Impacts to Native Vegetation

There are three PCTs (PCT 9, PCT 45, and PCT 74) within the disturbance footprint, with up to 4.54 ha of native vegetation to be removed, comprising a small number of mature trees, a small amount of woody regrowth, and an area of native grassland.

Up to 0.10 ha of the BC Act-listed CEEC *White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions* will be impacted by this proposal.

Up to 3.94 ha of the EPBC Act-listed CEEC *Natural Grasslands of the Murray Valley Plains* would be impacted by the proposal. A test of significance conducted under the EPBC Act concluded that this impact is unlikely to be significant or warrant referral (**Appendix D**).

6.2 Serious and Irreversible Impacts

The Guidance to assist a decision-maker to determine a serious and irreversible impact (DPIE 2019) and the NSW threatened species data collection have been used to determine which threatened entities require further assessment for Serious and Irreversible Impacts (SAII). An impact is to be regarded as serious and irreversible if it is likely to contribute significantly to the risk of a threatened species (including endangered populations) or ecological community becoming extinct based on following 4 principles (set out in clause 6.7 of BCR):

- **Principle 1:** The impact will cause a further decline of a species or ecological community that is currently observed, estimated, inferred or reasonably suspected to be in a rapid rate of decline
- **Principle 2:** The impact will further reduce the population size of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to have a very small population size
- **Principle 3:** The impact is made on the habitat of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to have a very limited geographic distribution
- **Principle 4:** The impacted species or ecological community is unlikely to respond to measures to improve its habitat and vegetation integrity, and therefore its members are not replaceable.

One such entity is relevant to the present proposal and is explored below:

6.2.1 White Box - Yellow Box - Blakely's Red Gum Grassy Woodland

For this CEEC, Principles 1 and 2 must be considered.

Principle 1. While estimates of the current and historical extent of White Box – Yellow Box – Blakely's Red Gum communities vary, most component communities are estimated to have declined to less than 10% of their former area of occupancy. Further, there is evidence to suggest that clearing of communities belonging to this CEEC has increased: annual clearing averaged 650 ha for the years 2009-2016, rising to 870 ha in 2016-2017 and to 1,933 ha in 2017-2018. This does not account for impacts associated with pasture improvement or clearing of regrowth. While figures for the extent of clearing after 2018 have not been published, the available evidence suggests that the CEEC is in rapid decline.

The proposal would result in a further reduction to the community of 0.1 ha. This would entail the removal of two mature trees and a number of saplings. These trees largely lack a native understorey: only three native grasses and one native forb were recorded in the BAM plot for this community, and the understorey in these areas is almost entirely composed of non-native pasture grasses. Some natural regeneration of the community is occurring and can be seen in the plot photograph for this community (**Appendix B**). The low VI score for the community suggests that the local occurrence of the CEEC may possess relatively low intrinsic biodiversity value; nevertheless, clearing would contribute to the ongoing decline of this community.

Principle 2. The CEEC does not have a limited geographical range: the current best estimate of the extent of occurrence (EOO) is 702,800 km^2. Similarly, while the community has been reduced to 10% or less of its original extent, its area of occupancy (AOO) remains relatively large at 151,100 km^2 when assessed using 10 km x 10 km grid cells. It is also unclear whether estimates of the extent of the community account for sites like the subject land. The predictive mapping contained in the State Vegetation Type Map misidentifies most local occurrences of PCTs 74 and 75, in which Yellow Box (*Eucalyptus melliodora*) is typically dominant or co-dominant, as PCT 76, a Grey Box (*E. microcarpa*) community. Similarly, many River Red Gum (*E. camaldulensis*) patches are also misidentified as PCT 76. Only small fragments of PCT 75 are included in the mapping for the surrounding landscape and the accuracy of this mapping is uncertain. Consequently, no clear estimate of the proportion of the local extent of the community that would be impacted by the proposal can be provided. For this reason, while it can be reasonably assumed that the community has undergone a marked reduction in extent and condition, it is difficult to determine an actual population size. The proposal would result in the loss of only 0.1 ha of this community and would not reduce the overall AOO, as similar patchs of the CEEC would remain in the surrounding landscape. The local 'population' would be reduced in extent but not removed entirely.

6.3 Prescribed Impacts

The BCR lists certain impacts as prescribed impacts that must be avoided, minimised and mitigated. These prescribed impacts and their relevance to the proposal are described in **Table 6-1.**

Table 6-1. Prescribed impacts of the proposal.

Prescribed Impact	Site Assessment	Mitigation Measure
Impacts on the habitat of threatened species or TECs associated with karst, caves, crevices, cliffs and other features of geological significance.	No karsts, caves, crevices, cliffs or other features of geological significance present on the subject land or within the study area.	None required.
Impacts of development on the habitat of threatened species or TECs associated with rocks.	No areas of loose surface rock or outcropping rock occur within the disturbance footprint.	None required.
Impacts of development on the habitat of threatened species or TECs associated with human made structures.	In the longer term, the proposal will entail the removal of the existing magazines. These may provide some limited habitat for fauna species, though the survey did not include these structures and their usefulness to fauna species is therefore unknown.	None required.
Impacts of development on the habitat of threatened species or TECs associated with non-native vegetation.	Of the c. 7.05 ha disturbance footprint, 4.50 ha support native vegetation. The balance largely consists of human-made infrastructure lacking all vegetation (existing magazines and sheds, tracks, wholly cleared APZs) but also contains small areas (c. 0.6 ha) of majority non-native vegetation. Non-native vegetation on the subject land may provide marginal habitat for species or ecosystem credit species, and mitigations associated with fauna interactions still apply. Considering the very small amount of non-native vegetation within the impact footprint, these impacts are considered negligible.	**Table 6-3.**
Impacts of development on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range.	Minor impacts to connectivity would result from the proposal (see **Section 3.11**).	**Table 6-3.**
Impacts of the development on movement of threatened species that maintains their life cycle.	Minor impacts to connectivity would result from the proposal (see **Section 3.11**).	**Table 6-3.**
Impacts of development on water quality, water bodies and hydrological processes that sustain threatened species and TECs.	No natural watercourses occur on the subject land. Consequently, negligible impacts to water quality, water bodies and hydrological processes are expected to result from this Project.	None required**.** **Table 6-3.**
Impacts of wind turbine strikes on	None associated with the proposal.	None required**.**

protected animals.		
Impact of vehicle strikes on threatened species of animals or on animals that are part of a TEC.	An increase in overall traffic movement is anticipated due to construction and maintenance works associated with the proposal. Maintaining suitably low speed limits (20km/hr) on site will help to mitigate resultant impacts.	**Table 6-3.**

6.4 Indirect Impacts

Potential indirect impacts associated with the proposal are explored further in **Table 6-2**. The main impacts of the proposal are expected to be contained within the disturbance footprint, provided there is adequate demarcation between operational and non-operational areas. Disturbance from machinery and operational activities will occur, such as noise and dust. However, these impacts will be minimised by following the environmental safeguards proposed in **Table 6-3**.

Table 6-2. Potential indirect impacts of the proposal

Nature of impact	Timing	Frequency	PCTs, threatened species and/or TECs impacted	Consequence of impact on biodiversity
Inadvertent impacts on adjacent habitat or vegetation	Construction phase	Possible	• Native vegetation surrounding the disturbance footprint • Threatened species assumed present	Increased edge effects, loss of foraging habitat, potential mortality to neighbouring fauna
Reduced viability of adjacent habitat due to edge effects	Construction phase	High	• Native vegetation surrounding the disturbance footprint • Threatened species assumed present	Degradation (possibly temporary) of a small area of native vegetation and habitat for threatened flora and fauna.
Reduce viability of adjacent habitat due to noise, dust or light spill	Construction phase	Medium	• Threatened species assumed present	Minor foraging and breeding habitat for fauna may be altered or removed.

Transport of weeds and pathogens from the site to adjacent vegetation	Construction phase	Possible	• Native vegetation surrounding the disturbance footprint	Degradation (possibly temporary) of native vegetation.
Increased risk of starvation or exposure, and loss of shade or shelter	Construction phase	Low	• Threatened species assumed present	Minor loss of foraging and refuging habitat
Loss of breeding habitat	Construction and Operation phase	Possible	• Threatened species assumed present	Minor potential loss of potential breeding habitat, chiefly for grassland species.
Trampling of threatened flora species	Construction and Operation phase	Low	• Threatened species assumed present	Possible minor loss of threatened flora
Inappropriate Waste Management	Construction and Operation phase	Possible	• Native vegetation surrounding the disturbance footprint • Threatened species assumed present	Degradation of native vegetation and habitat for threatened species.

6.5 Impacts to Wetlands, Watercourses, and Aquatic Habitat

No natural watercourses occur on the subject land. A farm dam occurs in close proximity to the subject land and provides some habitat for aquatic species such as freshwater turtles and ducks, but the dam lacks typical wetland vegetation. It is also unlikely that impacts to this dam would be required. Consequently, negligible impacts to wetland, watercourse or aquatic habitats are expected to result from this Project.

6.6 Cumulative Impacts

The potential impacts of this proposal must be regarded as a contribution to the wider loss of biodiversity in the local area and across NSW. The incremental effects of multiple impacts – past, present, and future – are referred to as cumulative impacts. This BDAR provides an opportunity to consider the impacts associated with this proposal within a wider context.

Other major projects in the Berrigan Shire LGA include the Finley Solar Farm (determined 29/01/2018), which resulted in the removal of 378 ha of PCT 76 in a derived condition, and the Replacement of the Murray River Bridge, which was determined in 2004 and for which no assessment documents are currently available.

The subject land is situated in a landscape which has undergone extensive historical clearing for the purposes of agriculture. The disturbance footprint is situated within one of relatively few paddocks in the local landscape which has not been used for intensive agriculture and therefore retains what is presumed to be a natural grassland. Similarly, wooded vegetation most often occurs locally as isolated paddock trees, giving the small fragments found within the disturbance footprint and study area disproportionate habitat value. The impacts of this proposal are, by themselves, very small; however, considering the scarcity of native cover within the wider landscape and the absence of large connected areas of woodland or natural grassland, these impacts are not inconsequential. Considered individually, this proposal is highly unlikely to result in significant adverse impacts to biodiversity at either local or state level. Taken cumulatively, however, the impacts of this and other local development activities contribute to the ongoing decline in biodiversity values across the state.

6.7 Avoidance, Minimisation and Mitigation

The following avoidance measures have been integrated into the design and/or are suggested for the implementation of the project:

- The locations of the magazines were altered to bring the magazines closer together and reduce the impacts to native vegetation (i.e. clearing and fragmentation) associated with the longer access tracks in the initial design. A comparison of the initial and final footprints is given in **Figure 6-1**.
- Magazines have been sited in areas close to existing infrastructure where vegetation condition is generally poorer.
- Targeted surveys have been carried out where possible to confirm that specific threatened species do not occur within the site.
- The proposed impact area has been reduced in the planning phase to minimise impacts to native vegetation on the subject land. Exclusion zones have been implemented to avoid impacts to most woodland vegetation and to some wetland areas.
- In addition, minimisation and mitigation methods will be implemented. **Table 6-3** outlines recommended environmental safeguards to reduce impacts on vegetation, soil and biodiversity.

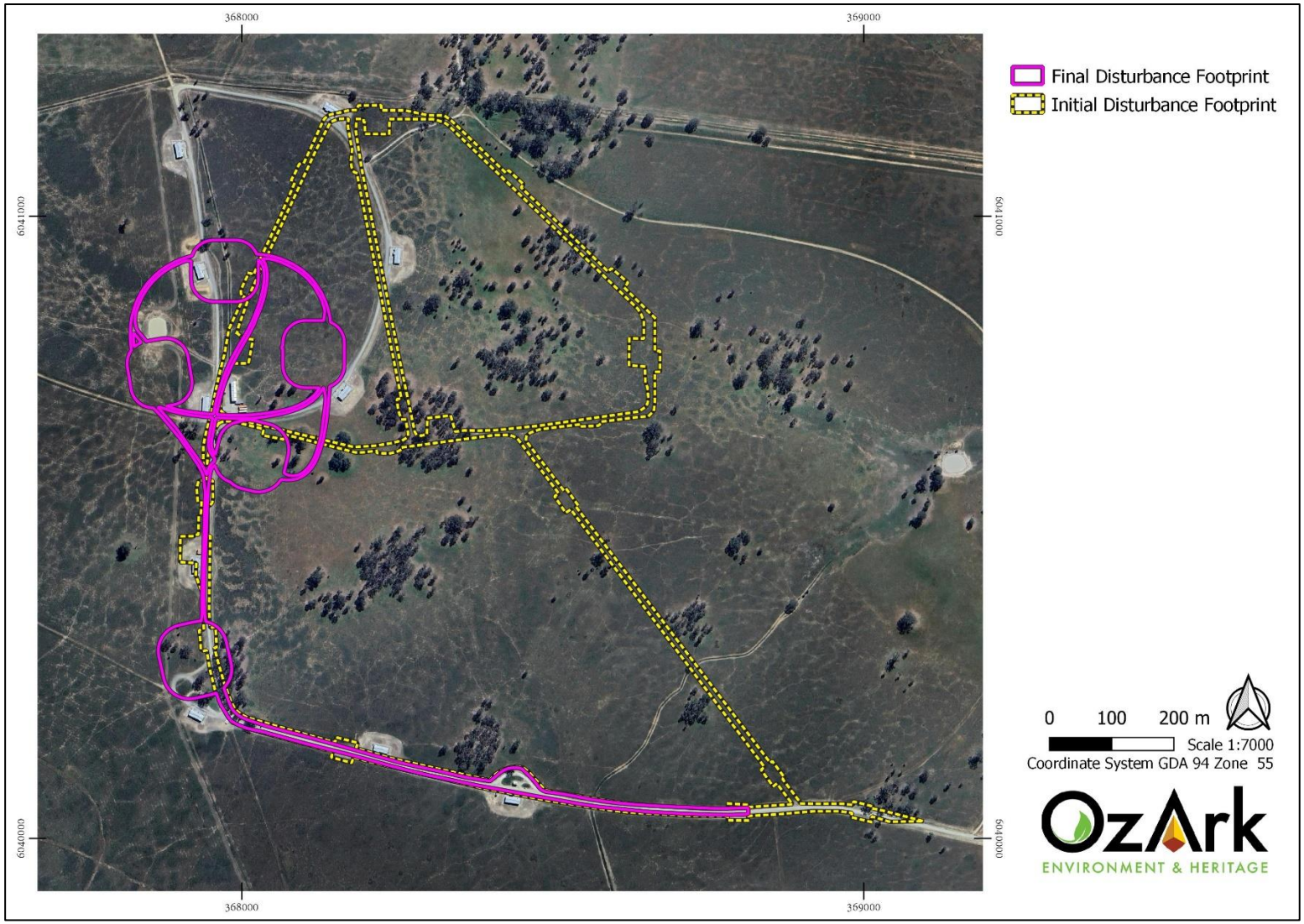


Figure 6-1. Comparison of initial and final proposal footprints, showing reduction in overall extent.

Note that the extent of clearing required by the initial footprint is underestimated in this figure as allowances had not been made for APZs.

Table 6-3. Mitigation measures for implementation.

Aspect	Environmental safeguards	Responsibility	Timing
General	1. Any change in design outside the assessed impact footprint (subject site) will require further ecological survey and assessment. 2. All personnel working on site will be made aware of the environmental sensitivities of the site and safeguards/mitigations to be implemented, e.g., site induction and 'toolbox' style briefings. This includes all native vegetation, threatened ecological communities and potential threatened flora and fauna. Evidence of all personnel receiving an induction will be kept on file (e.g., signed induction sheets).	Proponent	Pre-construction, construction, operation
Clearing of native vegetation	3. All construction personnel should be inducted to be aware that any deliberate or accidental damage of a stand of native vegetation outside the subject site has legislative consequences under Part 4 or 5 of the EP&A Act. Evidence of all personnel receiving this induction would be kept on file (signed induction sheets etc.). 4. Before starting work, a physical vegetation clearing boundary at the approved clearing limit is to be demarcated and implemented. The delineation of such a boundary may include the use of temporary fencing, parawebbing or similar. 5. Vegetation would be removed in such a way as to avoid damage to surrounding vegetation. 6. Groundcover disturbance would be kept to a minimum. 7. Any stockpile and compound sites should be located using the following criteria: • At least 40 m away from the nearest waterway • In areas of low ecological conservation significance (i.e. previously disturbed land) • On relatively level ground • Outside the one in 10-year Average Recurrence Interval (ARI) floodplain 8. Stockpiling materials and equipment and parking vehicles would be avoided within the dripline (extent of foliage cover) of any tree. 9. Where possible, vegetation to be removed would be mulched on-site and re-used to stabilise disturbed areas.	Proponent / contractor	Pre-construction, construction
Threatened Species	10. Provide identification resources for personnel to enable identification of threatened species that might occur on the work site, i.e. those species listed in **Table 5-1.** 11. Construction work to occur only during daylight hours to avoid indirect impacts on threatened fauna such as vehicle strikes. 12. On site speed limits should not exceed 20 km/hr to reduce the risk of vehicle strike 13. If unexpected threatened fauna or flora species	Contractor	Pre-construction and construction

	are discovered, stop works immediately and contact a suitably qualified ecologist for advice. 14. Keep records of any threatened species recorded on site during works.		
Light	15. Any artificial lighting to be used during construction or operation should follow the Best Practice Lighting Design within the National Light Pollution Guidelines (DoEE 2020). In particular, all lighting should be kept close to the ground, directed, and shielded to avoid light spill.		
Soil Management	16. A Construction Environmental Management Plan (CEMP) is required. 17. Install erosion and sediment controls in line with Landcom's Managing Urban Stormwater, Soils & Construction Guidelines (The Blue Book. Landcom 2004). 18. Where practicable, spread mulch made from vegetation cleared on site on areas of bare soil to stabilise, preventing dust and erosion. 19. Erosion and sedimentation controls are to be checked and maintained on a regular basis. This includes clearing of sediment from behind barriers and after heavy rainfall events. 20. Erosion and sediment control measures are not to be removed until the works are complete and areas are stabilised. 21. Stockpile topsoil removed to be redistributed across site at completion of construction. 22. Implement dust suppression activities.	Contractor	Pre-construction and construction
Introduction and spread of priority weeds and pathogens	23. Construction crew should be briefed on the identification of priority weeds that occur on site during inductions (see **Table 4-3)**. 24. If declared priority weeds are identified during construction they will be managed according to the requirements of the *Biosecurity Act 2015.* 25. Construction machinery (bulldozers, excavators, trucks, loaders and graders) will be cleaned using a high-pressure washer or other suitable device before entering and exiting work sites. 26. Machinery will be inspected by designated personnel following washdown to ensure no soil, mud, or vegetative material remains. Records of inspections to be maintained. 27. All pesticides will be used in accordance with the requirements on the label. Any person carrying out pesticide (including herbicide) application will be trained to do so and have the proper certificate of completion/competency or statement of attainment issued by a registered training organisation. 28. Keep records of any weed control activities that take place.	Contractor	Construction
Disturbance to fallen timber, dead wood, and bush rock	29. Any fallen timber, dead wood, and bush rock encountered on site would be left *in situ* (where possible) or relocated to a suitable place nearby.	Contractor	Construction

Rehabilitating cleared areas	30. Revegetation of any bare soil or cleared areas with locally occurring native flora species typical of the original habitat types is usually recommended. 31. Stockpiled topsoil to be re-spread over cleared areas.	Proponent, contractor	Construction and post-construction
Exacerbating invasive fauna	32. All food scraps and rubbish are to be appropriately disposed of in sealed receptacles to prevent providing forage habitats for foxes, rats, dogs, and cats.	Contractor	Construction
Increased risk of fire	33. If any "hot works" are to be undertaken, these activities will not take place on days of extreme fire danger (where possible).	Contractor	Construction

6.8 Matters of National Environmental Significance

Under the environmental assessment provisions of the EPBC Act, Matters of National Environmental Significance (MNES) and impacts on Commonwealth land are required to be considered to assist in determining whether the proposal should be referred to the Australian Government.

The EPBC Act protected matters search has identified seven wetlands of international importance, five TECs, 36 threatened species, nine migratory species and 16 marine species that could possibly occur in the 10 km search area (**Appendix A**). Of these, 15 threatened and/or migratory species were assessed as potentially occurring on the subject land, based on habitat available and nearby records (**Table 6-4; Appendix D**). An assessment of impact significance has been undertaken for each of these threatened and migratory species following EPBC guidelines, as detailed in **Appendix D**. It is concluded that no MNES will be significantly impacted by the proposal. A summary of these matters and whether the proposal is likely to impact them is provided in **Table 6-5**.

Table 6-4. EPBC Act-listed threatened and/or migratory species potentially impacted by the proposal.

Scientific Name	Common Name	+Comm. Status	BioNet Records < 10 km?
Anthochaera phrygia	Regent Honeyeater	CE	0
Apus pacificus	Fork-tailed Swift	C,J,K	2
Climacteris picumnus victoriae	Brown Treecreeper (south-eastern)	V	20
Crinia sloanei	Sloane's Froglet	E	0
Falco hypoleucos	Grey Falcon	V	0
Grantiella picta	Painted Honeyeater	V	0
Hirundapus caudacutus	White-throated Needletail	V,C,J,K	0
Lathamus discolor	Swift Parrot	CE	0
Lophochroa leadbeateri leadbeateri	Pink Cockatoo	E	0
Melanodryas cucullata cucullata	Hooded Robin (south-eastern form)	E	0
Neophema chrysostoma	Blue-winged Parrot	V	2
Polytelis swainsonii	Superb Parrot	V	4

Stagonopleura guttata	Diamond Firetail	V	0
Swainsona murrayana	Slender Darling Pea	V	0
Swainsona plagiotropis	Red Darling Pea	V	0

+V=Vulnerable, E=Endangered, CE=Critically Endangered, C=CAMBA, J=JAMBA, K= ROKAMBA

Table 6-5. Impacts to Matters of National Environmental Significance and Commonwealth land.

Consideration	Potential impact?
Any impact on a listed threatened species or communities?	Yes (non-significant, **Appendix D**)
Any impacts on listed migratory species?	Yes (non-significant, **Appendix D**)
Any impacts on a Ramsar wetland of international importance?	No
Any impacts on a Commonwealth marine environment?	No
Any impacts on a World Heritage property?	No
Any impacts on a National Heritage place?	No
Any impacts on the Great Barrier Reef Marine Park?	No
Does the proposal involve a nuclear action (including uranium mining)?	No
Any impact on a water resource, in relation to coal seam gas development and large coal mining development?	No
Additionally, any impact (direct or indirect) on Commonwealth land?	No

7 Biodiversity Credit and Offset Report

7.1 Management Zones

The BAM considers future vegetation condition of different areas of the disturbance footprint when calculating biodiversity credits and offsets. It has been assumed that all vegetation within the disturbance footprint will be cleared (i.e., its future Vegetation Integrity [VI] Score will be 0). Therefore, offset requirements have been assessed assuming only one management zone.

7.2 Vegetation Integrity Assessment

VI Scores have been calculated for each vegetation zone based on patch size, area to be impacted, vegetation composition, structure and function, as defined below.

Patch size – Area in hectares of total vegetation zone patch (i.e. the connected woody and non-woody vegetation). See **Section 4.3.2**.

Area – Area within the property that will be subject to clearing, modification or other treatment by the Proposal. There is only one management zone as described above.

Composition (Comp.) – Score calculated based on species richness, i.e. the number of native species present.

Structure (Struct.) – Score calculated based on the cover (%) of each native species growth form.

Function (Funct.) – Score calculated based on habitat features, i.e. presence of tree sizes, hollow trees, coarse woody debris, litter cover (%) and high threat weed cover (%). The function score does not apply to grassland PCTs.

Benchmark data for the PCTs is also used in this calculation.

Data required for the calculation was collected in the field using the methodology specified in the BAM, as described above. The VI assessment for each vegetation zone, including the loss of VI due to the proposal, is shown in **Table 7-1**.

Table 7-1. Vegetation Integrity (VI) assessment.

Vegetation Zone	PCT	Area	Comp.	Struct.	Funct.	Current VIS	Management Zone	Future VIS	Change in VIS
9_Remnant	9	0.5	34.7	82	66.2	57.3	Disturbance footprint	0	-57.3
45_Moderate	45	3.94	56.7	81.2	-	67.9	Disturbance footprint	0	-67.9
74_Remnant	74	0.1	26	40.4	78.1	43.5	Disturbance footprint	0	-43.5

7.3 Ecosystem Credit Summary

Based on the VI score and area of PCT impacted, 183 Ecosystem Credits are required to be offset for the proposal. The ecosystem credits required for the proposal are summarised in **Table 7-2**. The full biodiversity credit summary report is provided in **Appendix E**.

Table 7-2. Ecosystem credits requiring offsetting (copied from BAM-C).

Vegetation zone name	BAM-C Zone	Current VIS	Change in VIS	Area (ha)	BC Act listing status	EPBC Act listing status	TEC name	Species sensitivity to gain class	Biodiversity risk weighting	Potential SAII	Ecosystem credits
9_Remnant	1	57.3	-57.3	0.5	Not a TEC	Not a TEC	No associated TEC	High Sensitivity to Gain	1.75	False	13
45_Moderate	2	67.9	-67.9	3.94	Not a TEC	CEEC	Natural Grasslands of the Murray Valley Plains	High Sensitivity to Gain	2.50	False	167
74_Remnant	3	43.5	-43.5	0.1	CEEC	Does not fit listing	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland	High Sensitivity to Gain	2.50	True	3
TOTAL											**183**

7.4 Species Credit Summary

In total, three species credit species were assumed to be present for part or all of the disturbance footprint, generating an obligation to retire two (2) species credits. The species credits required for the proposal are summarised in **Table 7-3**. The full biodiversity credit summary report is provided in **Appendix E.**

Table 7-3. Species credit summary.

Scientific Name	Common Name	Species presence	Impacted area	Biodiversity risk weighting	Potential SAII	Species credits generated
Myotis macropus	Southern Myotis	Assumed present	0.07 ha	2.00	False	2
TOTAL						**2**

7.5 Offset Requirement

Offsetting is required for the 183 Ecosystem Credits and two (2) Species Credits listed above.

The proponent intends to purchase and retire the necessary number of credits on the open market or, if not available, offset credits through a direct payment into the Biodiversity Conservation Fund.

8 Summary and Conclusions

OzArk Environment & Heritage (OzArk) has been engaged by GHD on behalf of Orica Australia Pty Ltd (the proponent) to prepare a BDAR for the proposed upgrade of the existing Explosives Reserve Magazine Compound at 431 Newell Highway (Lot 2 DP225459), near Tocumwal, NSW (the Project). The Project is to be known as the Tocumwal Explosive Magazine Storage Upgrade and is located in the Berrigan Shire LGA. The Project will be assessed as a State Significant Development (SSD-64923965) and enters the BOS by virtue of its status as an SSD.

The proposal would occupy up to 7.05 ha, of which 4.50 ha possesses remnant native vegetation. The native vegetation present in the disturbance footprint consists of three Plant Community Types (PCTs):

- PCT 9 – River Red Gum - wallaby grass tall woodland wetland on the outer River Red Gum zone mainly in the Riverina Bioregion.
- PCT 45 – Plains Grass grassland on alluvial mainly clay soils in the Riverina Bioregion and NSW South Western Slopes Bioregion.
- PCT 74 – Yellow Box - River Red Gum tall grassy riverine woodland of NSW South Western Slopes Bioregion and Riverina Bioregion.

Each PCT was recorded in a single condition state and assigned to a single vegetation zone: 9_Remnant, 45_Moderate, and 74_Remnant.

PCT 74 was found to belong to the BC Act-listed CEEC *White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions*. Up to 0.10 ha of this community would be impacted by the proposal. PCT 45 was found to belong to the EPBC Act-listed CEEC *Natural Grasslands of the Murray Valley Plains*. Up to 3.9 ha of this community would be impacted by the proposal.

In total, 34 ecosystem credit species were generated by the BAM-C. The habitat suitability of the subject land for these species was assessed. Three species were removed from the list due to habitat constraints; consequently, 31 species were assumed present as ecosystem credit species, generating a total of 183 Ecosystem Credits.

In total, 25 species credit species were generated by the BAM-C. After consideration of geographical and habitat constraints, six species could be discounted due either to distribution or to the absence of features necessary for breeding and one (Sloane's Froglet, *Crinia sloanei*) due to the lack of suitable plant communities within the specified buffer distance of a waterbody. A further 17 species were eliminated by targeted surveys. One species – the

Southern Myotis (*Myotis macropus*) – could not be ruled out by constraints or surveys and have been assumed present, generating an obligation to retire a total of two (2) species credits.

The proponent intends to satisfy their offset obligations by buying and retiring the necessary credits from the open market or, if appropriate credits are not available, by paying directly into the Biodiversity Conservation Fund.

The significance of the proposed impact to EPBC Act-listed threatened, migratory, wetland and marine species, populations and communities predicted to occur within a 10 km search area was assessed. No significant impact to any threatened entity likely to result in the extinction of a local population was identified. The residual ecological impacts of the proposal would be adequately mitigated and offset using the management actions recommended and the offset requirements detailed within this BDAR. Therefore, a referral of the proposal to DCCEEW for these matters is not required.

This assessment covers the current form of the proposal. Any change to the scope of work may require re-assessment.

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Appendix A: Database Search Results

NSW Biodiversity Values Map and Threshold Report

NSW GOVERNMENT Department of Planning and Environment

Biodiversity Values Map and Threshold Report

This report is generated using the Biodiversity Values Map and Threshold (BMAT) tool. The BMAT tool is used by proponents to supply evidence to your local council to determine whether or not a Biodiversity Development Assessment Report (BDAR) is required under the Biodiversity Conservation Regulation 2017 (Cl. 7.2 & 7.3).

The report provides results for the proposed development footprint area identified by the user and displayed within the blue boundary on the map.

There are two pathways for determining whether a BDAR is required for the proposed development:

1. Is there Biodiversity Values Mapping?
2. Is the 'clearing of native vegetation area threshold' exceeded?

Biodiversity Values Map and Threshold Report

Date of Report Generation		20/03/2024 10:52 AM
1. Biodiversity Values (BV) Map - Results Summary (Biodiversity Conservation Regulation Section 7.3)		
1.1	**Does the development Footprint intersect with BV mapping?**	no
1.2	**Was ALL BV Mapping within the development footprinted added in the last 90 days?** (dark purple mapping only, no light purple mapping present)	no
1.3	**Date of expiry of dark purple 90 day mapping**	N/A
1.4	**Is the Biodiversity Values Map threshold exceeded?**	no
2. Area Clearing Threshold - Results Summary (Biodiversity Conservation Regulation Section 7.2)		
2.1	**Size of the development or clearing footprint**	211,316.1 sqm
2.2	**Native Vegetation Area Clearing Estimate (NVACE)** (within development/clearing footprint)	7,534.0 sqm
2.3	**Method for determining Minimum Lot Size**	LEP
2.4	**Minimum Lot Size** (10,000sqm = 1ha)	1,200,000 sqm
2.5	**Area Clearing Threshold** (10,000sqm = 1ha)	10,000 sqm
2.6	**Does the estimate exceed the Area Clearing Threshold?** (NVACE results are an estimate and can be reviewed using the Guidance)	no
REPORT RESULT: Is the Biodiversity Offset Scheme (BOS) Threshold exceeded for the proposed development footprint area? (Your local council will determine if a BDAR is required)		**no**

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NSW GOVERNMENT Department of Planning and Environment

What do I do with this report?

• If the result above indicates the BOS Threshold has been exceeded, your local council **may require** a Biodiversity Development Assessment Report with your development application. Seek further advice from Council. An accredited assessor can apply the Biodiversity Assessment Method and prepare a BDAR for you. For a list of accredited assessors go to: https://customer.lmbc.nsw.gov.au/assessment/AccreditedAssessor.

• If the result above indicates the BOS Threshold has not been exceeded, you may not require a Biodiversity Development Assessment Report. This BMAT report can be provided to Council to support your development application. Council can advise how the area clearing threshold results should be considered. Council will review these results and make a determination if a BDAR is required. Council may ask you to review the area clearing threshold results. You may also be required to assess whether the development is "likely to significantly affect threatened species" as determined under the test in Section 7.3 of the *Biodiversity Conservation Act 2016*.

• If a BDAR is not required by Council, you may still require a permit to clear vegetation from your local council.

• If **all** Biodiversity Values mapping within your development footprint was less than 90 days old, i.e. areas are displayed as dark purple on the BV map, a BDAR may not be required if your Development Application is submitted within that 90 day period. Any BV mapping less than 90 days old on this report will expire on the date provided in Line item 1.3 above.

For more detailed advice about actions required, refer to the **Interpreting the evaluation report** section of the Biodiversity Values Map Threshold Tool User Guide .

Review Options:

• If you believe the Biodiversity Values mapping is incorrect please refer to our BV Map Review webpage for further information.

• If you or Council disagree with the area clearing threshold estimate results from the NVACE in Line Item 2.6 above (i.e. area of Native Vegetation within the Development footprint proposed to be cleared), review the results using the Guide for reviewing area clearing threshold results from the BMAT Tool.

Acknowledgement

I, as the applicant for this development, submit that I have correctly depicted the area that will be impacted or likely to be impacted as a result of the proposed development.

Signature: _____ Date: _____

(Typing your name in the signature field will be considered as your signature for the purposes of this form)

20/03/2024 10:52 AM

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Department of Planning and Environment

Biodiversity Values Map and Threshold Tool

The Biodiversity Values (BV) Map and Threshold Tool identifies land with high biodiversity value, particularly sensitive to impacts from development and clearing.

The BV map forms part of the Biodiversity Offsets Scheme threshold, which is one of the factors for determining whether the Scheme applies to a clearing or development proposal. You have used the Threshold Tool in the map viewer to generate this BV Threshold Report for your nominated area. This report calculates results for your proposed development footprint and indicates whether Council may require you to engage an accredited assessor to prepare a Biodiversity Development Assessment Report (BDAR) for your development.

This report may be used as evidence for development applications submitted to councils. You may also use this report when considering native vegetation clearing under the State Environmental Planning Policy (Biodiversity and Conservation) 2021 - Chapter 2 vegetation in non-rural areas.

What's new? For more information about the latest updates to the Biodiversity Values Map and Threshold Tool go to the updates section on the Biodiversity Values Map webpage.

Map Review: Landholders can request a review of the BV Map where they consider there is an error in the mapping on their property. For more information about the map review process and an application form for a review go to the Biodiversity Values Map Review webpage.

If you need help using this map tool see our Biodiversity Values Map and Threshold Tool User Guide or contact the Map Review Team at map.review@environment.nsw.gov.au or on 1800 001 490.

Biodiversity Values Map



346.5 0 173.24 346.5 Metres

WGS_1984_Web_Mercator_Auxiliary_Sphere

This map is a user generated static output from an Internet mapping site and is for reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable.

Legend

- Biodiversity Values that have been mapped for more than 90 days
- Biodiversity Values added within last 90 days
- Native Vegetation Area Clearing Estimate (NVACE)
- Development area selected by proponent

20/03/2024 10:52 AM

Imagery © Airbus DS/Spot Image 2016

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The results provided in this tool are generated using the best available mapping and knowledge of species habitat requirements.

This map is valid as at the date the report was generated. Checking the Biodiversity Values Map viewer for mapping updates is recommended.

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Berrigan Local Environmental Plan 2013 – Terrestrial Biodiversity Values Mapping.

The red polygon shows the approximate location of the subject land.



EPBC Act Protected Matters Report

Australian Government
Department of Climate Change, Energy, the Environment and Water

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 20-Mar-2024

Summary
Details
- Matters of NES
- Other Matters Protected by the EPBC Act
- Extra Information

Caveat
Acknowledgements

Summary

Matters of National Environment Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance (Ramsar	7
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	5
Listed Threatened Species:	36
Listed Migratory Species:	9

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at https://www.dcceew.gov.au/parks-heritage/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Lands:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	16
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have

State and Territory Reserves:	None
Regional Forest Agreements:	None
Nationally Important Wetlands:	None
EPBC Act Referrals:	3
Key Ecological Features (Marine):	None
Biologically Important Areas:	None
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar Wetlands) [Resource Information]

Ramsar Site Name	Proximity
Banrock station wetland complex	500 - 600km upstream from Ramsar site
Barmah forest	10 - 20km upstream from Ramsar site
Gunbower forest	50 - 100km upstream from Ramsar site
Hattah-kulkyne lakes	200 - 300km upstream from Ramsar site
Nsw central murray state forests	10 - 20km upstream from Ramsar site
Riverland	400 - 500km upstream from Ramsar site
The coorong, and lakes alexandrina and albert wetland	500 - 600km upstream from Ramsar site

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.
Status of Vulnerable, Disallowed and Ineligible are not MNES under the EPBC Act.

Community Name	Threatened Category	Presence Text
Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions	Endangered	Community may occur within area
Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	Endangered	Community likely to occur within area
Natural Grasslands of the Murray Valley Plains	Critically Endangered	Community may occur within area

Community Name	Threatened Category	Presence Text
Weeping Myall Woodlands	Endangered	Community may occur within area
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Community likely to occur within area

Listed Threatened Species [Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

Scientific Name	Threatened Category	Presence Text
BIRD		
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Species or species habitat may occur within area
Aphelocephala leucopsis Southern Whiteface [529]	Vulnerable	Species or species habitat likely to occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat likely to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Climacteris picumnus victoriae Brown Treecreeper (south-eastern) [67062]	Vulnerable	Species or species habitat likely to occur within area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat likely to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]	Vulnerable	Species or species habitat likely to occur within area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat likely to occur within area

Scientific Name	Threatened Category	Presence Text
Hirundapus caudacutus		
White-throated Needletail [682]	Vulnerable	Species or species habitat may occur within area
Lathamus discolor		
Swift Parrot [744]	Critically Endangered	Species or species habitat may occur within area
Lophochroa leadbeateri leadbeateri		
Major Mitchell's Cockatoo (eastern), Eastern Major Mitchell's Cockatoo, Pink Cockatoo (eastern) [82926]	Endangered	Species or species habitat may occur within area
Melanodryas cucullata cucullata		
South-eastern Hooded Robin, Hooded Robin (south-eastern) [67093]	Endangered	Species or species habitat likely to occur within area
Neophema chrysostoma		
Blue-winged Parrot [726]	Vulnerable	Species or species habitat likely to occur within area
Pedionomus torquatus		
Plains-wanderer [906]	Critically Endangered	Species or species habitat likely to occur within area
Polytelis swainsonii		
Superb Parrot [738]	Vulnerable	Species or species habitat likely to occur within area
Rostratula australis		
Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Stagonopleura guttata		
Diamond Firetail [59398]	Vulnerable	Species or species habitat likely to occur within area
FISH		
Galaxias rostratus		
Flathead Galaxias, Beaked Minnow, Flat-headed Galaxias, Flat-headed Jollytail, Flat-headed Minnow [84745]	Critically Endangered	Species or species habitat may occur within area
Macquaria australasica		
Macquarie Perch [66632]	Endangered	Species or species habitat may occur within area
FROG		

Scientific Name	Threatened Category	Presence Text
Crinia sloanei		
Sloane's Froglet [59151]	Endangered	Species or species habitat may occur within area
Litoria raniformis		
Southern Bell Frog,, Growling Grass Frog, Green and Golden Frog, Warty Swamp Frog, Golden Bell Frog [1828]	Vulnerable	Species or species habitat may occur within area
INSECT		
Synemon plana		
Golden Sun Moth [25234]	Vulnerable	Species or species habitat may occur within area
MAMMAL		
Nyctophilus corbeni		
Corben's Long-eared Bat, South-eastern Long-eared Bat [83395]	Vulnerable	Species or species habitat may occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)		
Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Endangered	Species or species habitat known to occur within area
Pteropus poliocephalus		
Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
PLANT		
Amphibromus fluitans		
River Swamp Wallaby-grass, Floating Swamp Wallaby-grass [19215]	Vulnerable	Species or species habitat likely to occur within area
Austrostipa wakoolica		
[66623]	Endangered	Species or species habitat likely to occur within area
Brachyscome muelleroides		
Mueller Daisy [15572]	Vulnerable	Species or species habitat may occur within area
Lepidium aschersonii		
Spiny Peppercress [10976]	Vulnerable	Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Lepidium monoplocoides		
Winged Pepper-cress [9190]	Endangered	Species or species habitat likely to occur within area
Sclerolaena napiformis		
Turnip Copperburr [11742]	Endangered	Species or species habitat likely to occur within area
Senecio macrocarpus		
Large-fruit Fireweed, Large-fruit Groundsel [16333]	Vulnerable	Species or species habitat may occur within area
Swainsona murrayana		
Slender Darling-pea, Slender Swainson, Murray Swainson-pea [6765]	Vulnerable	Species or species habitat likely to occur within area
Swainsona plagiotropis		
Red Darling-pea, Red Swainson-pea [10804]	Vulnerable	Species or species habitat may occur within area
REPTILE		
Aprasia parapulchella		
Pink-tailed Worm-lizard, Pink-tailed Legless Lizard [1665]	Vulnerable	Species or species habitat likely to occur within area

Listed Migratory Species [Resource Information]

Scientific Name	Threatened Category	Presence Text
Migratory Marine Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Hirundapus caudacutus		
White-throated Needletail [682]	Vulnerable	Species or species habitat may occur within area
Motacilla flava		
Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca		
Satin Flycatcher [612]		Species or species habitat may occur within area
Migratory Wetlands Species		

Scientific Name	Threatened Category	Presence Text
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]	Vulnerable	Species or species habitat likely to occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species		[Resource Information]
Scientific Name	Threatened Category	Presence Text
Bird		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area
Bubulcus ibis as Ardea ibis Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area overfly marine area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area
Chalcites osculans as Chrysococcyx osculans Black-eared Cuckoo [83425]		Species or species habitat likely to occur within area overfly marine area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]	Vulnerable	Species or species habitat likely to occur within area overfly marine area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat may occur within area overfly marine area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat may occur within area overfly marine area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area overfly marine area

Scientific Name	Threatened Category	Presence Text
Myiagra cyanoleuca		
Satin Flycatcher [612]		Species or species habitat may occur within area overfly marine area
Neophema chrysostoma		
Blue-winged Parrot [726]	Vulnerable	Species or species habitat likely to occur within area overfly marine area
Rostratula australis as Rostratula benghalensis (sensu lato)		
Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area overfly marine area

Extra Information

EPBC Act Referrals			[Resource Information]
Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action			
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed
INDIGO Central Submarine Telecommunications Cable	2017/8127	Not Controlled Action	Completed
Not controlled action (particular manner)			
INDIGO Marine Cable Route Survey (INDIGO)	2017/7996	Not Controlled Action (Particular Manner)	Post-Approval

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data are available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance

3 DATA SOURCES

Threatened ecological communities

For threatened ecological communities where the distribution is well known, maps are generated based on information contained in recovery plans, State vegetation maps and remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species

Threatened, migratory and marine species distributions have been discerned through a variety of methods. Where distributions are well known and if time permits, distributions are inferred from either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc.) together with point locations and described habitat; or modelled (MAXENT or BIOCLIM habitat modelling) using

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded
- seals which have only been mapped for breeding sites near the Australian continent

The breeding sites may be important for the protection of the Commonwealth Marine environment.

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact us page.

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BioNET Atlas search – threatened species predicted to occur within the Murray Fans subregion of the Riverina bioregion.

Class	Scientific Name	Common Name	*NSW status	+Comm. status	‘Records
Amphibia	*Crinia sloanei*	Sloane's Froglet	E1,P	E	104
Amphibia	*Litoria raniformis*	Southern Bell Frog	E1,P	V	26
Aves	*^^Anthochaera phrygia*	Regent Honeyeater	E4A,P,2	CE	13
Aves	*^^Falco hypoleucos*	Grey Falcon	V,P,2	V	1
Aves	*^^Lophochroa leadbeateri*	Pink Cockatoo	V,P,2		26
Aves	*Actitis hypoleucos*	Common Sandpiper	P	C,J,K	3
Aves	*Anseranas semipalmata*	Magpie Goose	V,P		20
Aves	*Aphelocephala leucopsis*	Southern Whiteface	V,P	V	142
Aves	*Apus pacificus*	Fork-tailed Swift	P	C,J,K	7
Aves	*Ardeotis australis*	Australian Bustard	E1,P		4
Aves	*Arenaria interpres*	Ruddy Turnstone	P	C,J,K	3
Aves	*Artamus cyanopterus cyanopterus*	Dusky Woodswallow	V,P		539
Aves	*Botaurus poiciloptilus*	Australasian Bittern	E1,P	E	118
Aves	*Burhinus grallarius*	Bush Stone-curlew	E1,P		67
Aves	*Calidris acuminata*	Sharp-tailed Sandpiper	P	C,J,K	44
Aves	*Calidris canutus*	Red Knot	P	E,C,J,K	1
Aves	*Calidris ferruginea*	Curlew Sandpiper	E1,P	CE,C,J,K	20
Aves	*Calidris melanotos*	Pectoral Sandpiper	P	J,K	15
Aves	*Calidris ruficollis*	Red-necked Stint	P	C,J,K	20
Aves	*Calidris subminuta*	Long-toed Stint	P	C,J,K	5
Aves	*Calidris tenuirostris*	Great Knot	V,P	V,C,J,K	2
Aves	*Callocephalon fimbriatum*	Gang-gang Cockatoo	V,P,3	E	1
Aves	*Cecropis daurica*	Red-rumped Swallow	P	C,J,K	1
Aves	*Certhionyx variegatus*	Pied Honeyeater	V,P		2
Aves	*Chlidonias leucopterus*	White-winged Black Tern	P	C,J,K	5
Aves	*Chthonicola sagittata*	Speckled Warbler	V,P		11
Aves	*Cinclosoma castanotum*	Chestnut Quail-thrush	V,P		1
Aves	*Circus assimilis*	Spotted Harrier	V,P		30
Aves	*Climacteris picumnus victoriae*	Brown Treecreeper (eastern subspecies)	V,P	V	2528
Aves	*Daphoenositta chrysoptera*	Varied Sittella	V,P		280
Aves	*Epthianura albifrons*	White-fronted Chat	V,P		66
Aves	*Falco subniger*	Black Falcon	V,P		50
Aves	*Gallinago hardwickii*	Latham's Snipe	P	J,K	44
Aves	*Gelochelidon nilotica*	Gull-billed Tern	P	C	7
Aves	*Glossopsitta porphyrocephala*	Purple-crowned Lorikeet	V,P,3		5
Aves	*Glossopsitta pusilla*	Little Lorikeet	V,P		12
Aves	*Grantiella picta*	Painted Honeyeater	V,P	V	10

Class	Scientific Name	Common Name	*NSW status	+Comm. status	‘Records
Aves	*Grus rubicunda*	Brolga	V,P		44
Aves	*Haliaeetus leucogaster*	White-bellied Sea-Eagle	V,P		193
Aves	*Hamirostra melanosternon*	Black-breasted Buzzard	V,P,3		2
Aves	*Hieraaetus morphnoides*	Little Eagle	V,P		97
Aves	*Hirundapus caudacutus*	White-throated Needletail	P	V,C,J,K	4
Aves	*Hydroprogne caspia*	Caspian Tern	P	J	14
Aves	*Lathamus discolor*	Swift Parrot	E1,P	CE	17
Aves	*Limosa lapponica*	Bar-tailed Godwit	P	C,J,K	1
Aves	*Limosa limosa*	Black-tailed Godwit	V,P	E,C,J,K	5
Aves	*Lophoictinia isura*	Square-tailed Kite	V,P,3		10
Aves	*Melanodryas cucullata cucullata*	South-eastern Hooded Robin	E1,P	E	138
Aves	*Melithreptus gularis gularis*	Black-chinned Honeyeater (eastern subspecies)	V,P		59
Aves	*Neophema chrysostoma*	Blue-winged Parrot	V,P	V	12
Aves	*Neophema pulchella*	Turquoise Parrot	V,P,3		2
Aves	*Ninox connivens*	Barking Owl	V,P,3		27
Aves	*Ninox strenua*	Powerful Owl	V,P,3		3
Aves	*Numenius phaeopus*	Whimbrel	P	C,J,K	1
Aves	*Oxyura australis*	Blue-billed Duck	V,P		32
Aves	*Pachycephala inornata*	Gilbert's Whistler	V,P		64
Aves	*Pachycephala olivacea*	Olive Whistler	V,P		1
Aves	*Pedionomus torquatus*	Plains-wanderer	E1,P,3	CE	59
Aves	*Petroica boodang*	Scarlet Robin	V,P		330
Aves	*Petroica phoenicea*	Flame Robin	V,P		3682
Aves	*Philomachus pugnax*	Ruff	P	C,J,K	7
Aves	*Pluvialis fulva*	Pacific Golden Plover	P	C,J,K	4
Aves	*Pluvialis squatarola*	Grey Plover	P	C,J,K	2
Aves	*Polytelis anthopeplus monarchoides*	Regent Parrot (eastern subspecies)	E1,P,3	V	29
Aves	*Polytelis swainsonii*	Superb Parrot	V,P,3	V	806
Aves	*Pomatostomus temporalis temporalis*	Grey-crowned Babbler (eastern subspecies)	V,P		1056
Aves	*Rostratula australis*	Australian Painted Snipe	E1,P	E	5
Aves	*Stagonopleura guttata*	Diamond Firetail	V,P	V	247
Aves	*Stictonetta naevosa*	Freckled Duck	V,P		40
Aves	*Tringa glareola*	Wood Sandpiper	P	C,J,K	3
Aves	*Tringa nebularia*	Common Greenshank	P	C,J,K	23
Aves	*Tringa stagnatilis*	Marsh Sandpiper	P	C,J,K	30
Aves	*Tyto novaehollandiae*	Masked Owl	V,P,3		3
Mammalia	*Antechinomys laniger*	Kultarr	E1,P		1
Mammalia	*Chalinolobus picatus*	Little Pied Bat	V,P		2

Class	Scientific Name	Common Name	*NSW status	+Comm. status	‘Records
Mammalia	*Conilurus albipes*	White-footed Tree-rat	E4,P	X	1
Mammalia	*Dasyurus maculatus*	Spotted-tailed Quoll	V,P	E	2
Mammalia	*Lasiorhinus krefftii*	Northern Hairy-nosed Wombat	E4,P	CE	1
Mammalia	*Miniopterus orianae oceanensis*	Large Bent-winged Bat	V,P		1
Mammalia	*Myotis macropus*	Southern Myotis	V,P		9
Mammalia	*Nyctophilus corbeni*	Corben's Long-eared Bat	V,P	V	1
Mammalia	*Petaurus norfolcensis*	Squirrel Glider	V,P		60
Mammalia	*Petrogale penicillata*	Brush-tailed Rock-wallaby	E1,P	V	1
Mammalia	*Phascogale tapoatafa*	Brush-tailed Phascogale	V,P		2
Mammalia	*Phascolarctos cinereus*	Koala	E1,P	E	99
Mammalia	*Saccolaimus flaviventris*	Yellow-bellied Sheathtail-bat	V,P		100
Flora	*^^Prasophyllum sp. Moama*		E4A,P,2		556
Flora	*^^Pterostylis despectans*		E4A,P,2	E	3
Flora	*Amphibromus fluitans*	Floating Swamp Wallaby-grass	V	V	1255
Flora	*Austrostipa metatoris*	A spear-grass	V	V	21
Flora	*Austrostipa wakoolica*	A spear-grass	E1	E	39
Flora	*Brachyscome muelleroides*	Claypan Daisy	V	V	P
Flora	*Cullen parvum*	Small Scurf-pea	E1		3
Flora	*Eriocaulon australasicum*	Austral Pipewort	E1	E	P
Flora	*Eucalyptus leucoxylon subsp. pruinosa*	Yellow Gum	V		18
Flora	*Lepidium monoplocoides*	Winged Peppercress	E1	E	1
Flora	*Lepidium pseudopapillosum*	Formbe Peppercress	E1	V	P
Flora	*Maireana cheelii*	Chariot Wheels	V	V	9
Flora	*Pilularia novae-hollandiae*	Austral Pillwort	E1,3		2
Flora	*Sclerolaena napiformis*	Turnip Copperburr	E1	E	1058
Flora	*Swainsona murrayana*	Slender Darling Pea	V	V	15
Flora	*Swainsona plagiotropis*	Red Darling Pea	V	V	P
Flora	*Swainsona sericea*	Silky Swainson-pea	V		2
Flora	*Wilsonia rotundifolia*	Round-leafed Wilsonia	E1		2

*NSW Status: P=Protected, P13=Protected native plant, V=Vulnerable, E1=Endangered, E2=Endangered population, E4=Extinct, E4A=Critically endangered, 2=Category 2 sensitive species, 3=Category 3 sensitive species.

+Comm. Status: C=CAMBA, J=JAMBA, K=ROKAMBA, CE=Critically endangered, E=Endangered, V=Vulnerable.

‘Records: Number of records, P = predicted to occur, K = known to occur.

BioNET Atlas search – threatened ecological communities predicted to occur within the Murray Fans subregion of the Riverina bioregion.

TEC	*NSW status	+Comm. status	[1]Records
Acacia melvillei Shrubland in the Riverina and Murray-Darling Depression bioregions	E		K
Allocasuarina luehmannii Woodland in the Riverina and Murray-Darling Depression Bioregions	E		K
Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions		E	K
Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia		E	K
Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions	E		K
Mallee Bird Community of the Murray Darling Depression Bioregion		E	K
Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions	E		K
Natural Grasslands of the Murray Valley Plains		CE	K
Plains mallee box woodlands of the Murray Darling Depression, Riverina and Naracoorte Coastal Plain Bioregions		CE	K
Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregions	E		K
Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains		CE	K
Weeping Myall Woodlands		E	K
White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and	CE		K
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland		CE	K

*E=Endangered, CE=Critically Endangered

[+]E=Endangered, CE=Critically Endangered

[1]K=Known

BioNET Atlas search – key threatening processes (KTPs) predicted to occur within the Murray Fans subregion of the Riverina bioregion.

Threats	NSW status	Comm status	Records*
Aggressive exclusion of birds from woodland and forest habitat by abundant Noisy Miners, *Manorina melanocephala* (Latham, 1802)	KTP	KTP	P
Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands	KTP		P
Anthropogenic Climate Change	KTP	KTP	P
Bushrock removal	KTP		P
Clearing of native vegetation	KTP	KTP	P
Competition and grazing by the feral European Rabbit, *Oryctolagus cuniculus* (L.)	KTP	KTP	P
Competition and habitat degradation by Feral Goats, *Capra hircus* Linnaeus 1758	KTP	KTP	P
Competition from feral honey bees, *Apis mellifera* L.	KTP		P
Forest eucalypt dieback associated with over-abundant psyllids and Bell Miners	KTP		P
Habitat degradation and loss by Feral Horses (brumbies, wild horses), *Equus caballus* Linnaeus 1758	KTP		P
Herbivory and environmental degradation caused by feral deer	KTP		P
High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition	KTP		P
Importation of Red Imported Fire Ants *Solenopsis invicta* Buren 1972	KTP	KTP	P
Infection by Psittacine Circoviral (beak and feather) Disease affecting endangered psittacine species and populations	KTP	KTP	P
Infection of frogs by amphibian chytrid causing the disease chytridiomycosis	KTP	KTP	P
Infection of native plants by *Phytophthora cinnamomi*	KTP	KTP	P
Introduction of the Large Earth Bumblebee *Bombus terrestris* (L.)	KTP		P
Invasion and establishment of exotic vines and scramblers	KTP		P
Invasion and establishment of Scotch Broom (*Cytisus scoparius*)	KTP		P
Invasion and establishment of the Cane Toad (Bufo marinus)	KTP	KTP	P
Invasion of native plant communities by African Olive *Olea europaea* subsp. *cuspidata* (Wall. ex G. Don) Cif.	KTP		P
Invasion of native plant communities by *Chrysanthemoides monilifera*	KTP		P
Invasion of native plant communities by exotic perennial grasses	KTP		P
Invasion of the Yellow Crazy Ant, *Anoplolepis gracilipes* (Fr. Smith) into NSW	KTP		P
Invasion, establishment and spread of Lantana (*Lantana camara* L. sens. Lat)	KTP		P
Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants	KTP	KTP	P
Loss of Hollow-bearing Trees	KTP		P
Loss or degradation (or both) of sites used for hill-topping by butterflies	KTP		P
Predation and hybridisation by Feral Dogs, *Canis lupus familiaris*	KTP		P
Predation by *Gambusia holbrooki* Girard, 1859 (Plague Minnow or Mosquito Fish)	KTP		P
Predation by the European Red Fox *Vulpes vulpes* (Linnaeus, 1758)	KTP	KTP	P
Predation by the Feral Cat *Felis catus* (Linnaeus, 1758)	KTP	KTP	P
Predation, habitat degradation, competition and disease transmission by Feral Pigs, *Sus scrofa* Linnaeus 1758	KTP	KTP	P

Threats	NSW status	Comm status	Records*
Removal of dead wood and dead trees	KTP		P

*P=predicted.

Appendix B: BAM Plot Locations and Photographs

Plot Name	PCT	Condition	Easting (Zone 55)	Northing (Zone 55)	Photographs	
TO01	9	Remnant	368528	6040974		

Plot Name	PCT	Condition	Easting (Zone 55)	Northing (Zone 55)	Photographs	
TO03	74	Remnant	368222	6040698		

Plot Name	PCT	Condition	Easting (Zone 55)	Northing (Zone 55)	Photographs	
TO06	45	Moderate	368004	6040858		

Plot Name	PCT	Condition	Easting (Zone 55)	Northing (Zone 55)	Photographs	
TO07	9	Remnant	367972	6040294		

Plot Name	PCT	Condition	Easting (Zone 55)	Northing (Zone 55)	Photographs	
TOX01	45	Moderate	367875	6040690		

Plot Name	PCT	Condition	Easting (Zone 55)	Northing (Zone 55)	Photographs
NN	0	Non-native	368104	6040673	

Appendix C: Field Survey Results

Flora Species List

In total, 62 plant species were detected during the July and October field surveys. These species are given in the table below. Of this number, 33 (53.23%) are native and 29 (46.77%) are introduced. Three are listed as High-threat Exotic species (HTE) under the BAM. One HTE species – Silver-Leaved Nightshade (*Solanum elaeagnifolium*) – is also listed as a Weed of National Significance (WoNS) and as a Priority Weed (PW) for the Murray.

[1]Growth Form	Scientific Name	Common Name	[2]Status	[3]HTE	[4]WoNS	[5]PW
TG	*Eucalyptus camaldulensis*	River Red Gum	N	No	No	No
TG	*Eucalyptus melliodora*	Yellow Box	N	No	No	No
SG	*Atriplex semibaccata*	Creeping Saltbush	N	No	No	No
SG	*Enchylaena tomentosa*	Ruby Saltbush	N	No	No	No
SG	*Sclerolaena muricata*	Black Rolypoly	N	No	No	No
GG	*Austrostipa aristiglumis*	Plains Grass	N	No	No	No
GG	*Austrostipa scabra*	Speargrass	N	No	No	No
GG	*Chloris truncata*	Windmill Grass	N	No	No	No
GG	*Enteropogon acicularis*	Curly Windmill Grass	N	No	No	No
GG	*Enteropogon ramosus*	Curly Windmill Grass	N	No	No	No
GG	*Juncus amabilis*	Rush	N	No	No	No
GG	*Juncus subsecundus*	Rush	N	No	No	No
GG	*Panicum effusum*	Hairy Panic	N	No	No	No
GG	*Rytidosperma caespitosum*	Ringed Wallaby Grass	N	No	No	No
GG	*Rytidosperma duttonianum*	Brown-backed Wallaby Grass	N	No	No	No
GG	*Sporobolus caroli*	Fairy Grass	N	No	No	No
GG	*Walwhalleya proluta*	Rigid Panic	N	No	No	No
FG	*Asperula conferta*	Common Woodruff	N	No	No	No
FG	*Centipeda cunninghamii*	Common Sneezeweed	N	No	No	No
FG	*Crassula sieberiana*	Australian Stonecrop	N	No	No	No
FG	*Goodenia pinnatifida*	Scrambled Eggs	N	No	No	No
FG	*Haloragis aspera*	Rough Raspwort	N	No	No	No
FG	*Lythrum hyssopifolia*	Hyssop Loosestrife	N	No	No	No
FG	*Oxalis perennans*	Grassland Wood-sorrel	N	No	No	No
FG	*Pseudognaphalium luteoalbum*	Jersey Cudweed	N	No	No	No
FG	*Ranunculus pachycarpus*	Thick-Fruit Buttercup	N	No	No	No
FG	*Rhodanthe corymbiflora*	Small White Sunray	N	No	No	No

[1]Growth Form	Scientific Name	Common Name	[2]Status	[3]HTE	[4]WoNS	[5]PW
FG	*Rumex dumosus*	Wiry Dock	N	No	No	No
FG	*Sida corrugata*	Corrugated Sida	N	No	No	No
FG	*Solanum esuriale*	Quena	N	No	No	No
FG	*Vittadinia gracilis*	Woolly New Holland Daisy	N	No	No	No
EG	*Marsilea drummondii*	Common Nardoo	N	No	No	No
OG	*Convolvulus angustissimus*	No common name	N	No	No	No
TG	*Schinus molle* var. *areira*	Pepper Tree	I	No	No	No
GG	*Avena fatua*	Wild Oats	I	No	No	No
GG	*Eragrostis curvula*	African Lovegrass	I	Yes	No	No
GG	*Hordeum glaucum*	Northern Barley Grass	I	No	No	No
GG	*Hordeum leporinum*	Barley Grass	I	No	No	No
GG	*Lolium* sp.	Ryegrass	I	No	No	No
FG	*Arctotheca calendula*	Capeweed	I	No	No	No
FG	*Centaurea melitensis*	Maltese Cockspur	I	No	No	No
FG	*Chenopodium murale*	Nettle-Leaf Goosefoot	I	No	No	No
FG	*Cirsium vulgare*	Spear Thistle	I	No	No	No
FG	*Echium plantagineum*	Paterson's Curse	I	No	No	No
FG	*Erodium moschatum*	Musky Crowfoot	I	No	No	No
FG	*Hypochaeris radicata*	Flatweed	I	No	No	No
FG	*Lactuca serriola*	Prickly Lettuce	I	No	No	No
FG	*Lepidium africanum*	African Peppercress	I	No	No	No
FG	*Lysimachia arvensis*	Scarlet Pimpernel, Blue Pimpernel	I	No	No	No
FG	*Malva parviflora*	Small-Flowered Mallow	I	No	No	No
FG	*Marrubium vulgare*	White Horehound	I	No	No	No
FG	*Medicago polymorpha*	Burr Medic	I	No	No	No
FG	*Moraea setifolia*	Thread Iris	I	No	No	No
FG	*Romulea minutiflora*	Small-Flowered Onion Grass	I	No	No	No
FG	*Solanum elaeagnifolium*	Silver-Leaved Nightshade	I	Yes	Yes	Yes
FG	*Solanum nigrum*	Black-Berry Nightshade	I	No	No	No
FG	*Sonchus oleraceus*	Common Sowthistle	I	No	No	No
FG	*Trifolium angustifolium*	Narrow-Leaved Clover	I	No	No	No
FG	*Trifolium arvense*	Haresfoot Clover	I	No	No	No
FG	*Trifolium subterraneum*	Subterranean Clover	I	No	No	No

[1]Growth Form	Scientific Name	Common Name	[2]Status	[3]HTE	[4]WoNS	[5]PW
FG	*Urtica urens*	Small Nettle	I	No	No	No
FG	*Xanthium spinosum*	Bathurst Burr	I	Yes	No	No

[1]Growth form: FG = forb, GG = grass and grass-like, SG = shrub, TG = tree, EG = fern, OG = other. [2]Status: N = native, I = introduced. [3]High-threat exotic species (Yes/No). [4]Weed of National Significance (Yes/No). [5]Priority weed for the LLS Region (Yes/No).

Fauna species list

In total, 37 fauna species were detected during the field surveys. Of these, 30 (81.08%) were native and seven (18.92%) introduced. No threatened species were detected.

Class	Scientific name	Common name	Status[1]	BC Act Status	EPBC Act Status	Seen	SM4 Recorder	Camera Trap
Amphibia	*Crinia parinsignifera*	Eastern Sign-bearing Froglet	N	-	-	x		
Amphibia	*Limnodynastes Tasmiensis*	Spotted Grass Frog	N	-	-	x		
Aves	*Acanthiza chrysorrhoa*	Yellow-rumped Thornbill	N	-	-	x		
Aves	*Acanthiza nana*	Yellow Thornbill	N	-	-	x		
Aves	*Acridotheres tristis*	Common Myna	I	-	-	x		
Aves	*Anas superciliosa*	Pacific Black Duck	N	-	-		x	
Aves	*Aquila audax*	Wedge-tailed Eagle	N	-	-	x		
Aves	*Cacatua galerita*	Sulphur-crested Cockatoo	N	-	-		x	
Aves	*Cacatua sanguinea*	Little Corella	N	-	-		x	
Aves	*Cacomantis flabelliformis*	Fan-tailed Cuckoo	N	-	-		x	
Aves	*Chenonetta jubata*	Australian Wood Duck	N	-	-		x	
Aves	*Cincloramphus timoriensis*	Tawny Grassbird	N	-	-		x	
Aves	*Coracina novaehollandiae*	Black-faced Cuckoo-shrike	N	-	-	x		
Aves	*Corvus coronoides*	Australian Raven	N	-	-		x	
Aves	*Corvus mellori*	Little Raven	N	-	-		x	
Aves	*Cracticus nigrogularis*	Pied Butcherbird	N	-	-		x	
Aves	*Entomyzon cyanotis*	Blue-faced Honeyeater	N	-	-	x		
Aves	*Eolophus roseicapilla*	Galah	N	-	-		x	
Aves	*Grallina cyanoleuca*	Magpie-lark	N	-	-	x	x	

Class	Scientific name	Common name	Status[1]	BC Act Status	EPBC Act Status	Seen	SM4 Recorder	Camera Trap
Aves	*Falco cenchroides*	Nankeen Kestrel	N	-	-	x		
Aves	*Gymnorhina tibicen*	Australian Magpie	N	-	-	x	x	
Aves	*Malurus cyaneus*	Superb Fairy-wren	N	-	-	x		
Aves	*Manorina melanocephala*	Noisy Miner	N	-	-	x	x	
Aves	*Ninox boobook*	Southern Boobook	N	-	-		x	
Aves	*Ocyphaps lophotes*	Crested Pigeon	N	-	-	x	x	
Aves	*Pardalotus striatus*	Striated Pardalote	N	-	-		x	
Aves	*Passer domesticus*	House Sparrow	I	-	-	x		
Aves	*Philemon corniculatus*	Noisy Friarbird	N	-	-	x		
Aves	*Platycercus eximius*	Eastern Rosella	N	-	-		x	
Aves	*Psephotus haematonotus*	Red-rumped Parrot	N	-	-		x	
Aves	*Ptilotula penicillata*	White-plumed Honeyeater	N	-	-		x	
Aves	*Strepera graculina*	Pied Currawong	N	-	-	x		
Aves	*Sturnus vulgaris*	Common Starling	I	-	-	x		
Mammalia	*Bos taurus*	Domesticated cow	I	-	-	x		x
Mammalia	*Oryctolagus cuniculus*	Rabbit	I	-	-	x		
Mammalia	*Rattus rattus*	Black Rat	I	-	-			x
Mammalia	*Vulpes vulpes*	European Red Fox	I	-	-			x

[1]N=Native, I=Introduced.

BAM Data Sheets

BAM Plot - Field Survey Sheet

Page 1 of (2)

Date	19/07/2023	**Survey Name**	Tocumwal Magazine Upgrade				
Recorders	David Orchard, Paris Hughes			**Plot ID #**	TO01	**Zone ID**	9_Remnant
Photo #	-			**Plot dimensions**			20 x 50
Datum	GDA94	**Zone**	55	**Plot bearing along midline**			227
Easting	368528	**Northing**	6040974	Record magnetic bearing along midline from 0 m point			

Record easting, northing at plot marker (0 m point), Photos taken vertically and horizontally at 0m point and 50 m point, looking into plot

IBRA region	Riverina
Subregion	Murray Fans
Likely Vegetation Class	Inland Riverine Forests
Plant Community Type	9
Condition state	Remnant

Floristics plot is centred on the midline, at 0 m point, 10 m either side

BAM Composition / Structure plot (400m^2)		
Dimensions (circle applicable size)		
20 x 20 m	~~10 x 40 m~~	**Sum values***
Native Richness (count of native species)	**Trees**	1
	Shrubs	0
	Grasses etc	6
	Forbs	2
	Ferns	0
	Other	0
Cover (sum of cover of natives species)	**Trees**	15
	Shrubs	0
	Grasses etc	41.2
	Forbs	0.2
	Ferns	0
	Other	0
High threat weed cover		0.1

*These values summarise the floristic data for input into BAM calculator

Function plot is an extention of floristics plot out to 50 m along midline (or equiv. area)

BAM Function plot (1000m^2)		
Dimensions (circle applicable size)		
20 x 50 m	~~10 x 100 m~~	
Tree stem DBH (cm)		Notes on function attributes:
>80	1	Stem size class records # large trees (cf. benchmark)
50 - 79	0	Record stems for living trees only, and for all species
30 - 49	+	For multistemmed trees, record only the largest stem
20 - 29	+	Presence of <5cm stems records regeneration
10 - 19	+	Record # trees with hollows, not number of hollows
5 - 9	-	Count as one stem where tree is multistemmed
< 5	+	Hollow bearing stem may be a dead stem (incl. stag)
# Trees with hollows	<20cm -	Total #
	>20cm** -	1
Length of logs		Total (m)
		112.8

Measure length of logs >10cm, fully or partly in contact with the ground, and within the plot.

**Hollows of >20cm are recorded for habitat for some threatened species

BAM Litter/ Groundcover (1 x 1 m plots) Litter cover is used for BAM, other attributes are useful for recording site condition in general

		1	2	3	4	5	Average
Sub-plot score (% cover)	**Litter**	75	30	55	70	45	55
	Bare ground						
	Cryptogam						
	Rock						

Litter / groundcover plots are located at 5, 15, 25, 35, 45 m (alternating sides) along the midline of Function plot

Other plot information (not essential for BAM)

Disturbance	Severity	Timing	Landform
Clearing (incl. logging)			Microrelief
Cultivation			Slope
Grazing (native / stock)			Aspect
Soil erosion			Soil surface texture
Firewood removal			Soil colour
Fire (ground stratum, mid, canopy burnt?)			Site drainage
Storm damage			Distance to nearest water
Weediness			Distance to nearest rock outcrop /cave

Severity code: 0=no evidence, 1=slight, 2=moderate, 3= severe

Timing code: R = recent (<3y), NR = not recent, O = old/historic

Notes

BAM Plot - Field Survey Sheet

Date	19/07/2023	Survey Name	Tocumwal Magazine Upgrade			
Recorders	David Orchard, Paris Hughes		Plot ID #	TO01	Zone ID	9_Remnant
GF code	***Genus species*** (tick if photographed or sample taken)		Cover %	Abund (count)	N, E, HTE	Stratum
TG	*Eucalyptus camaldulensis*		15		N	
GG	*Rytidosperma caespitosum*		25		N	
GG	*Rytidosperma duttonianum*		10		N	
GG	*Hordeum glaucum*		30		E	
GG	*Lolium* sp.		10		E	
FG	*Trifolium angustifolium*		0.1	10	E	
FG	*Trifolium arvense*		0.1	20	E	
GG	*Panicum effusum*		1		N	
FG	*Arctotheca calendula*		8		E	
FG	*Lysimachia arvensis*		0.1	30	E	
GG	*Austrostipa scabra*		5		N	
FG	*Lepidium africanum*		0.1	20	E	
GG	*Chloris truncata*		0.1	20	N	
FG	*Erodium moschatum*		0.1	10	E	
FG	*Oxalis perennans*		0.1	8	N	
FG	*Xanthium spinosum*		0.1	2	HTE	
FG	*Rumex dumosus*		0.1	5	N	
FG	*Sonchus oleraceus*		0.1	20	E	
GG	*Sporobolus caroli*		0.1	10	N	
FG	*Cirsium vulgare*		0.1	2	E	
FG	*Echium plantagineum*		0.1	8	E	

Growth Form (see BAM Appendix 4) - Tree (TG), Shrub (SG), Grass & grasslike (GG), Forb (FG), Fern (EG), Other (OG)
Cover: 0.1, 0.2, 0.3, ... 1, 2, 3, ...10, 15, 20, 25, ...100% (incl. leaf, branch, stem cover per species).
Abundance for each species with ≤5% cover: 1, 2, 3, 4, ... 10, 20, 30, ... 100, 500, 1000, 1500, 2000 stems
N=native, E=exotic, HTE=high threat exotic
All species in a plot must be recorded. If you can only ID to genus, separate different species by unique identifiyer e.g. *Genus* sp1, *Genus* sp2 etc
Identify top 3 dominants in each stratum (use own stratum definitions) Cover area examples: 0.1% = 63x63cm, 0.5% = 1.4x1.4m, 1% =2x2 m, 5%=4x5m, 25%=10x10m

BAM Plot - Field Survey Sheet

Date	19/07/2023	**Survey Name**	Tocumwal Magazine Upgrade				
Recorders	David Orchard, Paris Hughes			**Plot ID #**	TO03	**Zone ID**	74_Remn.
Photo #	-			**Plot dimensions**			20 x 50
Datum	GDA94	**Zone**	55	**Plot bearing along midline**			88
Easting	368222	**Northing**	6040698	Record magnetic bearing along midline from 0 m point			

Record easting, northing at plot marker (0 m point), Photos taken vertically and horizontally at 0m point and 50 m point, looking into plot

IBRA region	Riverina
Subregion	Murray Fans
Likely Vegetation Class	Floodplain Transition Woodlands
Plant Community Type	74 — **Condition state**: Remnant

Floristics plot is centred on the midline, at 0 m point, 10 m either side

BAM Composition / Structure plot (400m²)

Dimensions (circle applicable size): 20 x 20 m ~~10 x 40 m~~

		Sum values*
Native Richness (count of native species)	**Trees**	1
	Shrubs	0
	Grasses etc	3
	Forbs	1
	Ferns	0
	Other	0
Cover (sum of cover of natives species)	**Trees**	25
	Shrubs	0
	Grasses etc	11
	Forbs	0.1
	Ferns	0
	Other	0
High threat weed cover		0.3

*These values summarise the floristic data for input into BAM calculator

Function plot is an extention of floristics plot out to 50 m along midline (or equiv. area)

BAM Function plot (1000m²)

Dimensions (circle applicable size): 20 x 50 m ~~10 x 100 m~~

Tree stem DBH (cm)		Notes on function attributes:
>80	1	Stem size class records # large trees (cf. benchmark)
50 - 79	1	Record stems for living trees only, and for all species
30 - 49	+	For multistemmed trees, record only the largest stem
20 - 29	+	Presence of <5cm stems records regeneration
10 - 19	+	Record # trees with hollows, not number of hollows
5 - 9	-	Count as one stem where tree is multistemmed
< 5	-	Hollow bearing stem may be a dead stem (incl. stag)

# Trees with hollows	<20cm	-	Total #
	>20cm**	-	1
Length of logs			Total (m)
			58.5

Measure length of logs >10cm, fully or partly in contact with the ground, and within the plot.

**Hollows of >20cm are recorded for habitat for some threatened species

BAM Litter/ Groundcover (1 x 1 m plots) Litter cover is used for BAM, other attributes are useful for recording site condition in general

		1	2	3	4	5	Average
Sub-plot score (% cover)	**Litter**	1	90	60	45	80	55.2
	Bare ground						
	Cryptogam						
	Rock						

Litter / groundcover plots are located at 5, 15, 25, 35, 45 m (alternating sides) along the midline of Function plot

Other plot information (not essential for BAM)

Disturbance	Severity	Timing	Landform
Clearing (incl. logging)			Microrelief
Cultivation			Slope
Grazing (native / stock)			Aspect
Soil erosion			Soil surface texture
Firewood removal			Soil colour
Fire (ground stratum, mid, canopy burnt?)			Site drainage
Storm damage			Distance to nearest water
Weediness			Distance to nearest rock outcrop /cave

Severity code: 0=no evidence, 1=slight, 2=moderate, 3= severe

Timing code: R = recent (<3y), NR = not recent, O = old/historic

Notes

BAM Plot - Field Survey Sheet

Date	19/07/2023	Survey Name	Tocumwal Magazine Upgrade			
Recorders	David Orchard, Paris Hughes		Plot ID #	TO03	Zone ID	74_Remn.
GF code	***Genus species*** (tick if photographed or sample taken)		Cover %	Abund (count)	N, E, HTE	Stratum
TG	*Eucalyptus melliodora*		25		N	
FG	*Cirsium vulgare*		0.1	7	E	
GG	*Austrostipa scabra*		2		N	
GG	*Rytidosperma caespitosum*		8		N	
FG	*Trifolium arvense*		0.2	60	E	
GG	*Lolium* sp.		5		E	
FG	*Arctotheca calendula*		2		E	
FG	*Marrubium vulgare*		0.1	10	E	
FG	*Solanum elaeagnifolium*		0.1	30	HTE	
FG	*Erodium moschatum*		0.1	40	E	
GG	*Hordeum* sp.		50		E	
FG	*Echium plantagineum*		0.2	100	E	
GG	*Walwhalleya proluta*		1		N	
FG	*Medicago polymorpha*		0.2	60	E	
GG	*Avena fatua*		25		E	
FG	*Xanthium spinosum*		0.2	40	HTE	
FG	*Crassula sieberiana*		0.1	100	N	
TG	*Schinus molle var. areira*		0.1	1	E	
FG	*Chenopodium murale*		0.1	3	E	
FG	*Malva parviflora*		0.1	10	E	
FG	*Solanum nigrum*		0.1	8	E	
FG	*Urtica urens*		0.1	1	E	
FG	*Lepidium africanum*		0.1	20	E	

Growth Form (see BAM Appendix 4) - Tree (TG), Shrub (SG), Grass & grasslike (GG), Forb (FG), Fern (EG), Other (OG)
Cover: 0.1, 0.2, 0.3, ... 1, 2, 3, ...10, 15, 20, 25, ...100% (incl. leaf, branch, stem cover per species).
Abundance for each species with ≤5% cover: 1, 2, 3, 4, ... 10, 20, 30, ... 100, 500, 1000, 1500, 2000 stems
N=native, E=exotic, HTE=high threat exotic
All species in a plot must be recorded. If you can only ID to genus, separate different species by unique identifiyer e.g. *Genus* sp1, *Genus* sp2 etc
Identify top 3 dominants in each stratum (use own stratum definitions) Cover area examples: 0.1% = 63x63cm, 0.5% = 1.4x1.4m, 1% =2x2 m, 5%=4x5m, 25%=10x10m

BAM Plot - Field Survey Sheet

Date	19/07/2023	**Survey Name**	Tocumwal Magazine Upgrade				
Recorders	David Orchard, Paris Hughes			**Plot ID #**	TO06	**Zone ID**	45_Mod.
Photo #	-			**Plot dimensions**			20 x 50
Datum	GDA94	**Zone**	55	**Plot bearing along midline**			3
Easting	368004	**Northing**	6040858	Record magnetic bearing along midline from 0 m point			

Record easting, northing at plot marker (0 m point), Photos taken vertically and horizontally at 0m point and 50 m point, looking into plot

IBRA region	Riverina
Subregion	Murray Fans
Likely Vegetation Class	Riverine Plain Grasslands
Plant Community Type	45
Condition state	Moderate

Floristics plot is centred on the midline, at 0 m point, 10 m either side

BAM Composition / Structure plot (400m^2)		
Dimensions (circle applicable size)		
20 x 20 m	~~10 x 40 m~~	**Sum values***
Native Richness (count of native species)	**Trees**	0
	Shrubs	2
	Grasses etc	6
	Forbs	3
	Ferns	1
	Other	0
Cover (sum of cover of natives species)	**Trees**	0
	Shrubs	0.3
	Grasses etc	87
	Forbs	2.2
	Ferns	0.1
	Other	0
High threat weed cover		0

*These values summarise the floristic data for input into BAM calculator

Function plot is an extention of floristics plot out to 50 m along midline (or equiv. area)

BAM Function plot (1000m^2)		
Dimensions (circle applicable size)		
20 x 50 m	~~10 x 100 m~~	
Tree stem DBH (cm)		Notes on function attributes:
>80	0	Stem size class records # large trees (cf. benchmark)
50 - 79	0	Record stems for living trees only, and for all species
30 - 49	-	For multistemmed trees, record only the largest stem
20 - 29	-	Presence of <5cm stems records regeneration
10 - 19	-	Record # trees with hollows, not number of hollows
5 - 9	-	Count as one stem where tree is multistemmed
< 5	-	Hollow bearing stem may be a dead stem (incl. stag)

# Trees with hollows	<20cm -	Total #
	>20cm** -	0
Length of logs		Total (m)
		0

Measure length of logs >10cm, fully or partly in contact with the ground, and within the plot.

**Hollows of >20cm are recorded for habitat for some threatened species

BAM Litter/ Groundcover (1 x 1 m plots) Litter cover is used for BAM, other attributes are useful for recording site condition in general

		1	2	3	4	5	Average
Sub-plot score (% cover)	**Litter**	2	1	0	0	1	0.8
	Bare ground						
	Cryptogam						
	Rock						

Litter / groundcover plots are located at 5, 15, 25, 35, 45 m (alternating sides) along the midline of Function plot

Other plot information (not essential for BAM)

Disturbance	Severity	Timing	Landform
Clearing (incl. logging)			Microrelief
Cultivation			Slope
Grazing (native / stock)			Aspect
Soil erosion			Soil surface texture
Firewood removal			Soil colour
Fire (ground stratum, mid, canopy burnt?)			Site drainage
Storm damage			Distance to nearest water
Weediness			Distance to nearest rock outcrop /cave

Severity code: 0=no evidence, 1=slight, 2=moderate, 3= severe

Timing code: R = recent (<3y), NR = not recent, O = old/historic

Notes

BAM Plot - Field Survey Sheet

Date	19/07/2023	Survey Name	Tocumwal Magazine Upgrade			
Recorders	David Orchard, Paris Hughes		Plot ID #	TO06	Zone ID	45_Mod.
GF code	***Genus species*** (tick if photographed or sample taken)		Cover %	Abund (count)	N, E, HTE	Stratum
SG	*Sclerolaena muricata*		0.2	1	N	
GG	*Enteropogon ramosus*		35		N	
GG	*Juncus amabilis*		10		N	
GG	*Juncus subsecundus*		2		N	
GG	*Rytidosperma caespitosum*		25		N	
FG	*Asperula conferta*		2		N	
FG	*Trifolium subterraneum*		0.1	30	E	
FG	*Hypochaeris radicata*		0.1	70	E	
FG	*Ranunculus pachycarpus*		0.1	1	N	
GG	*Austrostipa scabra*		5		N	
FG	*Erodium moschatum*		0.1	20	E	
FG	*Rumex dumosus*		0.1	4	N	
EG	*Marsilea drummondii*		0.1	1	N	
FG	*Echium plantagineum*		0.1	40	E	
SG	*Enchylaena tomentosa*		0.1	1	N	
GG	*Walwhalleya proluta*		10		N	
FG	*Arctotheca calendula*		0.1	10	E	

Growth Form (see BAM Appendix 4) - Tree (TG), Shrub (SG), Grass & grasslike (GG), Forb (FG), Fern (EG), Other (OG)
Cover: 0.1, 0.2, 0.3, ... 1, 2, 3, ...10, 15, 20, 25, ...100% (incl. leaf, branch, stem cover per species).
Abundance for each species with ≤5% cover: 1, 2, 3, 4, ... 10, 20, 30, ... 100, 500, 1000, 1500, 2000 stems
N=native, E=exotic, HTE=high threat exotic
All species in a plot must be recorded. If you can only ID to genus, separate different species by unique identifiyer e.g. *Genus* sp1, *Genus* sp2 etc
Identify top 3 dominants in each stratum (use own stratum definitions) Cover area examples: 0.1% = 63x63cm, 0.5% = 1.4x1.4m, 1% =2x2 m, 5%=4x5m, 25%=10x10m

BAM Plot - Field Survey Sheet

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Date	19/07/2023	**Survey Name**	Tocumwal Magazine Upgrade				
Recorders	David Orchard, Paris Hughes			**Plot ID #**	TO07	**Zone ID**	9_Remnant
Photo #	-			**Plot dimensions**			20 x 50
Datum	GDA94	**Zone**	55	**Plot bearing along midline**			175
Easting	367972	**Northing**	6040294	Record magnetic bearing along midline from 0 m point			

Record easting, northing at plot marker (0 m point), Photos taken vertically and horizontally at 0m point and 50 m point, looking into plot

IBRA region	Riverina
Subregion	Murray Fans
Likely Vegetation Class	Inland Riverine Forests
Plant Community Type	9
Condition state	Remnant

Floristics plot is centred on the midline, at 0 m point, 10 m either side

BAM Composition / Structure plot (400m²)		
Dimensions (circle applicable size)		
20 x 20 m	~~10 x 40 m~~	**Sum values***
Native Richness (count of native species)	**Trees**	1
	Shrubs	1
	Grasses etc	2
	Forbs	2
	Ferns	1
	Other	0
Cover (sum of cover of natives species)	**Trees**	25
	Shrubs	0.1
	Grasses etc	10.1
	Forbs	0.2
	Ferns	0.1
	Other	0
High threat weed cover		0.2

*These values summarise the floristic data for input into BAM calculator

Function plot is an extention of floristics plot out to 50 m along midline (or equiv. area)

BAM Function plot (1000m²)		
Dimensions (circle applicable size)		
20 x 50 m	~~10 x 100 m~~	
Tree stem DBH (cm)		Notes on function attributes:
>80	1	Stem size class records # large trees (cf. benchmark)
50 - 79	0	Record stems for living trees only, and for all species
30 - 49	+	For multistemmed trees, record only the largest stem
20 - 29	+	Presence of <5cm stems records regeneration
10 - 19	+	Record # trees with hollows, not number of hollows
5 - 9	+	Count as one stem where tree is multistemmed
< 5	+	Hollow bearing stem may be a dead stem (incl. stag)
# Trees with hollows	<20cm -	Total #
	>20cm** -	1
Length of logs		Total (m)
		8.2

Measure length of logs >10cm, fully or partly in contact with the ground, and within the plot.

**Hollows of >20cm are recorded for habitat for some threatened species

BAM Litter/ Groundcover (1 x 1 m plots) Litter cover is used for BAM, other attributes are useful for recording site condition in general

		1	2	3	4	5	Average
Sub-plot score (% cover)	**Litter**	90	90	75	85	100	88
	Bare ground						
	Cryptogam						
	Rock						

Litter / groundcover plots are located at 5, 15, 25, 35, 45 m (alternating sides) along the midline of Function plot

Other plot information (not essential for BAM)

Disturbance	Severity	Timing	Landform
Clearing (incl. logging)			Microrelief
Cultivation			Slope
Grazing (native / stock)			Aspect
Soil erosion			Soil surface texture
Firewood removal			Soil colour
Fire (ground stratum, mid, canopy burnt?)			Site drainage
Storm damage			Distance to nearest water
Weediness			Distance to nearest rock outcrop /cave

Severity code: 0=no evidence, 1=slight, 2=moderate, 3= severe

Timing code: R = recent (<3y), NR = not recent, O = old/historic

Notes

BAM Plot - Field Survey Sheet

Date	19/07/2023	Survey Name	Tocumwal Magazine Upgrade			
Recorders	David Orchard, Paris Hughes		Plot ID #	TO07	Zone ID	9_Remnant
GF code	*Genus species* (tick if photographed or sample taken)		Cover %	Abund (count)	N, E, HTE	Stratum
TG	*Eucalyptus camaldulensis*		25		N	
GG	*Rytidosperma caespitosum*		10		N	
GG	*Lolium* sp.		35		E	
GG	*Eragrostis curvula*		0.1	1	HTE	
FG	*Echium plantagineum*		0.1	20	E	
FG	*Medicago polymorpha*		0.1	10	E	
FG	*Trifolium subterraneum*		0.1	6	E	
FG	*Arctotheca calendula*		0.1	30	E	
FG	*Sonchus oleraceus*		0.1	10	E	
FG	*Chenopodium murale*		0.1	5	E	
FG	*Vittadinia gracilis*		0.1	3	N	
FG	*Lactuca serriola*		0.1	2	E	
EG	*Marsilea drummondii*		0.1	1	N	
GG	*Juncus subsecundus*		0.1	10	N	
FG	*Oxalis perennans*		0.1	5	N	
FG	*Malva parviflora*		0.1	1	E	
FG	*Cirsium vulgare*		0.1	2	E	
SG	*Atriplex semibaccata*		0.1	1	N	
FG	*Solanum nigrum*		0.1	3	E	
FG	*Solanum elaeagnifolium*		0.1	1	HTE	

Growth Form (see BAM Appendix 4) - Tree (TG), Shrub (SG), Grass & grasslike (GG), Forb (FG), Fern (EG), Other (OG)
Cover: 0.1, 0.2, 0.3, ... 1, 2, 3, ...10, 15, 20, 25, ...100% (incl. leaf, branch, stem cover per species).
Abundance for each species with ≤5% cover: 1, 2, 3, 4, ... 10, 20, 30, ... 100, 500, 1000, 1500, 2000 stems
N=native, E=exotic, HTE=high threat exotic
All species in a plot must be recorded. If you can only ID to genus, separate different species by unique identifiyer e.g. *Genus* sp1, *Genus* sp2 etc
Identify top 3 dominants in each stratum (use own stratum definitions) Cover area examples: 0.1% = 63x63cm, 0.5% = 1.4x1.4m, 1% =2x2 m, 5%=4x5m, 25%=10x10m

BAM Plot - Field Survey Sheet

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Date	10/10/2023	**Survey Name**	Tocumwal Magazine Upgrade				
Recorders	David Orchard, Paris Hughes			**Plot ID #**	TOX01	**Zone ID**	45_Mod.
Photo #	-			**Plot dimensions**			20 x 50
Datum	GDA94	**Zone**	55	**Plot bearing along midline**			11
Easting	367875	**Northing**	6040690	Record magnetic bearing along midline from 0 m point			

Record easting, northing at plot marker (0 m point), Photos taken vertically and horizontally at 0m point and 50 m point, looking into plot

IBRA region	Riverina
Subregion	Murray Fans
Likely Vegetation Class	Riverine Plain Grasslands
Plant Community Type	45

Condition state Moderate

Floristics plot is centred on the midline, at 0 m point, 10 m either side

BAM Composition / Structure plot (400m^2)		
Dimensions (circle applicable size)		
20 x 20 m	~~10 x 40 m~~	**Sum values***
Native Richness (count of native species)	**Trees**	0
	Shrubs	0
	Grasses etc	6
	Forbs	7
	Ferns	1
	Other	1
Cover (sum of cover of natives species)	**Trees**	0
	Shrubs	0
	Grasses etc	83.1
	Forbs	0.7
	Ferns	0.1
	Other	0.1
High threat weed cover		0

*These values summarise the floristic data for input into BAM calculator

Function plot is an extention of floristics plot out to 50 m along midline (or equiv. area)

BAM Function plot (1000m^2)		
Dimensions (circle applicable size)		
20 x 50 m	~~10 x 100 m~~	
Tree stem DBH (cm)		Notes on function attributes:
>80	0	Stem size class records # large trees (cf. benchmark)
50 - 79	0	Record stems for living trees only, and for all species
30 - 49	-	For multistemmed trees, record only the largest stem
20 - 29	-	Presence of <5cm stems records regeneration
10 - 19	-	Record # trees with hollows, not number of hollows
5 - 9	-	Count as one stem where tree is multistemmed
< 5	-	Hollow bearing stem may be a dead stem (incl. stag)

# Trees with hollows	<20cm	-	Total #
	>20cm**	-	0
Length of logs			Total (m)
			0

Measure length of logs >10cm, fully or partly in contact with the ground, and within the plot.

**Hollows of >20cm are recorded for habitat for some threatened species

BAM Litter/ Groundcover (1 x 1 m plots) Litter cover is used for BAM, other attributes are useful for recording site condition in general

		1	2	3	4	5	Average
Sub-plot score (% cover)	**Litter**	0	2	0	1	0	0.6
	Bare ground						
	Cryptogam						
	Rock						

Litter / groundcover plots are located at 5, 15, 25, 35, 45 m (alternating sides) along the midline of Function plot

Other plot information (not essential for BAM)

Disturbance	Severity	Timing	Landform
Clearing (incl. logging)			Microrelief
Cultivation			Slope
Grazing (native / stock)			Aspect
Soil erosion			Soil surface texture
Firewood removal			Soil colour
Fire (ground stratum, mid, canopy burnt?)			Site drainage
Storm damage			Distance to nearest water
Weediness			Distance to nearest rock outcrop /cave

Severity code: 0=no evidence, 1=slight, 2=moderate, 3= severe

Timing code: R = recent (<3y), NR = not recent, O = old/historic

Notes

BAM Plot - Field Survey Sheet

Date	10/10/2023	Survey Name	Tocumwal Magazine Upgrade			
Recorders	David Orchard, Paris Hughes		Plot ID #	TOX01	Zone ID	45_Mod.
GF code	***Genus species*** (tick if photographed or sample taken)		Cover %	Abund (count)	N, E, HTE	Stratum
GG	*Austrostipa aristiglumis*		2		N	
GG	*Rytidosperma duttonianum*		65		N	
FG	*Arctotheca calendula*		0.1	30	E	
FG	*Goodenia pinnatifida*		0.1	5	N	
FG	*Sida corrugata*		0.1	2	N	
FG	*Oxalis perennans*		0.1	10	N	
FG	*Rhodanthe corymbiflora*		0.1	3	N	
FG	*Erodium moschatum*		1		E	
OG	*Convolvulus angustissimus*		0.1	2	N	
FG	*Medicago polymorpha*		2		E	
GG	*Juncus subsecundus*		0.1	8	N	
FG	*Echium plantagineum*		0.1	30	E	
GG	*Lolium* sp.		0.3	100	E	
GG	*Enteropogon acicularis*		1		N	
GG	*Austrostipa scabra*		10		N	
FG	*Trifolium arvense*		2		E	
GG	*Walwhalleya proluta*		5		N	
FG	*Solanum esuriale*		0.1	1	N	
FG	*Haloragis aspera*		0.1	20	N	
FG	*Vittadinia gracilis*		0.1	8	N	
FG	*Moraea setifolia*		0.1	1	E	
FG	*Trifolium subterraneum*		5		E	
EG	*Marsilea drummondii*		0.1	20	N	
FG	*Romulea minutiflora*		0.1	10	E	

Growth Form (see BAM Appendix 4) - Tree (TG), Shrub (SG), Grass & grasslike (GG), Forb (FG), Fern (EG), Other (OG)
Cover: 0.1, 0.2, 0.3, ... 1, 2, 3, ...10, 15, 20, 25, ...100% (incl. leaf, branch, stem cover per species).
Abundance for each species with ≤5% cover: 1, 2, 3, 4, ... 10, 20, 30, ... 100, 500, 1000, 1500, 2000 stems
N=native, E=exotic, HTE=high threat exotic
All species in a plot must be recorded. If you can only ID to genus, separate different species by unique identifiyer e.g. *Genus* sp1, *Genus* sp2 etc
Identify top 3 dominants in each stratum (use own stratum definitions) Cover area examples: 0.1% = 63x63cm, 0.5% = 1.4x1.4m, 1% =2x2 m, 5%=4x5m, 25%=10x10m

BAM Plot - Field Survey Sheet

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Date	10/10/2023	**Survey Name**	Tocumwal Magazine Upgrade				
Recorders	David Orchard, Paris Hughes			**Plot ID #**	NN	**Zone ID**	0_NN
Photo #	-			**Plot dimensions**			20 x 50
Datum	GDA94	**Zone**	55	**Plot bearing along midline**			255
Easting	368104	**Northing**	6040673	Record magnetic bearing along midline from 0 m point			

Record easting, northing at plot marker (0 m point), Photos taken vertically and horizontally at 0m point and 50 m point, looking into plot

IBRA region	Riverina
Subregion	Murray Fans
Likely Vegetation Class	Non-native Vegetation
Plant Community Type	0

Condition state Non-native

Floristics plot is centred on the midline, at 0 m point, 10 m either side

BAM Composition / Structure plot (400m²)		
Dimensions (circle applicable size)		
20 x 20 m	~~10 x 40 m~~	**Sum values***
Native Richness (count of native species)	**Trees**	0
	Shrubs	0
	Grasses etc	2
	Forbs	0
	Ferns	0
	Other	0
Cover (sum of cover of natives species)	**Trees**	0
	Shrubs	0
	Grasses etc	2
	Forbs	0
	Ferns	0
	Other	0
High threat weed cover		0.2

*These values summarise the floristic data for input into BAM calculator

Function plot is an extention of floristics plot out to 50 m along midline (or equiv. area)

BAM Function plot (1000m²)		
Dimensions (circle applicable size)		
20 x 50 m	~~10 x 100 m~~	
Tree stem DBH (cm)		Notes on function attributes:
>80	0	Stem size class records # large trees (cf. benchmark)
50 - 79	0	Record stems for living trees only, and for all species
30 - 49	-	For multistemmed trees, record only the largest stem
20 - 29	-	Presence of <5cm stems records regeneration
10 - 19	-	Record # trees with hollows, not number of hollows
5 - 9	-	Count as one stem where tree is multistemmed
< 5	-	Hollow bearing stem may be a dead stem (incl. stag)

# Trees with hollows	<20cm	-	Total #
	>20cm**	-	0
Length of logs			Total (m) 0

Measure length of logs >10cm, fully or partly in contact with the ground, and within the plot.

**Hollows of >20cm are recorded for habitat for some threatened species

BAM Litter/ Groundcover (1 x 1 m plots) Litter cover is used for BAM, other attributes are useful for recording site condition in general

		1	2	3	4	5	Average
Sub-plot score (% cover)	**Litter**	-	-	-	-	-	-
	Bare ground						
	Cryptogam						
	Rock						

Litter / groundcover plots are located at 5, 15, 25, 35, 45 m (alternating sides) along the midline of Function plot

Other plot information (not essential for BAM)

Disturbance	Severity	Timing	Landform
Clearing (incl. logging)			Microrelief
Cultivation			Slope
Grazing (native / stock)			Aspect
Soil erosion			Soil surface texture
Firewood removal			Soil colour
Fire (ground stratum, mid, canopy burnt?)			Site drainage
Storm damage			Distance to nearest water
Weediness			Distance to nearest rock outcrop /cave

Severity code: 0=no evidence, 1=slight, 2=moderate, 3= severe

Timing code: R = recent (<3y), NR = not recent, O = old/historic

Notes

BAM Plot - Field Survey Sheet

Date	10/10/2023	Survey Name	Tocumwal Magazine Upgrade			
Recorders	David Orchard, Paris Hughes		Plot ID #	NN	Zone ID	0_NN
GF code	***Genus species*** (tick if photographed or sample taken)		Cover %	Abund (count)	N, E, HTE	Stratum
GG	*Lolium* sp.		5		E	
GG	*Hordeum* sp.		50		E	
GG	*Austrostipa scabra*		1		N	
FG	*Cirsium vulgare*		0.1	20	E	
FG	*Marrubium vulgare*		0.1	5	E	
FG	*Xanthium spinosum*		0.1	8	HTE	
FG	*Trifolium arvense*		1	3	E	
GG	*Walwhalleya proluta*		1		N	
FG	*Malva parviflora*		0.1	10	E	
FG	*Chenopodium murale*		0.1	7	E	
GG	*Avena fatua*		30	8	E	
FG	*Solanum elaeagnifolium*		0.1	4	HTE	
FG	*Centaurea melitensis*		0.1	2	E	
FG	*Arctotheca calendula*		1		E	

Growth Form (see BAM Appendix 4) - Tree (TG), Shrub (SG), Grass & grasslike (GG), Forb (FG), Fern (EG), Other (OG)
Cover: 0.1, 0.2, 0.3, ... 1, 2, 3, ...10, 15, 20, 25, ...100% (incl. leaf, branch, stem cover per species).
Abundance for each species with ≤5% cover: 1, 2, 3, 4, ... 10, 20, 30, ... 100, 500, 1000, 1500, 2000 stems
N=native, E=exotic, HTE=high threat exotic
All species in a plot must be recorded. If you can only ID to genus, separate different species by unique identifiyer e.g. *Genus* sp1, *Genus* sp2 etc
Identify top 3 dominants in each stratum (use own stratum definitions) Cover area examples: 0.1% = 63x63cm, 0.5% = 1.4x1.4m, 1% =2x2 m, 5%=4x5m, 25%=10x10m

Appendix D: EPBC Act Habitat Assessment and Matters of National Environmental Significance

The EPBC Act protects nationally and internationally important flora, fauna, ecological communities and heritage places, which are defined in the EPBC Act as matters of national environmental significance. The EPBC Act policy *Matters of National Environmental Significance: Significant Impact Guidelines 1.1* (DoE, 2013) forms the basis of determining if impact to protected matters is significant.

The EPBC Act protected matters search has identified seven wetlands of international importance, five TECs, 36 threatened species, 9 migratory species and 16 marine species that could possibly occur in the 10 km search area (**Appendix A**).

The following tables give an overview of the assessments of these threatened entities and shows that the proposed activity:

1. Is not likely to have a significant impact on a matter of national environmental significance. The matters of national environmental significance are:
    i. World heritage properties.
    ii. National heritage places.
    iii. Wetlands of international importance.
    iv. Threatened species and ecological communities.
    v. Migratory species.
    vi. Commonwealth marine areas.
    vii. The Great Barrier Reef Marine Park. and;
    viii. Nuclear actions (including uranium mines).
    ix. A water resource, in relation to coal seam gas development and large coal mining development.
2. Is not likely to have a significant impact on the environment in general (for actions by Commonwealth agencies or actions on Commonwealth land) or the environment on Commonwealth land (for actions outside Commonwealth land).

Notes:

Important Population as determined by the *Environment Protection and Biodiversity Conservation Act 1999*, is one that for a vulnerable species:

a) is likely to be key source populations either for breeding or dispersal
b) is likely to be necessary for maintaining genetic diversity
c) is at or near the limit of the species range.

A ‘significant impact’ is an impact which is important, notable, or of consequence, having regard to its context or intensity (DoE, 2013).

Species life cycle information in Likelihood of Occurrence section below is sourced from https://www.environment.nsw.gov.au/threatenedSpeciesApp

Wetlands of International Importance

Name	Proximity	Assessment of significance required (Yes / No)
Banrock Station Wetland Complex	500 – 600 km upstream	No, the proposal does not occur close to the wetland.
Barmah Forest	10 – 20 km upstream	No, the proposal is not connected to this wetland (**Section 3.9**).
Gunbower Forest	50 – 100 km upstream	No, the proposal does not occur close to the wetland.
Hattah-kulkyne Lakes	200 – 300 km upstream	No, the proposal does not occur close to the wetland.
NSW Central Murray State Forests	10 – 20 km upstream	No, the proposal is not connected to this wetland (**Section 3.9**).
Riverland	400 – 500 km upstream	No, the proposal does not occur close to the wetland.
The Coorong, and Lakes Alexandrina and Albert Wetland	500 – 600 km upstream	No, the proposal does not occur close to the wetland.

EPBC Act-listed Threatened Ecological Communities

Name	Status	Assessment of significance required (Yes / No)
Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions	Endangered	No, this community does not occur within the subject land.
Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	Endangered	No, this community does not occur within the subject land.
Natural grasslands of the Murray Valley Plains	Critically Endangered	Yes, this community occurs within the subject land.
Weeping Myall Woodlands	Endangered	No, this community does not occur within the subject land.
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	No, this community does not occur within the subject land.

Scientific Name	Common Name	+Comm. Status	BioNet Records <10 km?	Likelihood of Occurrence	Test of significance required (Yes/No)
THREATENED BIRDS					
Anthochaera phrygia	Regent Honeyeater	CE	0	The Regent Honeyeater mainly inhabits temperate woodlands and open forests of the inland slopes of south-east Australia. Birds are also found in drier coastal woodlands and forests in some years. Once recorded between Adelaide and the central coast of Queensland, its range has contracted dramatically in the last 30 years to between north-eastern Victoria and south-eastern Queensland. The Regent Honeyeater is a generalist forager, although it feeds mainly on the nectar from a relatively small number of eucalypts that produce high volumes of nectar. Key eucalypt species include Mugga Ironbark, Yellow Box, White Box and Swamp Mahogany. Other tree species may be regionally important. For example, the Lower Hunter Spotted Gum forests have recently been demonstrated to support regular breeding events. Flowering of associated species such as Thin-leaved Stringybark *Eucalyptus eugenioides* and other Stringybark species, and Broad-leaved Ironbark *E. fibrosa* can also contribute important nectar flows at times. Nectar and fruit from the mistletoes *Amyema miquelii*, A. pendula and *A. cambagei* are also utilised. When nectar is scarce lerp and honeydew can comprise a large proportion of the diet. Insects make up about 15% of the total diet and are important components of the diet of nestlings. Colour-banding of Regent Honeyeater has shown that the species can undertake large-scale nomadic movements in the order of hundreds of kilometres. It is likely that movements are dependent on spatial and temporal flowering and other resource patterns. There are three known key breeding areas, two of them in NSW - Capertee Valley and Bundarra-Barraba regions. The species breeds between July and January in Box-Ironbark and other temperate woodlands and riparian gallery forest dominated by River Sheoak. Regent Honeyeaters usually nest in horizontal branches or forks in tall mature eucalypts and Sheoaks. Also nest in mistletoe haustoria. **Moderate (foraging) – Subject land is within the known distribution of the species and associated vegetation communities (PCT 9 and 74) are present. However, there are no records within 10 km.**	Yes
Aphelocephala leucopsis	Southern	V	0	The southern whiteface is typically inhabits arid open woodlands	No

Scientific Name	Common Name	+Comm. Status	BioNet Records <10 km?	Likelihood of Occurrence	Test of significance required (Yes/No)
	Whiteface			with a shrubby or grassy understory, as well as grass plains throughout much of southern Australia. It prefers *Acacia* woodlands, particularly those dominated by mulga and drought-resistant chenopod shrub species, including saltbush and bluebush. **Low – Subject land is within the known distribution of the species. However, vegetation communities within the site are a poor match for the known preferences of the species and there are no records within 10 km.**	
Botaurus poiciloptilus	Australasian Bittern	E	0	Australasian Bitterns are widespread but uncommon over south-eastern Australia. In NSW they may be found over most of the state except for the far north-west. Favours permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes (*Typha* spp.) and spikerushes (*Eleocharis* spp.). Hides during the day amongst dense reeds or rushes and feed mainly at night on frogs, fish, yabbies, spiders, insects and snails. Feeding platforms may be constructed over deeper water from reeds trampled by the bird; platforms are often littered with prey remains. Breeding occurs in summer from October to January; nests are built in secluded places in densely-vegetated wetlands on a platform of reeds; there are usually six olive-brown eggs to a clutch. **Absent - No appropriate marsh habitat present.**	No
Calidris acuminata	Sharp-tailed Sandpiper	V,C,J,K	0	The Sharp-tailed Sandpiper spends the non-breeding season in Australia with small numbers occurring regularly in New Zealand. Most of the population migrates to Australia, mostly to the south-east and are widespread in both inland and coastal locations and in both freshwater and saline habitats. Many inland records are of birds on passage. In Australasia, the Sharp-tailed Sandpiper prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation. This includes lagoons, swamps, lakes and pools near the coast, and dams, waterholes, soaks, bore drains and bore swamps, saltpans and hypersaline saltlakes inland. They also occur in saltworks and sewage farms. They use flooded paddocks, sedgelands and other ephemeral wetlands, but leave when they dry. They use intertidal mudflats in sheltered bays, inlets, estuaries or seashores, and swamps and creeks lined with mangroves. They tend to occupy coastal mudflats mainly after ephemeral terrestrial wetlands have	No

Scientific Name	Common Name	+Comm. Status	BioNet Records <10 km?	Likelihood of Occurrence	Test of significance required (Yes/No)
				dried out, moving back during the wet season. They may be attracted to mats of algae and water weed either floating or washed up around terrestrial wetlands. **Absent - No appropriate wetland habitat present.**	
Calidris ferruginea	Curlew Sandpiper	CE,C,J,K	1	In Australia, Curlew Sandpipers occur around the coasts and are also quite widespread inland, though in smaller numbers. Records occur in all states during the non-breeding period, and also during the breeding season when many non-breeding one-year old birds remain in Australia rather than migrating north. In NSW, they are widespread east of the Great Divide, especially in coastal regions. They are occasionally recorded in the Tablelands and are widespread in the Riverina and south-west NSW, with scattered records elsewhere. **Absent - No appropriate wetland habitat present.**	No
Climacteris picumnus victoriae	Brown Treecreeper (south-eastern)	V	20	The Brown Treecreeper is endemic to eastern Australia and occurs in eucalypt forests and woodlands of inland plains and slopes of the Great Dividing Range. It is less commonly found on coastal plains and ranges. The western boundary of the range of *Climacteris picumnus victoriae* runs approximately through Corowa, Wagga Wagga, Temora, Forbes, Dubbo and Inverell and along this line the subspecies intergrades with the arid zone subspecies of Brown Treecreeper *Climacteris picumnus picumnus* which then occupies the remaining parts of the state. The eastern subspecies lives in eastern NSW in eucalypt woodlands through central NSW and in coastal areas with drier open woodlands such as the Snowy River Valley, Cumberland Plains, Hunter Valley and parts of the Richmond and Clarence Valleys. The population density of this subspecies has been greatly reduced over much of its range, with major declines recorded in central NSW and the northern and southern tablelands. Declines have occurred in remnant vegetation fragments smaller than 300 hectares, that have been isolated or fragmented for more than 50 years. **High – Subject land is within the known distribution of the species, an associated vegetation community (PCT 74) is present, and there are 20 records within 10 km.**	Yes
Falco hypoleucos	Grey Falcon	V	0	The Grey Falcon is sparsely distributed in NSW, chiefly throughout	Yes

Scientific Name	Common Name	+Comm. Status	BioNet Records <10 km?	Likelihood of Occurrence	Test of significance required (Yes/No)
				the Murray-Darling Basin, with the occasional vagrant east of the Great Dividing Range. The breeding range has contracted since the 1950s with most breeding now confined to arid parts of the range. There are possibly less than 5000 individuals left. Population trends are unclear, though it is believed to be extinct in areas with more than 500mm rainfall in NSW. Usually restricted to shrubland, grassland and wooded watercourses of arid and semi-arid regions, although it is occasionally found in open woodlands near the coast. Also occurs near wetlands where surface water attracts prey. Preys primarily on birds, especially parrots and pigeons, using high-speed chases and stoops; reptiles and mammals are also taken. Like other falcons it utilises old nests of other birds of prey and ravens, usually high in a living eucalypt near water or a watercourse; peak laying season is in late winter and early spring; two or three eggs are laid. **Moderate – Subject land is within the predicted distribution of the species and an associated vegetation community (PCT 45) is present. However, there are no records within 10 km.**	
Gallinago hardwickii	Latham's Snipe	V,J,K	0	Latham's Snipe is a non-breeding visitor to south-eastern Australia and is a passage migrant through northern Australia (i.e. it travels through northern Australia to reach non-breeding areas located further south). The species has been recorded along the east coast of Australia from Cape York Peninsula through to south-eastern South Australia (including the Adelaide plains and Mount Lofty Ranges, and the Eyre Peninsula). The range extends inland over the eastern tablelands in south-eastern Queensland (and occasionally from Rockhampton in the north), and to west of the Great Dividing Range in New South. The species is widespread in Tasmania and is found in all regions of Victoria except for the north-west. Most birds spend the non-breeding period at sites located south of the Richmond River in New South Wales. In Australia, Latham's Snipe occurs in permanent and ephemeral wetlands up to 2000 m above sea-level. They usually inhabit open, freshwater wetlands with low, dense vegetation (e.g. swamps, flooded grasslands or heathlands, around bogs and other water bodies. However, they can also occur in habitats with saline or brackish water, in modified or artificial habitats, and in habitats located close to humans or human activity.	No

Scientific Name	Common Name	+Comm. Status	BioNet Records <10 km?	Likelihood of Occurrence	Test of significance required (Yes/No)
				Absent - No appropriate wetland habitat present.	
Grantiella picta	Painted Honeyeater	V	0	The Painted Honeyeater is nomadic and occurs at low densities throughout its range. The greatest concentrations of the bird and almost all breeding occurs on the inland slopes of the Great Dividing Range in NSW, Victoria and southern Queensland. During the winter it is more likely to be found in the north of its distribution. Inhabits Boree/ Weeping Myall (*Acacia pendula*), Brigalow (*A. harpophylla*) and Box-Gum Woodlands and Box-Ironbark Forests. **Moderate - Subject land is within the known distribution of the species and associated vegetation communities (PCT 9 and 74) are present. However, there are no records within 10 km.**	Yes

Scientific Name	Common Name	+Comm. Status	BioNet Records <10 km?	Likelihood of Occurrence	Test of significance required (Yes/No)
Hirundapus caudacutus	White-throated Needletail	V,C,J,K	0	The White-throated Needletail is widespread in eastern and south-eastern. In eastern Australia, it is recorded in all coastal regions of Queensland and NSW, extending inland to the western slopes of the Great Divide and occasionally onto the adjacent inland plains. In Australia, the White-throated Needletail is almost exclusively aerial, from heights of less than 1 m up to more than 1000 m above the ground. Because they are aerial, it has been stated that conventional habitat descriptions are inapplicable, but there are, nevertheless, certain preferences exhibited by the species. Although they occur over most types of habitat, they are probably recorded most often above wooded areas, including open forest and rainforest, and may also fly between trees or in clearings, below the canopy, but they are less commonly recorded flying above woodland. **Moderate - Subject land is within the known distribution of the species and associated vegetation communities (PCT 9, 45, and 74) are present. However, there are no records within 10 km.**	Yes
Lathamus discolor	Swift Parrot	CE	0	Breeds in Tasmania during spring and summer, migrating in the autumn and winter months to south-eastern Australia from Victoria and the eastern parts of South Australia to south-east Queensland. In NSW mostly occurs on the coast and south west slopes. Migrates to the Australian south-east mainland between March and October. On the mainland they occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. Favoured feed trees include winter flowering species such as Swamp Mahogany *Eucalyptus robusta*, Spotted Gum *Corymbia maculata*, Red Bloodwood *C. gummifera*, Mugga Ironbark *E. sideroxylon*, and White Box *E. albens*. Commonly used lerp infested trees include Inland Grey Box *E. microcarpa*, Grey Box *E. moluccana* and Blackbutt *E. pilularis*. Return to some foraging sites on a cyclic basis depending on food availability. Following winter they return to Tasmania where they breed from September to January, nesting in old trees with hollows and feeding in forests dominated by Tasmanian Blue Gum *Eucalyptus globulus*. **Moderate (foraging) - Subject land is within the known distribution of the species and associated vegetation**	Yes

Scientific Name	Common Name	+Comm. Status	BioNet Records <10 km?	Likelihood of Occurrence	Test of significance required (Yes/No)
				communities (PCT 9 and 74) are present. However, there are no records within 10 km.	
Lophochroa leadbeateri leadbeateri	Pink Cockatoo	E	0	Found across the arid and semi-arid inland, from south-western Queensland south to north-west Victoria, through most of South Australia, north into the south-west Northern Territory and across to the west coast between Shark Bay and about Jurien. In NSW it is found regularly as far east as about Bourke and Griffith, and sporadically further east than that. Inhabits a wide range of treed and treeless inland habitats, always within easy reach of water. Feeds mostly on the ground, especially on the seeds of native and exotic melons and on the seeds of species of saltbush, wattles and cypress pines. Normally found in pairs or small groups, though flocks of hundreds may be found where food is abundant. Nesting, in tree hollows, occurs throughout the second half of the year; nests are at least 1 km apart, with no more than one pair every 30 square kilometres. **Absent (surveyed) - Subject land is within the known distribution of the species and associated vegetation communities (PCT 9, 45, and 74) are present. However, there are no records within 10 km. However, this species was eliminated via targeted surveys.**	No
Melanodryas cucullata cucullata	Hooded Robin (south-eastern form)	E	0	The Hooded Robin is widespread, found across Australia, except for the driest deserts and the wetter coastal areas - northern and eastern coastal Queensland and Tasmania. However, it is common in few places, and rarely found on the coast. It is considered a sedentary species, but local seasonal movements are possible. The south-eastern form (subspecies *cucullata*) is found from Brisbane to Adelaide and throughout much of inland NSW, with the exception of the extreme north-west, where it is replaced by subspecies *picata*. Two other subspecies occur outside NSW. Prefers lightly wooded country, usually open eucalypt woodland, acacia scrub and mallee, often in or near clearings or open areas. Requires structurally diverse habitats featuring mature eucalypts, saplings, some small shrubs and a ground layer of moderately tall native grasses. **Moderate - Subject land is within the known distribution of the species and associated vegetation communities (PCT 9 and 74) are present. However, there are no records within 10 km.**	Yes

Scientific Name	Common Name	+Comm. Status	BioNet Records <10 km?	Likelihood of Occurrence	Test of significance required (Yes/No)
Neophema chrysostoma	Blue-winged Parrot	V	2	The main populations of Blue-winged Parrots are in Tasmania and Victoria, particularly in southern Victoria and the midlands and eastern areas of Tasmania. Sparser populations are found in western New South Wales and eastern South Australia, extending to south-west Queensland and occasionally into the Northern Territory. The species is a partial migrant, with variable numbers of birds migrating across the Bass Strait in winter. **Moderate – Subject land is within the known distribution of the species and there are two records within 10 km. However, there are no associated vegetation communities present.**	Yes
Pedionomus torquatus	Plains-wanderer	CE	0	Plains-wanderers live in semi-arid, lowland native grasslands that typically occur on hard red-brown soils. These grasslands support a high diversity of plant species, including a number of state and nationally threatened species. The Plains-wanderer has declined greatly since European settlement. Areas where the species was formerly common and is now so reduced in numbers that it is effectively extinct include eastern NSW, south-western Victoria, and south-eastern South Australia. Its current stronghold is the western Riverina of southern NSW. Areas of secondary importance include north-central Victoria and central-western Queensland. The bird was formerly fairly common until about 1920 on the Slopes and Tablelands, and there are two earlier records of birds near Sydney. The main reason for the decline in the numbers and distribution of Plains-wanderers in all eastern States has been the conversion of native grasslands to dense introduced pasture or croplands. If native grasslands are not overgrazed or cultivated then Plains-wanderers are largely sedentary, though there is some recent evidence to suggest that birds may not remain sedentary during prolonged drought conditions. **Low – Subject land is within the known distribution of the species. However, there are no associated vegetation communities present or records within 10 km.**	No
Polytelis swainsonii	Superb Parrot	V	4	The Superb Parrot is found throughout eastern inland NSW. On the South-western Slopes their core breeding area is roughly bounded by Cowra and Yass in the east, and Grenfell, Cootamundra and Coolac in the west. Birds breeding in this region are mainly absent during winter, when they migrate north to the region of the upper	Yes

Scientific Name	Common Name	+Comm. Status	BioNet Records <10 km?	Likelihood of Occurrence	Test of significance required (Yes/No)
				Namoi and Gwydir Rivers. The other main breeding sites are in the Riverina along the corridors of the Murray, Edward and Murrumbidgee Rivers where birds are present all year round. This species inhabits Box-Gum, Box-Cypress-pine and Boree Woodlands and River Red Gum Forest. **High – Subject land is within the known distribution of the species, associated vegetation communities (PCT 9, 45, 74) are present, and there are four records within 10 km.**	
Rostratula australis	Australian Painted Snipe	E	0	The Australian Painted Snipe is restricted to Australia. Most records are from the south east, particularly the Murray Darling Basin, with scattered records across northern Australia and historical records from around the Perth region in Western Australia. In NSW many records are from the Murray-Darling Basin including the Paroo wetlands, Lake Cowal, Macquarie Marshes, Fivebough Swamp and more recently, swamps near Balldale and Wanganella. Other important locations with recent records include wetlands on the Hawkesbury River and the Clarence and lower Hunter Valleys. Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber. Nests on the ground amongst tall vegetation, such as grasses, tussocks or reeds. **Absent - No appropriate wetland habitat present.**	No
Stagonopleura guttata	Diamond Firetail	V	0	The Diamond Firetail is endemic to south-eastern Australia, extending from central Queensland to the Eyre Peninsula in South Australia. It is widely distributed in NSW, with a concentration of records from the Northern, Central and Southern Tablelands, the Northern, Central and South Western Slopes and the North West Plains and Riverina. Not commonly found in coastal districts, though there are records from near Sydney, the Hunter Valley and the Bega Valley. This species has a scattered distribution over the rest of NSW, though is very rare west of the Darling River. Found in grassy eucalypt woodlands, including Box-Gum Woodlands and Snow Gum Eucalyptus pauciflora Woodlands. Also occurs in open forest, mallee, Natural Temperate Grassland, and in secondary grassland derived from other communities. **Moderate - Subject land is within the known distribution of the species and associated vegetation communities (PCT 9, 45,**	Yes

Scientific Name	Common Name	+Comm. Status	BioNet Records <10 km?	Likelihood of Occurrence	Test of significance required (Yes/No)
				and 74) are present. However, there are no records within 10 km.	
FISH					
Galaxias rostratus	Flathead Galaxias	CE	0	Flathead Galaxias, also known as Murray jollytail are a small native fish that are known from the southern part of the Murray Darling Basin. They have been recorded in the Macquarie, Lachlan, Murrumbidgee and Murray Rivers in NSW. Despite extensive scientific sampling over the past 15 years there have been very few recorded sightings of Flathead Galaxias. They have not been recorded and are considered locally extinct in the lower Murray, Murrumbidgee, Macquarie and Lachlan Rivers. The species is now only known from the upper Murray River near Tintaldra and wetland areas near Howlong. Flathead Galaxias are found in still or slow moving water bodies such as wetlands and lowland streams. The species has been recorded forming shoals. They have been associated with a range of habitats including rock and sandy bottoms and aquatic vegetation. Flathead Galaxias spawn in spring and lay slightly adhesive demersal eggs. **Absent – No suitable aquatic habitat present.**	No
Macquaria australasica	Macquarie Perch	E	0	The Macquarie Perch is a moderate-sized fish with an elongate-oval body which is laterally compressed. In the Murray-Darling Basin the species varies from almost black or dark silvery grey to bluish grey or green-brown above, paler to off-white below, often with a yellowish tinge. Macquarie Perch have declined considerably from their historical distribution within NSW and they are now considered isolated to the upper reaches of the Lachlan and Murrumbidgee Rivers in southern NSW (Ingram et al. 1990). It is also found in low numbers in the Mongarlowe River (Lintermans 2008). Other populations exist in Cataract Dam in the Nepean River catchment, as well as a 2008 record from Georges River near Campbelltown, the first record from the river since 1894 (NSW DPI 2008a). It persists in the Burrinjuck, Cotter (Murrumbidgee) and Wyangala impoundments (McDowall 1996). A breeding population in the Queanbeyan River upstream of the Googong Reservoir exists solely due to a translocation of individuals from the reservoir past a natural barrier (Lintermans	No

Scientific Name	Common Name	+Comm. Status	BioNet Records <10 km?	Likelihood of Occurrence	Test of significance required (Yes/No)
				2006). The Googong reservoir population is believed to be effectively extinct. Macquarie perch may occasionally become displaced downstream from the Queanbeyan River into Googong, but they do not form a population in the reservoir (Lintermans pers comm 2009). Hawkesbury and Shoalhaven River populations, seem abundant. Records have also been made in the Dharawal State Conservation Area, the Metropolitan Special Area and in adjacent areas around Appin (Bio-Analysis Pty Ltd 2009). The Macquarie Perch is a riverine, schooling species. It prefers clear water and deep, rocky holes with lots of cover. As well as aquatic vegetation, additional cover may comprise of large boulders, debris and overhanging banks (Cadwallader & Eden 1979). Spawning occurs just above riffles (shallow running water). Populations may survive in impoundments if able to access suitable spawning sites (Wager & Jackson 1993). **Absent – No suitable aquatic habitat present.**	
FROGS					
Crinia sloanei	Sloane's Froglet	E	0	Sloane's Froglet has been recorded from widely scattered sites in the floodplains of the Murray-Darling Basin, with the majority of records in the Darling Riverine Plains, NSW South Western Slopes and Riverina bioregions in New South Wales. It has not been recorded recently in the northern part of its range and has only been recorded infrequently in the southern part of its range in NSW. It is typically associated with periodically inundated areas in grassland, woodland and disturbed habitats. **Moderate – Subject land is within the known distribution of the species and an associated vegetation community (PCT 74) is present. However, there are no records within 10 km.**	Yes
Litoria raniformis	Southern Bell Frog	V	0	In NSW the species was once distributed along the Murray and Murrumbidgee Rivers and their tributaries, the southern slopes of the Monaro district and the central southern tablelands as far north as Tarana, near Bathurst. Currently, the species is known to exist only in isolated populations in the Coleambally Irrigation Area, the Lowbidgee floodplain and around Lake Victoria. A few yet unconfirmed records have also been made in the Murray Irrigation	No

Scientific Name	Common Name	+Comm. Status	BioNet Records <10 km?	Likelihood of Occurrence	Test of significance required (Yes/No)
				Area in recent years. The species is also found in Victoria, Tasmania and South Australia, where it has also become endangered. Usually found in or around permanent or ephemeral Black Box/Lignum/Nitre Goosefoot swamps, Lignum/Typha swamps and River Red Gum swamps or billabongs along floodplains and river valleys. They are also found in irrigated rice crops, particularly where there is no available natural habitat. **Low – Subject land is within the known geographic distribution of the species. However, there are no associated vegetation communities present or records within 10 km.**	
INSECTS					
Synemon plana	Golden Sun Moth	CE	0	The Golden Sun Moth's NSW populations are found in the area between Queanbeyan, Gunning, Young and Tumut. The species' historical distribution extended from Bathurst (central NSW) through the NSW Southern Tablelands, through to central and western Victoria, to Bordertown in eastern South Australia. Occurs in Natural Temperate Grasslands and grassy Box-Gum Woodlands in which groundlayer is dominated by wallaby grasses *Austrodanthonia spp*. **Low – Subject land is not within the known geographic distribution of the species. There are no associated vegetation communities present or records within 10 km.**	No
MAMMALS					
Nyctophilus corbeni	Corben's Long-eared Bat	V	0	Overall, the distribution of the south eastern form coincides approximately with the Murray Darling Basin with the Pilliga Scrub region being the distinct stronghold for this species. Inhabits a variety of vegetation types, including mallee, bulloke *Allocasuarina luehmannii* and box eucalypt dominated communities, but it is distinctly more common in box/ironbark/cypress-pine vegetation that occurs in a north-south belt along the western slopes and plains of NSW and southern Queensland. Roosts in tree hollows, crevices, and under loose bark. **Low – Subject land is within the predicted geographic distribution of the species. However, there are no associated**	No

Scientific Name	Common Name	+Comm. Status	BioNet Records <10 km?	Likelihood of Occurrence	Test of significance required (Yes/No)
				vegetation communities present or records within 10 km.	
Phascolarctos cinereus	Koala	E	58	The Koala has a fragmented distribution throughout eastern Australia from north-east Queensland to the Eyre Peninsula in South Australia. In New South Wales, Koala populations are found on the central and north coasts, southern highlands, southern and northern tablelands, Blue Mountains, southern coastal forests, with some smaller populations on the plains west of the Great Dividing Range. Inhabit eucalypt woodlands and forests. **Absent – Subject land is within the known distribution of the species, associated vegetation communities (PCT 9 and 74) are present, and there are 58 records within 10 km. However, this species was eliminated via targeted surveys.**	No
Pteropus poliocephalus	Grey-headed Flying-fox	V	0	Grey-headed Flying-foxes are generally found within 200 km of the eastern coast of Australia, from Rockhampton in Queensland to Adelaide in South Australia. In times of natural resource shortages, they may be found in unusual locations. Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy. Individual camps may have tens of thousands of animals and are used for mating, and for giving birth and rearing young. Site fidelity to camps is high; some camps have been used for over a century. Can travel up to 50 km from the camp to forage; commuting distances are more often <20 km. Feed on the nectar and pollen of native trees, in particular *Eucalyptus, Melaleuca* and *Banksia*, and fruits of rainforest trees and vines. Also forage in cultivated gardens and fruit crops. **Low – Subject land is not within the known geographic distribution of the species. There are no associated vegetation communities present or records within 10 km.**	No
PLANTS					
Amphibromus fluitans	Floating Swamp Wallaby-grass	V	0	There are many historic collections in the City of Greater Albury. It has been recorded recently in lagoons beside the Murray River near Cooks Lagoon (Shire of Greater Hume), Mungabarina Reserve,	No

Scientific Name	Common Name	+Comm. Status	BioNet Records <10 km?	Likelihood of Occurrence	Test of significance required (Yes/No)
				East Albury, at Ettamogah, Thurgoona (Charles Sturt University Campus), near Narranderra, and also further west along the Murray River (near Mathoura) and in Victoria. There is a recent record of this species near Laggan in Upper Lachlan Shire. It is also found in Victoria and in Tasmania. *Amphibromus fluitans* grows mostly in permanent swamps. The species needs wetlands which are at least moderately fertile and which have some bare ground, conditions which are produced by seasonally-fluctuating water levels. Habitats in south-western NSW include swamp margins in mud, dam and tank beds in hard clay and in semi-dry mud of lagoons with *Potamogeton* and *Chamaeraphis* species. **Low – Subject land is within the known geographic distribution of the species. However, there are no associated vegetation communities present, and no records within 10 km.**	
Austrostipa wakoolica	A spear-grass	E	4	Confined to the floodplains of the Murray River tributaries of central-western and south-western NSW, with localities including Manna State Forest, Matong, Lake Tooim, Merran Creek, Tulla, Cunninyeuk and Mairjimmy State Forest (now part of South West Woodland Nature Reserve). Grows on floodplains of the Murray River tributaries, in open woodland on grey, silty clay or sandy loam soils; habitats include the edges of a lignum swamp with box and mallee; creek banks in grey, silty clay; mallee and lignum sandy-loam flat; open Cypress Pine forest on low sandy range; and a low, rocky rise. **Absent (surveyed) – Targeted flora surveys in October, during the survey window for this species, failed to detect any individuals within the site.**	No
Brachyscome muelleroides	Claypan Daisy	V	0	The Claypan Daisy occurs in the Wagga Wagga, Narranderra, Tocumwal and Walbundrie areas. Also occurs in north-central Victoria (only along the Murray from Tocumwal to the Ovens River). Grows in damp areas on the margins of claypans in moist grassland with *Pycnosorus globosus, Agrostis avenacea* and *Austrodanthonia duttoniana*. Also recorded from the margins of lagoons in mud or water, and in association with *Calotis anthemoides*. **Absent (surveyed) – Targeted flora surveys in October, during the survey window for this species, failed to detect any**	No

Scientific Name	Common Name	+Comm. Status	BioNet Records <10 km?	Likelihood of Occurrence	Test of significance required (Yes/No)
				individuals within the site.	
Lepidium aschersonii	Spiny Peppercress	V	0	Not widespread, occurring in the marginal central-western slopes and north-western plains regions of NSW (and potentially the south western plains). In the north of the State recent surveys have recorded a number of new sites including Brigalow Nature Reserve, Brigalow State Conservation Area, Leard State Conservation Area and Bobbiwaa State Conservation Area. Also known from the West Wyalong area in the south of the State. The Spiny Peppercress occurs in periodically wet sites such as gilgai depressions and the margins of freshwater and saline marshes and shallow lakes, usually on heavy clay soil. **Low – Subject land is not within the known geographic distribution of the species. There are no associated vegetation communities present or records within 10 km.**	No
Lepidium monoplocoides	Winged Peppercress	E	0	Widespread in the semi-arid western plains regions of NSW. Collected from widely scattered localities, with large numbers of historical records but few recent collections. There is a single collection from Broken Hill and only two collections since 1915, the most recent being 1950. Also previously recorded from Bourke, Cobar, Urana, Lake Cargelligo, Balranald, Wanganella and Deniliquin. Recorded more recently from the Hay Plain, south-eastern Riverina, and from near Pooncarie. **Absent (surveyed) – Targeted flora surveys in October, during the survey window for this species, failed to detect any individuals within the site.**	No
Sclerolaena napiformis	Turnip Copperburr	E	0	Known from only a few small populations in remnant grassland in the southern Riverina of NSW and north-central Victoria. NSW populations are confined to the area between Jerilderie and Moama on travelling stock routes and road reserves. Confined to remnant grassland habitats on clay-loam soils. Grows on level plains in tussock grassland of *Austrostipa nodosa* and *Chloris truncata*, in grey cracking clay to red-brown loamy clay. **Low – Subject land is within the known geographic distribution of the species. However, there are no associated vegetation communities present or records within 10 km.**	No

Scientific Name	Common Name	+Comm. Status	BioNet Records <10 km?	Likelihood of Occurrence	Test of significance required (Yes/No)
Senecio macrocarpus	Large-fruit Fireweed	V	0	Woodland, grassland, and sedgeland. Tablelands east and north of the ACT. Shrub or herb to about 0.7 m high or sprawling, arising from a perennial rootstock, sparsely to moderately greyish-cobwebbed hairy below, becoming hairless above. Leaves alternating up the stems, 4–15 cm long, 2–10 mm wide, entire to distantly and minutely toothed, rarely prominently toothed or shallowly and distantly lobed. Flower heads 7–18 mm long, plumply cylindrical, with 50–150 florets, 0 petals, surrounded by 13–33 appressed bracts. Flower heads usually in clusters of about 2–10. Flowers mostly winter–spring. **Low – Subject land is within the predicted geographic distribution of the species. However, there are no associated vegetation communities present or records within 10 km.**	No
Swainsona murrayana	Slender Darling Pea	V	0	Found throughout NSW, it has been recorded in the Jerilderie and Deniliquin areas of the southern riverine plain, the Hay plain as far north as Willandra National Park, near Broken Hill and in various localities between Dubbo and Moree. The species has been collected from clay-based soils, ranging from grey, red and brown cracking clays to red-brown earths and loams. **Absent –This species is considered to be confined to the Hay Plain, a region of inland NSW that is variably defined but which excludes the Tocumwal area – see, for example Porteners (1993), who defines the Hay Plain as excluding the region contained in the Berrigan 1:100,000 topographic map, which contains the subject land.**	No

Scientific Name	Common Name	+Comm. Status	BioNet Records <10 km?	Likelihood of Occurrence	Test of significance required (Yes/No)
Swainsona plagiotropis	Red Darling Pea	V	0	Occurs in the upper Murray River valley in the south-western plains of NSW and into Victoria. Most NSW records are from the Jerilderie area, with possible collections from the Louth-Bourke area and a disjunct record in the north-western plains from Buttabone Stud Park 35 km NW of Warren. Also rare in Victoria, restricted to a few sites in the central north, mostly between Bendigo and the Murray River south of Echuca. Grows on flat grassland and in heavy red soil, often on roadsides and especially in table drains. **Absent – This species is considered to be confined to the Hay Plain. It has been excluded for the reason given for *S. murrayana* above.**	No
REPTILES					
Aprasia parapulchella	Pink-tailed Legless Lizard	V	0	The Pink-tailed Legless Lizard is only known from the Central and Southern Tablelands, and the South Western Slopes. There is a concentration of populations in the Canberra/Queanbeyan Region. Other populations have been recorded near Cooma, Yass, Bathurst, Albury and West Wyalong. This species is also found in the Australian Capital Territory. Inhabits sloping, open woodland areas with predominantly native grassy groundlayers, particularly those dominated by Kangaroo Grass (*Themeda australis*). **Low – Subject land is not within the known geographic distribution of the species. There are no associated vegetation communities present or records within 10 km.**	No
MIGRATORY SPECIES					
Migratory Marine Birds					
Apus pacificus	Fork-tailed Swift	C,J,K	2	In NSW, the Fork-tailed Swift is recorded in all regions. Many records occur east of the Great Divide; however, a few populations have been found west of the Great Divide. These are widespread but scattered further west of the line joining Bourke and Dareton. Sightings have been recorded at Milparinka, the Bulloo River and Thurloo Downs (Higgins 1999). The Fork-tailed Swift is almost exclusively aerial, flying from less than 1 m to at least 300 m above ground and probably much higher.	Yes

Scientific Name	Common Name	+Comm. Status	BioNet Records <10 km?	Likelihood of Occurrence	Test of significance required (Yes/No)
				Moderate – Subject land is within the known geographic distribution of the species and two records occur within 10 km. However, there are no associated vegetation communities present.	
Migratory Terrestrial Species					
Hirundapus caudacutus	White-throated Needletail	V,C,J,K	0	The White-throated Needletail is widespread in eastern and south-eastern. In eastern Australia, it is recorded in all coastal regions of Queensland and NSW, extending inland to the western slopes of the Great Divide and occasionally onto the adjacent inland plains. In Australia, the White-throated Needletail is almost exclusively aerial, from heights of less than 1 m up to more than 1000 m above the ground. Because they are aerial, it has been stated that conventional habitat descriptions are inapplicable, but there are, nevertheless, certain preferences exhibited by the species. Although they occur over most types of habitat, they are probably recorded most often above wooded areas, including open forest and rainforest, and may also fly between trees or in clearings, below the canopy, but they are less commonly recorded flying above woodland. **Moderate - Subject land is within the known distribution of the species and associated vegetation communities (PCT 9, 45, and 74) are present. However, there are no records within 10 km.**	Yes
Motacilla flava	Yellow Wagtail	M	0	Widespread wagtail, favoring wet meadows, marshland, grassy and muddy lakeshores. Occurs in fields and often near livestock during migration. Like other wagtails, walks on ground and pumps its long, white-sided tail up and down. Plumage highly variable, but breeding male wholly bright yellow below, with greenish back. Male head pattern varies regionally: in U.K. has greenish head with yellow eyebrow; in northern Europe head slaty gray overall; in central and southwest Europe head blue-gray with white eyebrow. Individuals of several subspecies may winter together. Female and nonbreeding plumages drabber and paler, with ghosting of male patterns. Uncertainty exists regarding this species presence outside of northern Europe.	No

Scientific Name	Common Name	+Comm. Status	BioNet Records <10 km?	Likelihood of Occurrence	Test of significance required (Yes/No)
				Low – Subject land is not within the known geographic distribution of the species, there are no associated vegetation communities present, and no records within 10 km.	
Myiagra cyanoleuca	Satin Flycatcher	M	0	The Satin Flycatcher is found along the east coast of Australia from far northern Queensland to Tasmania, including south-eastern South Australia. It is also found in New Guinea. The Satin Flycatcher is not a commonly seen species, especially in the far south of its range, where it is a summer breeding migrant. The Satin Flycatcher is found in tall forests, preferring wetter habitats such as heavily forested gullies, but not rainforests. The Satin Flycatcher takes insects on the wing, foraging actively from perches in the mid to upper canopy. After the breeding season, it may forage in loose groups, usually of adults and their newly-fledged young, in drier, more open forests. The Satin Flycatcher nests in loose colonies of two to five pairs nesting at intervals of about 20 m - 50 m apart. It builds a broad-based, cup-shaped nest of shredded bark and grass, coated with spider webs and decorated with lichen. The nest is placed on a bare, horizontal branch, with overhanging foliage, about 3 m - 25 m above the ground. Both sexes build the nest, incubate the eggs and feed the young. Nests may be parasitised by the Brush Cuckoo and, sometimes, the Pallid Cuckoo, Horsfield's Bronze-Cuckoo or the Golden Bronze-Cuckoo. **Low – Subject land is within the known geographic distribution of the species. However, the site lacks the preferred habitat for this species and there are no records within 10 km.**	No
Migratory Wetlands Species					
Actitis hypoleucos	Common Sandpiper	C,J,K	0	Found along all coastlines of Australia and in many areas inland, the Common Sandpiper is widespread in small numbers. The population when in Australia is concentrated in northern and western Australia. The species utilises a wide range of coastal wetlands and some inland wetlands, with varying levels of salinity, and is mostly found around muddy margins or rocky shores and rarely on mudflats. The Common Sandpiper has been recorded in estuaries and deltas of streams, as well as on banks farther upstream; around lakes, pools, billabongs, reservoirs, dams and claypans, and occasionally piers and jetties. The muddy margins utilised by the species are often	No

Scientific Name	Common Name	+Comm. Status	BioNet Records <10 km?	Likelihood of Occurrence	Test of significance required (Yes/No)
				narrow and may be steep. The species is often associated with mangroves, and sometimes found in areas of mud littered with rocks or snags. **Absent - No appropriate wetland habitat present.**	
Calidris acuminata	Sharp-tailed Sandpiper	V,C,J,K	0	The Sharp-tailed Sandpiper spends the non-breeding season in Australia with small numbers occurring regularly in New Zealand. Most of the population migrates to Australia, mostly to the south-east and are widespread in both inland and coastal locations and in both freshwater and saline habitats. Many inland records are of birds on passage. In Australasia, the Sharp-tailed Sandpiper prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation. **Absent - No appropriate wetland habitat present.**	No
Calidris ferruginea	Curlew Sandpiper	CE,C,J,K	1	In Australia, Curlew Sandpipers occur around the coasts and are also quite widespread inland, though in smaller numbers. Records occur in all states during the non-breeding period, and also during the breeding season when many non-breeding one-year old birds remain in Australia rather than migrating north. In NSW, they are widespread east of the Great Divide, especially in coastal regions. They are occasionally recorded in the Tablelands and are widespread in the Riverina and south-west NSW, with scattered records elsewhere. Curlew Sandpipers mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms. They are also recorded inland, though less often, including around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand. They occur in both fresh and brackish waters. Occasionally they are recorded around floodwaters. **Absent - No appropriate wetland habitat present.**	No
Calidris melanotos	Pectoral Sandpiper	J,K	0	The Pectoral Sandpiper breeds in northern Russia and North America. Within Australasia, the Pectoral Sandpiper prefers shallow fresh to saline wetlands. In New South Wales (NSW), the Pectoral Sandpiper is widespread, but scattered. Records exist east of the	No

Scientific Name	Common Name	+Comm. Status	BioNet Records <10 km?	Likelihood of Occurrence	Test of significance required (Yes/No)
				Great Divide, from Casino and Ballina, south to Ulladulla. West of the Great Divide, the species is widespread in the Riverina and Lower Western regions. The species is usually found in coastal or near coastal habitat but occasionally found further inland. It prefers wetlands that have open fringing mudflats and low, emergent or fringing vegetation, such as grass or samphire. The species has also been recorded in swamp overgrown with lignum. They forage in shallow water or soft mud at the edge of wetlands. **Absent - No appropriate wetland habitat present.**	
Gallinago hardwickii	Latham's Snipe	V,J,K	0	Latham's Snipe is a non-breeding visitor to south-eastern Australia and is a passage migrant through northern Australia (i.e. it travels through northern Australia to reach non-breeding areas located further south). The species has been recorded along the east coast of Australia from Cape York Peninsula through to south-eastern South Australia (including the Adelaide plains and Mount Lofty Ranges, and the Eyre Peninsula). The range extends inland over the eastern tablelands in south-eastern Queensland (and occasionally from Rockhampton in the north), and to west of the Great Dividing Range in New South Wales. **Absent - No appropriate wetland habitat present.**	No
OTHER MATTERS PROTECTED BY THE EPBC ACT					
Listed Marine Species					
Actitis hypoleucos	Common Sandpiper	C,J,K	0	Found along all coastlines of Australia and in many areas inland, the Common Sandpiper is widespread in small numbers. The population when in Australia is concentrated in northern and western Australia. The species utilises a wide range of coastal wetlands and some inland wetlands, with varying levels of salinity, and is mostly found around muddy margins or rocky shores and rarely on mudflats. The Common Sandpiper has been recorded in estuaries and deltas of streams, as well as on banks farther upstream; around lakes, pools, billabongs, reservoirs, dams and claypans, and occasionally piers and jetties. The muddy margins utilised by the species are often narrow and may be steep. The species is often associated with mangroves, and sometimes found in areas of mud littered with rocks or snags.	No

Scientific Name	Common Name	+Comm. Status	BioNet Records <10 km?	Likelihood of Occurrence	Test of significance required (Yes/No)
				Absent – See above.	
Apus pacificus	Fork-tailed Swift	C,J,K	2	In NSW, the Fork-tailed Swift is recorded in all regions. Many records occur east of the Great Divide; however, a few populations have been found west of the Great Divide. These are widespread but scattered further west of the line joining Bourke and Dareton. Sightings have been recorded at Milparinka, the Bulloo River and Thurloo Downs (Higgins 1999). The Fork-tailed Swift is almost exclusively aerial, flying from less than 1 m to at least 300 m above ground and probably much higher. **Moderate – See above.**	Yes
Bubulcus ibis as *Ardea ibis*	Cattle Egret	C,J	0	In Australia it is most widespread and common in north-eastern Western Australia across the Top End, Northern Territory, and in south-eastern Australia from Bundaberg, Queensland to Port Augusta, South Australia, including Tasmania. The Cattle Egret is found in grasslands, woodlands and wetlands, and is not common in arid areas. It also uses pastures and croplands, especially where drainage is poor. Will also forage at garbage dumps and is often seen with cattle and other stock. **Low – Subject land is within the known geographic distribution of the species. However, the site lacks the preferred habitat for this species and there are no records within 10 km.**	No
Calidris acuminata	Sharp-tailed Sandpiper	V,C,J,K	0	The Sharp-tailed Sandpiper spends the non-breeding season in Australia with small numbers occurring regularly in New Zealand. Most of the population migrates to Australia, mostly to the south-east and are widespread in both inland and coastal locations and in both freshwater and saline habitats. Many inland records are of birds on passage. In Australasia, the Sharp-tailed Sandpiper prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation. **Absent – See above**	No
Calidris ferruginea	Curlew Sandpiper	CE,C,J,K	1	In Australia, Curlew Sandpipers occur around the coasts and are also quite widespread inland, though in smaller numbers. Records occur in all states during the non-breeding period, and also during the breeding season when many non-breeding one-year old birds	No

Scientific Name	Common Name	+Comm. Status	BioNet Records <10 km?	Likelihood of Occurrence	Test of significance required (Yes/No)
				remain in Australia rather than migrating north. In NSW, they are widespread east of the Great Divide, especially in coastal regions. They are occasionally recorded in the Tablelands and are widespread in the Riverina and south-west NSW, with scattered records elsewhere. Curlew Sandpipers mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms. They are also recorded inland, though less often, including around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand. They occur in both fresh and brackish waters. Occasionally they are recorded around floodwaters. **Absent – See above.**	
Calidris melanotos	Pectoral Sandpiper	J,K	0	The Pectoral Sandpiper breeds in northern Russia and North America. Within Australasia, the Pectoral Sandpiper prefers shallow fresh to saline wetlands. In New South Wales (NSW), the Pectoral Sandpiper is widespread, but scattered. Records exist east of the Great Divide, from Casino and Ballina, south to Ulladulla. West of the Great Divide, the species is widespread in the Riverina and Lower Western regions. The species is usually found in coastal or near coastal habitat but occasionally found further inland. It prefers wetlands that have open fringing mudflats and low, emergent or fringing vegetation, such as grass or samphire. The species has also been recorded in swamp overgrown with lignum. They forage in shallow water or soft mud at the edge of wetlands. **Absent – See above.**	No
Chrysococcyx osculans	Black-eared Cuckoo	M	0	The Black-eared Cuckoo is widespread on mainland Australia, but avoids the wet, heavily forested areas on the east coast and the south-west corner of Western Australia. The species is found in drier country where species such as mulga and mallee form open woodlands and shrublands. It is often found in vegetation along creek beds. **Low – Subject land is within the species known geographic distribution. However, there are no associated vegetation communities present or records within 10 km.**	No

Scientific Name	Common Name	+Comm. Status	BioNet Records <10 km?	Likelihood of Occurrence	Test of significance required (Yes/No)
Gallinago hardwickii	Latham's Snipe	V,J,K	0	Latham's Snipe is a non-breeding visitor to south-eastern Australia and is a passage migrant through northern Australia (i.e. it travels through northern Australia to reach non-breeding areas located further south). The species has been recorded along the east coast of Australia from Cape York Peninsula through to south-eastern South Australia (including the Adelaide plains and Mount Lofty Ranges, and the Eyre Peninsula). The range extends inland over the eastern tablelands in south-eastern Queensland (and occasionally from Rockhampton in the north), and to west of the Great Dividing Range in New South Wales. **Absent – See above.**	No
Haliaeetus leucogaster	White-bellied Sea-Eagle	C	6	The White-bellied Sea-eagle is distributed around the Australian coastline, including Tasmania, and well inland along rivers and wetlands of the Murray Darling Basin. In New South Wales it is widespread along the east coast, and along all major inland rivers and waterways. Habitats are characterised by the presence of large areas of open water including larger rivers, swamps, lakes, and the sea. Occurs at sites near the sea or sea-shore, such as around bays and inlets, beaches, reefs, lagoons, estuaries and mangroves; and at, or in the vicinity of freshwater swamps, lakes, reservoirs, billabongs and saltmarsh. Terrestrial habitats include coastal dunes, tidal flats, grassland, heathland, woodland, and forest (including rainforest). Breeding habitat consists of mature tall open forest, open forest, tall woodland, and swamp sclerophyll forest close to foraging habitat. Nest trees are typically large emergent eucalypts and often have emergent dead branches or large dead trees nearby which are used as 'guard roosts'. Nests are large structures built from sticks and lined with leaves or grass. Feed mainly on fish and freshwater turtles, but also waterbirds, reptiles, mammals and carrion. Hunts its prey from a perch or whilst in flight (by circling slowly, or by sailing along 10–20 m above the shore). Prey is usually carried to a feeding platform or (if small) consumed in flight, but some items are eaten on the ground. May be solitary, or live in pairs or small family groups consisting of a pair of adults and dependent young. Typically lays two eggs between June and September with young birds remaining in the nest for 65-70 days.	No

Scientific Name	Common Name	+Comm. Status	BioNet Records <10 km?	Likelihood of Occurrence	Test of significance required (Yes/No)
				Absent – Subject land is within the known distribution of the species, associated vegetation communities (PCT 9, 45, and 74) are present, and there are six records within 10 km. However, this species is considered absent due to habitat constraints (no vegetation within 1 km of a suitable watercourse or waterbody).	
Hirundapus caudacutus	White-throated Needletail	V,C,J,K	0	The White-throated Needletail is widespread in eastern and south-eastern. In eastern Australia, it is recorded in all coastal regions of Queensland and NSW, extending inland to the western slopes of the Great Divide and occasionally onto the adjacent inland plains. In Australia, the White-throated Needletail is almost exclusively aerial, from heights of less than 1 m up to more than 1000 m above the ground. Because they are aerial, it has been stated that conventional habitat descriptions are inapplicable, but there are, nevertheless, certain preferences exhibited by the species. Although they occur over most types of habitat, they are probably recorded most often above wooded areas, including open forest and rainforest, and may also fly between trees or in clearings, below the canopy, but they are less commonly recorded flying above woodland. **Moderate – See above.**	Yes
Lathamus discolor	Swift Parrot	CE	0	Breeds in Tasmania during spring and summer, migrating in the autumn and winter months to south-eastern Australia from Victoria and the eastern parts of South Australia to south-east Queensland. In NSW mostly occurs on the coast and south west slopes. Migrates to the Australian south-east mainland between March and October. On the mainland they occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. Favoured feed trees include winter flowering species such as Swamp Mahogany *Eucalyptus robusta*, Spotted Gum *Corymbia maculata*, Red Bloodwood *C. gummifera*, Mugga Ironbark *E. sideroxylon*, and White Box *E. albens*. Commonly used lerp infested trees include Inland Grey Box *E. microcarpa*, Grey Box *E. moluccana* and Blackbutt *E. pilularis*. Return to some foraging sites on a cyclic basis depending on food availability. Following winter they return to Tasmania where they breed from September to January, nesting in old trees with hollows and feeding in forests	Yes

Scientific Name	Common Name	+Comm. Status	BioNet Records <10 km?	Likelihood of Occurrence	Test of significance required (Yes/No)
				dominated by Tasmanian Blue Gum *Eucalyptus globulus*. **Moderate (foraging) – See above.**	
Merops ornatus	Rainbow Bee-eater	J	0	The Rainbow Bee-eater is distributed across much of mainland Australia, and occurs on several near-shore islands. It is not found in Tasmania, and is thinly distributed in the most arid regions of central and Western Australia (Barrett et al. 2003; Blakers et al. 1984; Higgins 1999). The Rainbow Bee-eater occurs mainly in open forests and woodlands, shrublands, and in various cleared or semi-cleared habitats, including farmland and areas of human habitation (Higgins 1999). It usually occurs in open, cleared or lightly-timbered areas that are often, but not always, located in close proximity to permanent water. The Rainbow Bee-eater occurs in open woodlands and shrublands, including mallee, and in open forests that are usually dominated by eucalypts. It also occurs in grasslands (Gibson 1986; Jones 1986; Leach 1988; Longmore 1978; McEvey & Middleton 1968; Saunders & Ingram 1995; Woinarski et al. 1988, 1989) and, especially in arid or semi-arid areas, in riparian, floodplain or wetland vegetation assemblages **Low – Subject land is within the species known geographic distribution. However, there are no associated vegetation communities present or records within 10 km.**	No
Motacilla flava	Yellow Wagtail	M	0	Widespread wagtail, favoring wet meadows, marshland, grassy and muddy lakeshores. Occurs in fields and often near livestock during migration. Like other wagtails, walks on ground and pumps its long, white-sided tail up and down. Plumage highly variable, but breeding male wholly bright yellow below, with greenish back. Male head pattern varies regionally: in U.K. has greenish head with yellow eyebrow; in northern Europe head slaty gray overall; in central and southwest Europe head blue-gray with white eyebrow. Individuals of several subspecies may winter together. Female and nonbreeding plumages drabber and paler, with ghosting of male patterns. Uncertainty exists regarding this species presence outside of northern Europe. **Low – See above.**	No

***NSW Status:** ^^=Sensitive species: location of records generalised, P=Protected, V=Vulnerable, E1=Endangered, 2=Category 2 sensitive species, 3=Category 3 sensitive species.

+ Comm. Status: V=Vulnerable, E=Endangered, CE=Critically Endangered, C=CAMBA, J=JAMBA, K=ROKAMBA, M=Migratory.

EPBC Act-listed Critically Endangered and Endangered Ecological Communities

Natural grasslands of the Murray Valley Plains	
Significant Impact Guideline	**Assessment**
Reduce the extent of an ecological community	The proposal will result in the loss of up to 3.9 ha of this community. This will not reduce the overall extent of occurrence of the community, as defined by the International Union for Conservation of Nature (IUCN), which consists of an imaginary polygon enclosing all known examples of a taxon or, as in this case, a community. The impacts of this proposal are situated within a larger local occurrence of this proposal, which would remain; consequently, the extent of occurrence would be unchanged. Nevertheless, the actual total extent of the community would undergo a decline.
Fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines	The proposal would introduce new roads, bisecting the grassland and therefore introducing fragmentation to the community. These roads would be relatively narrow (c. 5-6 m) and it is unclear to what extent this would reduce gene flow for flora species or impede the movement of fauna. The local occurrence of the community is already fragmented by similar roads and most of the additional fragmentation would take place within an area that is already affected by this fragmentation.
Adversely affect habitat critical to the survival of an ecological community	Habitat critical to the survival of this community has not been formally identified; however, as the impacts would be confined to 3.9 ha of a much larger occurrence (>100 ha, conceivably up to c. 700 ha), the disturbance footprint by itself is unlikely to be considered critical.
Cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting	Regular burning and harvesting of flora and fauna are not expected to result from this proposal; however, some changes to the local composition of the community may result from “edge effects” such as the proliferation of weeds. This is discussed further below but is not expected to significantly impact the local occurrence of this population.
Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to: **– assisting invasive species, that are harmful to the listed ecological community, to become established, or** **– causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community.**	All construction activity carries a risk of facilitating the spread of invasive species. By clearing native vegetation to facilitate construction, the proposal may create niches that can be exploited by fast-growing weeds, which may then be able to colonise surrounding lands. The native vegetation would also be subject to edge effects associated with altered drainage patterns and changed microclimate, which may introduce additional stresses to the population and facilitate the spread of more opportunistic weed species. This may alter the overall species composition of the community, but is unlikely to do so on a large scale, suggesting that most of the local occurrence of the community would be unaffected. No additional use of harmful chemical has been identified by the proponent as a component of this proposal. Environmental safeguards for the management of biosecurity risks will be implemented (see **Section 6.7**).
Interfere with the recovery of an ecological community.	The major identified threatening process for this community is the clearance, conversion, and fragmentation of remaining examples, with weed invasion also contributing. This proposal will exacerbate these threats. Given the small scale of the proposed impacts and the large extent of the local occurrence, this is unlikely to significantly interfere with the recovery of the community.

Conclusion	**No significant impact**

EPBC Act-listed Critically Endangered and Endangered Species

Sloane's Froglet (*Crinia sloanei*)	
Significant Impact Guideline	**Assessment**
Lead to a long-term decrease in the size of a population	The proposal will impact up to 0.1 ha of potential habitat for this species. The subject land is not within a priority management area for the species. This species was not detected during 7 nights of audio recording conducted during the breeding season. Since no records occur within 10 km of the subject land, it is highly unlikely that this proposal would lead to the long-term decrease of any population of this species.
Reduce the area of occupancy of the species	As indicated above it is unlikely that an established population occupies the site. The current area of occupancy will not likely be significantly reduced.
Fragment an existing population into two or more populations	As indicated above it is unlikely that an established population occupies the site. As such, an existing population is not likely to be fragmented into two or more populations.
Adversely affect habitat critical to the survival of a species	Considering the above, the habitat within the subject land is unlikely critical habitat for the species. Furthermore, suitable habitat within the subject land consists of only two small areas (the largest being approximately 17 m × 6 m).
Disrupt the breeding cycle of a population	Since no population is known or believed to occur within the area, this proposal will not disrupt the breeding cycle for any population of this species.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The proposal will remove/modify up to 0.1 ha of potential habitat for the species. The proposal will not significantly exacerbate existing fragmentation of foraging habitat for this species, as previously discussed. Any reduction or fragmentation of available habitat is unlikely to cause the species to decline at a regional scale.
Result in invasive species that are harmful to a species becoming established in the species' habitat	There is the potential for works to introduce invasive species to the proposal site or exacerbate existing infestations of significant invasive species. Environmental safeguards for the management of biosecurity risks will be implemented (see **Section 6.7**).
Introduce disease that may cause the species to decline	Machinery used on site can potentially act as a transport for biosecurity risks. Environmental safeguards for the management of biosecurity risks will be implemented (see **Section 6.7**).
Interfere with the recovery of the species	Fragmentation and degradation of habitat; reduction of water quality; drought and climate change; and susceptibility to the amphibian chytrid fungus are the main threats to this species. Although this proposal will exacerbate clearing of up to 0.1 ha of marginally suitable habitat, this should not significantly interfere with the recovery of the species within the region.
Conclusion	**No significant impact**

Regent Honeyeater (*Anthochaera phrygia*)	
Significant Impact Guideline	**Assessment**
Lead to a long-term decrease in the size of a population	The proposal will impact up to 0.6 ha of potential habitat for this species. The land is not within a priority management area for the species. No records occur within 10 km of the subject land and the species was not detected during the field survey. Furthermore, the subject land occurs outside of the two known key breeding regions in NSW (Capertee Valley and the Bundarra-Barraba region). As such, it is unlikely the subject land is critical habitat for this species. Therefore, it is highly unlikely that this proposal would lead to the long-term decrease of any population of this species.
Reduce the area of occupancy of the species	As indicated above it is unlikely that an established population occupies the site. The current area of occupancy will not likely be significantly reduced.
Fragment an existing population into two or more populations	As indicated above it is unlikely that an established population occupies the site. As such, an existing population is not likely to be fragmented into two or more populations.
Adversely affect habitat critical to the survival of a species	The habitat within the subject land is unlikely critical habitat for the species, as no individuals have been found on or directly adjacent to the subject land.
Disrupt the breeding cycle of a population	Within NSW key breeding areas are in the Capertee Valley and Bundarra-Barraba region. The subject land does not fall within these regions. As such, this proposal will not disrupt the breeding cycle for any population of this species.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The proposal will remove/modify up to 0.6 ha of potential habitat for the species. The proposal will not significantly exacerbate existing fragmentation of foraging habitat for this species, as previously discussed. Any reduction or fragmentation of available habitat is unlikely to cause the species to decline at a regional scale.
Result in invasive species that are harmful to a species becoming established in the species' habitat	There is the potential for works to introduce invasive species to the proposal site or exacerbate existing infestations of significant invasive species. Environmental safeguards for the management of biosecurity risks will be implemented (see **Section 6.7**).
Introduce disease that may cause the species to decline	Machinery used on site can potentially act as a transport for biosecurity risks. Environmental safeguards for the management of biosecurity risks will be implemented (see **Section 6.7**).
Interfere with the recovery of the species	Historical loss, fragmentation and degradation of habitat from clearing for agricultural and residential development, particularly fertile Yellow Box-White Box-Blakely's Red Gum Woodland, is a major threat to this species. Although this proposal will exacerbate clearing of up to 0.6 ha of marginally suitable habitat, this should not significantly interfere with the recovery of the species within the region.
Conclusion	**No significant impact**

Swift Parrot (*Lathamus discolor*)	
Significant Impact Guideline	**Assessment**
Lead to a long-term decrease in the size of a population	The proposal would impact up to 0.6 ha of potential habitat for this species. The subject land is not within a priority management area for the species. This species breeds exclusively within Tasmania. Furthermore, the species was not detected during the field survey and no records occur within 10 km. Therefore, it is highly unlikely that this proposal would lead to the long-term decrease of any population of this species.
Reduce the area of occupancy of the species	As indicated above it is unlikely that an established population occupies the site. The current area of occupancy will not likely be significantly reduced.
Fragment an existing population into two or more populations	As indicated above it is unlikely that an established population occupies the site. As such, an existing population is not likely to be fragmented into two or more populations.
Adversely affect habitat critical to the survival of a species	The habitat within the subject land is unlikely critical habitat for the species, as no individuals have been found on or directly adjacent to the subject land.
Disrupt the breeding cycle of a population	Since no population is known or believed to occur within the area, this proposal will not disrupt the breeding cycle for any population of this species.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The proposal will remove/modify up to 0.6 ha of potential habitat for the species. The proposal will not significantly exacerbate existing fragmentation of foraging habitat for this species, as previously discussed. Any reduction or fragmentation of available habitat is unlikely to cause the species to decline at a regional scale.
Result in invasive species that are harmful to a species becoming established in the species' habitat	There is the potential for works to introduce invasive species to the proposal site or exacerbate existing infestations of significant invasive species. Environmental safeguards for the management of biosecurity risks will be implemented (see **Section 6.7**).
Introduce disease that may cause the species to decline	Machinery used on site can potentially act as a transport for biosecurity risks. Environmental safeguards for the management of biosecurity risks will be implemented (see **Section 6.7**).
Interfere with the recovery of the species	Clearing of woodlands, heavy grazing of feeding areas resulting in the removal of seeding grasses and preventing regeneration of food plants, loss of existing and future hollow-bearing trees, and illegal nest-robbing and trapping are the main threats to this species. Although this proposal will exacerbate clearing of up to 0.6 ha of suitable habitat, this should not significantly interfere with the recovery of the species within the region.
Conclusion	**No significant impact**

Hooded Robin (south-eastern form, *Melanodryas cucullata cucullata*)	
Significant Impact Guideline	**Assessment**
Lead to a long-term decrease in the size of a population	The proposal would impact up to 0.6 ha of potential habitat for this species. The subject land is not within a priority management area for the species. Furthermore, the species was not detected during the field survey and no records occur within 10 km. Therefore, it is highly unlikely that this proposal would lead to the long-term decrease of any population of this species.
Reduce the area of occupancy of the species	As indicated above it is unlikely that an established population exists at the site. The current area of occupancy will not likely be significantly reduced.
Fragment an existing population into two or more populations	As indicated above it is unlikely that an established population occupies the site. As such, an existing population is not likely to be fragmented into two or more populations.
Adversely affect habitat critical to the survival of a species	The habitat within the subject land is unlikely critical habitat for the species, as no individuals have been found on or directly adjacent to the subject land.
Disrupt the breeding cycle of a population	Since no population is known or believed to occur within the area, this proposal will not disrupt the breeding cycle for any population of this species.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The proposal will remove/modify up to 0.6 ha of potential habitat for the species. The proposal will not significantly exacerbate existing fragmentation of foraging habitat for this species, as previously discussed. Any reduction or fragmentation of available habitat is unlikely to cause the species to decline at a regional scale.
Result in invasive species that are harmful to a species becoming established in the species' habitat	There is the potential for works to introduce invasive species to the proposal site or exacerbate existing infestations of significant invasive species. Environmental safeguards for the management of biosecurity risks will be implemented (see **Section 6.7**).
Introduce disease that may cause the species to decline	Machinery used on site can potentially act as a transport for biosecurity risks. Environmental safeguards for the management of biosecurity risks will be implemented (see **Section 6.7**).
Interfere with the recovery of the species	Clearing of woodlands, resulting in loss and fragmentation of habitat; modification and destruction of ground habitat through heavy grazing and compaction by stock, removal of litter and fallen timber, introduction of exotic pasture grasses and frequent fire; aggressive exclusion from forest and woodland habitat by over abundant Noisy Miners; reduction in resources due to drought; and disturbance and changes to vegetation structure due to forestry activities (e.g. fire and harvesting) are the main threats to this species. Although this proposal will exacerbate the clearing and fragmentation of woodland, due to the clearing of up to 0.6 ha of suitable habitat, this should not significantly interfere with the recovery of the species within the region.
Conclusion	**No significant impact**

EPBC Act-listed Vulnerable Species

Brown Treecreeper (south-eastern subspecies, *Climacteris picumnus victoriae*)	
Significant Impact Guideline	**Assessment**
Lead to a long-term decrease in the size of an important population of a species	The proposal will impact up to 0.1 ha of potential habitat for this species. The subject land is not within a priority management area for the species, nor is it at the edge of the species' distribution. No evidence of this species or its nests was detected during the field survey. Furthermore, half of the 20 records within the 10 km search area are located within 1 km of the Murray River system. The closest record (from 2007) occurs ~ 3.2 km from the subject land. the closest of which occurs ~ 4.6 km from the subject land. In light of this, the subject land is unlikely to contain an important population of this species.
Reduce the area of occupancy of an important population	It is unlikely that an important population exists at the site, see above.
Fragment an existing important population into two or more populations	It is unlikely that an important population exists at the site, see above.
Adversely affect habitat critical to the survival of a species	Considering the above, the habitat within the subject land is unlikely critical habitat for the species. Furthermore, suitable habitat within the subject land consists of only two small areas (the largest being approximately 17 m × 6 m).
Disrupt the breeding cycle of an important population	As indicated above, no important population of this species is likely to occur locally.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The proposal will remove/modify up to 0.1 ha of potential habitat for the species. The proposal will not significantly exacerbate existing fragmentation of foraging habitat for this species, as previously discussed. Any reduction or fragmentation of available habitat is unlikely to cause the species to decline at a regional scale.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	There is the potential for works to introduce invasive species to the proposal site or exacerbate existing infestations of significant invasive species. Environmental safeguards for the management of biosecurity risks will be implemented (see **Section 6.7**).
Introduce disease that may cause the species to decline	Machinery used on site can potentially act as a transport for biosecurity risks. Environmental safeguards for the management of biosecurity risks will be implemented (see **Section 6.7**).
Interfere with the recovery of the species.	Historical loss of woodland, forest and mallee habitats as a result of agriculture, forestry, mining and residential development; fragmentation of woodland and forest remnants which isolates populations and causes local extinctions; ongoing degradation of habitat, particularly the loss of tree hollows and fallen timber from firewood collection and overgrazing; and the lack of regeneration of eucalypt overstorey in woodland due to overgrazing and too-frequent fires are the main threats facing this species. Although this proposal will exacerbate the loss of woodland, due to the clearing of up to 0.1 ha of suitable habitat, this should not significantly interfere with the recovery of the species within the region.
Conclusion	**No significant impact**

Grey Falcon (*Falco hypoleucos*)	
Significant Impact Guideline	**Assessment**
Lead to a long-term decrease in the size of an important population of a species	The proposal would impact up to 4.5 ha of potential habitat for this species. The subject land is not within a Priority Management Area for this species. However, it is near the edge of the species' distribution. As such, if a population is present, it would be considered an important population. The species was not detected during the field survey and no records occur within 10 km. The subject land is also likely to be of, at most, marginal suitability for the species as it does not conform to the preference of the species for wooded watercourses. Therefore, the subject land is unlikely to contain an important population of this species.
Reduce the area of occupancy of an important population	It is unlikely that an important population exists at the site, see above.
Fragment an existing important population into two or more populations	It is unlikely that an important population exists at the site, see above.
Adversely affect habitat critical to the survival of a species	The habitat within the subject land is unlikely critical habitat for the species, as no individuals have been found on or directly adjacent to the subject land. Furthermore, the preferred wooded watercourses do not occur within the subject land.
Disrupt the breeding cycle of an important population	As indicated above, no important population of this species is likely to occur locally.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The proposal will remove/modify up to 4.5 ha of potential habitat for the species. The proposal will not significantly exacerbate existing fragmentation for this species. Any reduction and fragmentation of available habitat is unlikely to cause the species to decline at a regional scale.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	There is the potential for works to introduce invasive species to the proposal site or exacerbate existing infestations of significant invasive species. Environmental safeguards for the management of biosecurity risks will be implemented (see **Section 6.7**).
Introduce disease that may cause the species to decline	Machinery used on site can potentially act as a transport for biosecurity risks. Environmental safeguards for the management of biosecurity risks will be implemented (see **Section 6.7**).
Interfere with the recovery of the species.	Identified threats to this species include grazing and clearing of habitat, secondary poisoning through pest control activities, and collecting of eggs. Although this proposal will exacerbate the loss of habitat, due to the clearing of up to 4.5 ha of suitable habitat, this should not significantly interfere with the recovery of the species within the region.
Conclusion	**No significant impact**

Painted Honeyeater (*Grantiella picta*)	
Significant Impact Guideline	**Assessment**
Lead to a long-term decrease in the size of an important population of a species	The proposal would impact up to 0.6 ha of potential habitat for this species. The subject land is not within a priority management area for the species identified at state level, nor is it at the edge of the species' distribution. Furthermore, the species was not detected during the field survey, no records occur within 10 km, and no impacts to the preferred food source of this species – mistletoes – are likely to result from the proposal. Therefore, the subject land is unlikely to contain an important population of this species.
Reduce the area of occupancy of an important population	It is unlikely that an important population exists at the site, see above.
Fragment an existing important population into two or more populations	It is unlikely that an important population exists at the site, see above.
Adversely affect habitat critical to the survival of a species	The habitat within the subject land is unlikely critical habitat for the species, as no individuals have been found on or directly adjacent to the subject land. Furthermore, the preferred food source of this species – mistletoes - do not occur within the subject land.
Disrupt the breeding cycle of an important population	As indicated above, no important population of this species is likely to occur locally.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The proposal will remove/modify up to 0.6 ha of potential habitat for the species. The proposal will not significantly exacerbate existing fragmentation for this species. Any reduction and fragmentation of available habitat is unlikely to cause the species to decline at a regional scale.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	There is the potential for works to introduce invasive species to the proposal site or exacerbate existing infestations of significant invasive species. Environmental safeguards for the management of biosecurity risks will be implemented (see **Section 6.7**).
Introduce disease that may cause the species to decline	Machinery used on site can potentially act as a transport for biosecurity risks. Environmental safeguards for the management of biosecurity risks will be implemented (see **Section 6.7**).
Interfere with the recovery of the species.	Habitat clearance, disturbance and fragmentation; the removal of large trees with heavy mistletoe infestations; overgrazing of grassy woodlands; habitat incursion by exotic weeds; inappropriate fire regimes; and competition with larger, more aggressive honeyeaters are the main threats to this species. Although this proposal will exacerbate the clearing of vegetation, due to the clearing of up to 0.6 ha of suitable habitat, this should not significantly interfere with the recovery of the species within the region.
Conclusion	**No significant impact**

White-throated Needletail (*Hirundapus caudacutus*)	
Significant Impact Guideline	**Assessment**
Lead to a long-term decrease in the size of an important population of a species	The proposal would impact up to 4.5 ha of potential habitat for this species. The subject land is not within a priority management area for the species, nor is it at the edge of the species' distribution. Furthermore, the species was not detected during the field survey and no records occur within 10 km. Therefore, the subject land is unlikely to contain an important population of this species.
Reduce the area of occupancy of an important population	It is unlikely that an important population exists at the site, see above.
Fragment an existing important population into two or more populations	It is unlikely that an important population exists at the site, see above.
Adversely affect habitat critical to the survival of a species	The habitat within the subject land is unlikely critical habitat for the species, as no individuals have been found on or directly adjacent to the subject land.
Disrupt the breeding cycle of an important population	As indicated above, no important population of this species is likely to occur locally.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The proposal will remove/modify up to 4.5 ha of potential habitat for the species. The proposal will not significantly exacerbate existing fragmentation for this species. Any reduction and fragmentation of available habitat is unlikely to cause the species to decline at a regional scale.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	There is the potential for works to introduce invasive species to the proposal site or exacerbate existing infestations of significant invasive species. Environmental safeguards for the management of biosecurity risks will be implemented (see **Section 6.7**).
Introduce disease that may cause the species to decline	Machinery used on site can potentially act as a transport for biosecurity risks. Environmental safeguards for the management of biosecurity risks will be implemented (see **Section 6.7**).
Interfere with the recovery of the species.	Vegetation clearing and windfarms are the main threats for this species. Although this proposal will exacerbate the clearing of vegetation, due to the clearing of up to 4.5 ha of suitable habitat, this should not significantly interfere with the recovery of the species within the region.
Conclusion	**No significant impact**

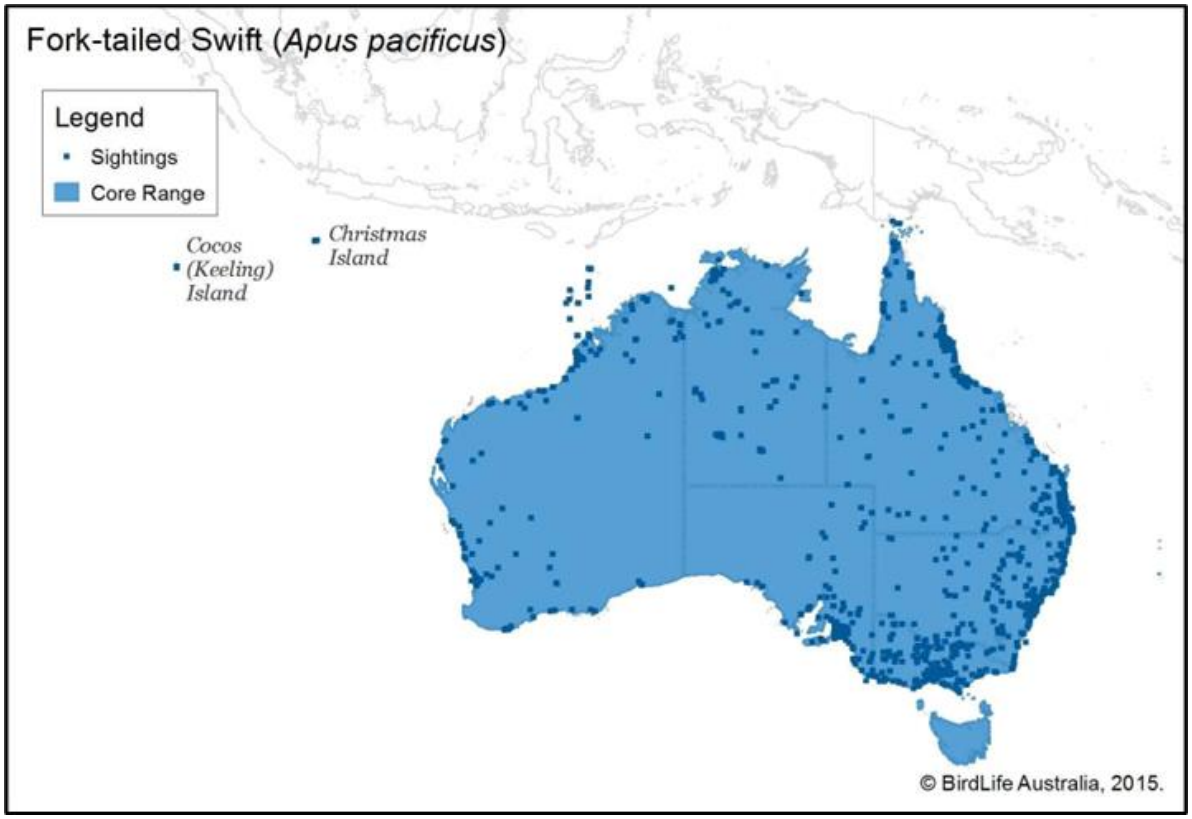
Blue-winged Parrot (*Neophema chrysostoma*)	
Significant Impact Guideline	**Assessment**
Lead to a long-term decrease in the size of an important population of a species	The proposal will not impact any associated PCTs for this species. The subject land is not within a specific priority management area for the species, nor is it at the edge of the species' distribution. Furthermore, the species was not detected during the field survey and only two records (from 1999 to 2004) occur within 10 km. The closest record (from 2004) occurs ~ 3.8 km from the subject land. Therefore, the subject land is unlikely to contain an important population of this species.
Reduce the area of occupancy of an important population	It is unlikely that an important population exists at the site, see above.
Fragment an existing important population into two or more populations	It is unlikely that an important population exists at the site, see above.
Adversely affect habitat critical to the survival of a species	The habitat within the subject land is unlikely critical habitat for the species, as no individuals have been found on or directly adjacent to the subject land.
Disrupt the breeding cycle of an important population	As indicated above, no important population of this species is likely to occur locally.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The proposal will not remove/modify any associated PCTs for the species. As such, the proposal will not isolate any habitat for this species and is unlikely to cause the species to decline at a regional scale.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	There is the potential for works to introduce invasive species to the proposal site or exacerbate existing infestations of significant invasive species. Environmental safeguards for the management of biosecurity risks will be implemented (see **Section 6.7**).
Introduce disease that may cause the species to decline	Machinery used on site can potentially act as a transport for biosecurity risks. Environmental safeguards for the management of biosecurity risks will be implemented (see **Section 6.7**).
Interfere with the recovery of the species.	habitat loss, degradation, fragmentation and removal; climate change; predation from invasive species; invasive weeds; firewood collection; and competition with noisy miners (*Manorina melanocephala*) are the main threats for this species. Although this proposal will exacerbate the loss of habitat, due to the clearing/modifying of up to 5.64 ha of native vegetation, this should not significantly interfere with the recovery of the species within the region.
Conclusion	**No significant impact**

Superb Parrot (*Polytelis swainsonii*)	
Significant Impact Guideline	**Assessment**
Lead to a long-term decrease in the size of an important population of a species	The proposal would impact up to 4.5 ha of potential habitat for this species. The subject land is not within a specific priority management area for the species, nor is it at the edge of the species' distribution. This species occurs throughout eastern inland NSW, but has distinctive breeding areas where it resides during the breeding season (September to January). Key breeding areas are bounded roughly by Cowra and Yass to the east, and Grenfell, Cootamundra and Coolac to the west. In addition, key breeding sites exist in the Riverina in the riparian corridors of the Murray, Edward and Murrumbidgee Rivers, where Superb Parrots remain year-round. As the site is close to the Murray River, any population within this area would be considered an important population. However, the species was not detected during the field surveys and only four records (from 1982 to 2019) occur within 10 km. The closest record (from 1982) occurs ~ 4.8 km from the subject land. Therefore, the subject land is unlikely to contain an important population of this species.
Reduce the area of occupancy of an important population	It is unlikely that an important population exists at the site, see above.
Fragment an existing important population into two or more populations	It is unlikely that an important population exists at the site, see above.
Adversely affect habitat critical to the survival of a species	The habitat within the subject land is unlikely critical habitat for the species, as no individuals have been found on or directly adjacent to the subject land.
Disrupt the breeding cycle of an important population	As indicated above, no important population of this species is likely to occur locally.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The proposal will remove/modify up to 4.5 ha of potential habitat for the species. The proposal will not significantly exacerbate existing fragmentation for this species. Any reduction and fragmentation of available habitat is unlikely to cause the species to decline at a regional scale.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	There is the potential for works to introduce invasive species to the proposal site or exacerbate existing infestations of significant invasive species. Environmental safeguards for the management of biosecurity risks will be implemented (see **Section 6.7**).
Introduce disease that may cause the species to decline	Machinery used on site can potentially act as a transport for biosecurity risks. Environmental safeguards for the management of biosecurity risks will be implemented (see **Section 6.7**).
Interfere with the recovery of the species.	Loss or degradation of habitat, loss of or competition for hollows, road kills, illegal collection of wild birds, psittacine beak and feather disease, and climate change are the main identified threats to this species. Although this proposal will exacerbate habitat loss, due to the clearing of up to 4.5 ha of suitable habitat, this should not significantly interfere with the recovery of the species within the region.
Conclusion	**No significant impact**

Diamond Firetail (*Stagonopleura guttata*)	
Significant Impact Guideline	**Assessment**
Lead to a long-term decrease in the size of an important population of a species	The proposal would impact up to 4.5 ha of potential habitat for this species. The subject land is not at the edge of the species' distribution. Priority sites have not been identified for this species; however, considering the small extent and heavily modified condition of the vegetation within the subject land, it is highly unlikely that the site supports a "key source population" for the species, as per the formal definition of an important population. Furthermore, the species was not detected during the field survey and no records occur within 10 km. Therefore, the subject land is unlikely to contain an important population of this species.
Reduce the area of occupancy of an important population	It is unlikely that an important population exists at the site, see above.
Fragment an existing important population into two or more populations	It is unlikely that an important population exists at the site, see above.
Adversely affect habitat critical to the survival of a species	The habitat within the subject land is unlikely critical habitat for the species, as no individuals have been found on or directly adjacent to the subject land.
Disrupt the breeding cycle of an important population	As indicated above, no important population of this species is likely to occur locally.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The proposal will remove/modify up to 4.5 ha of potential habitat for the species. The proposal will not significantly exacerbate existing fragmentation for this species. Any reduction and fragmentation of available habitat is unlikely to cause the species to decline at a regional scale.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	There is the potential for works to introduce invasive species to the proposal site or exacerbate existing infestations of significant invasive species. Environmental safeguards for the management of biosecurity risks will be implemented (see **Section 6.7**).
Introduce disease that may cause the species to decline	Machinery used on site can potentially act as a transport for biosecurity risks. Environmental safeguards for the management of biosecurity risks will be implemented (see **Section 6.7**).
Interfere with the recovery of the species.	Clearing and fragmentation of woodland, open forest, grassland and mallee habitat for agriculture and residential development, and firewood collection; poor regeneration of open forest and woodland habitats; and the invasion of weeds, resulting in the loss of important food plants are the main threats facing this species. Although this proposal will exacerbate the clearing and fragmentation of woodland, due to the clearing of up to 4.5 ha of suitable habitat, this should not significantly interfere with the recovery of the species within the region.
Conclusion	**No significant impact**

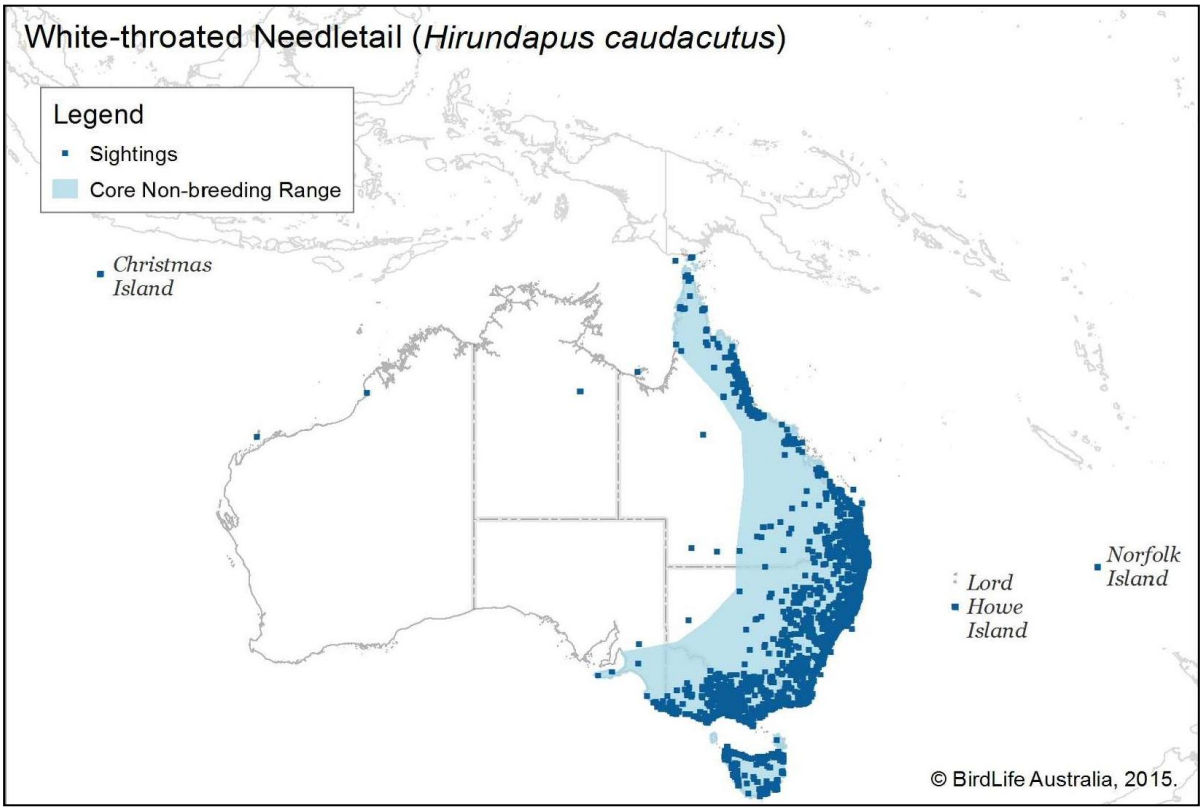
EPBC Act-listed Migratory Species

Fork-tailed Swift (*Apus pacificus*)	
Significant Impact Guideline	**Assessment**
Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species.	*Apus pacificus* is widespread throughout Australia with the entire country being mapped as within their "core range". The species was not observed during the field survey and only two records (from 2003) occur within the 10 km search area. Both records occur along the Murray River system ~ 4.9 km from the subject land. As this species forages aerially and breeds outside of Australia, the proposal is unlikely to substantially modify, destroy or isolate any area of important habitat for this migratory species.
Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species.	While there is potential for works to introduce invasive species to the proposal site or exacerbate existing infestations of significant invasive species, environmental safeguards for the management of biosecurity risks will be implemented (see **Section 6.7**).
Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.	It is unlikely that an ecologically significant proportion of the population occurs within or is dependent on the proposal site. The proposal is unlikely to seriously disrupt the lifecycle for this species
Conclusion	**No significant impact**



Fork-tailed Swift Core Range

White-throated Needletail (*Hirundapus caudacutus*)	
Significant Impact Guideline	**Assessment**
Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species.	This species is widespread in eastern Australia from Tasmania to Cape York, most often observed above wooded areas, including open forest and rainforest, and may also fly between trees or in clearings, below the canopy. The subject land falls within the mapped "non-breeding core range" for this species. This species was not observed during the field survey and no records occur within the 10 km search area. As this species forages aerially and breeds outside of Australia, the proposal is unlikely to substantially modify, destroy or isolate any area of important habitat for this migratory species.
Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species.	While there is potential for works to introduce invasive species to the proposal site or exacerbate existing infestations of significant invasive species, environmental safeguards for the management of biosecurity risks will be implemented (see **Section 6.7**).
Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.	It is unlikely that an ecologically significant proportion of the population occurs within or is dependent on the proposal site. The proposal is unlikely to seriously disrupt the lifecycle for this species
Conclusion	**No significant impact**



White-throated Needletail Core Range

Appendix E: BAM Credit Summary Report

BAM Credit Summary Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00041985/BAAS21028/23/00041986	Tocumwal Magazine Compound Upgrade	14/03/2024
Assessor Name	Report Created	BAM Data version *
David Orchard	10/09/2024	67
Assessor Number	BAM Case Status	Date Finalised
BAAS21028	Finalised	10/09/2024
Assessment Revision	Assessment Type	
0	Major Projects	

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

Zone	Vegetation zone name	TEC name	Current Vegetation integrity score	Change in Vegetation integrity (loss / gain)	Area (ha)	Sensitivity to loss (Justification)	Species sensitivity to gain class	BC Act Listing status	EPBC Act listing status	Biodiversity risk weighting	Potential SAII	Ecosystem credits

NSW GOVERNMENT

BAM Credit Summary Report

Plains Grass grassland on alluvial mainly clay soils in the Riverina Bioregion and NSW South Western Slopes Bioregion											
2	45_Moderate	Natural Grasslands of the Murray Valley Plains	67.9	67.9	3.9	Environment Protection and Conservation Act listing status	High Sensitivity to Gain	Not Listed	Critically Endangered	2.50	167
										Subtotal	**167**
River Red Gum - wallaby grass tall woodland wetland on the outer River Red Gum zone mainly in the Riverina Bioregion											
1	9_Remnant	Not a TEC	57.3	57.3	0.5	PCT Cleared - 66%	High Sensitivity to Gain			1.75	13
										Subtotal	**13**

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NSW GOVERNMENT

BAM Credit Summary Report

Yellow Box - River Red Gum tall grassy riverine woodland of NSW South Western Slopes Bioregion and Riverina Bioregion												
3	74_Remnant	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla	43.5	43.5	0.1	Population size	High Sensitivity to Gain	Critically Endangered Ecological Community	Not Listed	2.50	True	3
											Subtotal	**3**
											Total	**183**

Species credits for threatened species

Vegetation zone name	Habitat condition (Vegetation Integrity)	Change in habitat condition	Area (ha)/Count (no. individuals)	Sensitivity to loss (Justification)	Sensitivity to gain (Justification)	BC Act Listing status	EPBC Act listing status	Potential SAII	Species credits

NSW GOVERNMENT

BAM Credit Summary Report

Myotis macropus / Southern Myotis (Fauna)									
9_Remnant	57.3	57.3	0.07	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	2
								Subtotal	**2**

Assessment Id
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