APPENDIX T

DUNGOWAN DAM AND PIPELINE EIS

Waste Management Assessment

NSW GOVERNMENT | EMM creating opportunities

Dungowan Dam and pipeline project

Waste Management Assessment

Prepared for Water Infrastructure NSW

September 2022

Dungowan Dam and pipeline project

Waste Management Assessment

Water Infrastructure NSW

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Executive Summary

This Waste Management Assessment has identified waste streams to be generated from the Dungowan Dam and pipeline project, its impact on the surrounding environment and mitigation measures to address any potential impact.

Waste generated from the Dungowan Dam and pipeline project will likely include a mixture of general liquid waste, general solid waste (non-putrescible), general solid waste (putrescible) and hazardous waste. The key waste generating activities include spoil from excavations at the spillway and embankment, decommissioning the existing dam, site establishment and road upgrades; wastewater from concrete and grouting works, greywater and sewage at construction ancillary facilities; concrete and other solid waste from dam decommissioning; vegetation clearance within the reservoir area and for site establishment; and food and general waste at the accommodation camp and ancillary facilities.

Management measures are proposed to be implemented to ensure waste generation of the project has a negligible impact on the surrounding environment. A Construction Waste Management Plan will be prepared in accordance with the management measures outlined in this report and to comply with the NSW *Protection of the Environment Operations Act 1997*, *Protection of the Environment Operations (Waste) Regulation 2014* and the *NSW Waste and Sustainable Materials Strategy 2041 Stage 1: 2021–2027*, and will aim to prevent, avoid, reuse and recycle project related waste.

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1 Introduction

1.1 The project

The Peel River, part of the Namoi River catchment, provides water for irrigation as well as being the primary water supply for the city of Tamworth. Prompted by the millennium drought, investigations into the future water supply and demand for bulk water were undertaken for the regional city of Tamworth and Peel Valley water users. The Dungowan Dam and pipeline project (the project) is a critical project to improving long-term water security for the region. The project includes a new dam at Dungowan (new Dungowan Dam) approximately 3.5 km downstream of the existing Dungowan Dam and a new section of pipeline about 32 km long between the proposed Dam outlet and the tie in point to an existing pipeline from Dungowan Showground to the Calala Water Treatment Plant (WTP).

In September 2022, the Minister for Planning and Homes declared the project to be Critical State Significant Infrastructure (CSSI) as it is a development that is essential for the State for economic and social reasons. This requires Schedule 5 of the State Environmental Planning Policy (Planning Systems) 2021 to be updated to reflect the CSSI status of the project. As CSSI, the project is subject to Part 5, Division 5.2 of the EP&A Act, which requires the preparation of an environmental impact statement (EIS) and the approval of the NSW Minister for Planning and Homes. The EIS has been prepared for the planning approval application for the project. This Waste Management Assessment has been prepared to support the EIS. The project is shown in Figure 1.1.

In addition to requiring approval from the NSW Minister for Planning, the project has been deemed a controlled action under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and requires approval from the Commonwealth Minister for the Environment. The Minister for the Environment has accredited the NSW planning process for the assessment of the project. Therefore, a single EIS has been prepared to address the requirements set out by the NSW Department of Planning and Environment (DPE) and the Commonwealth Department of Agriculture, Water and Environment.

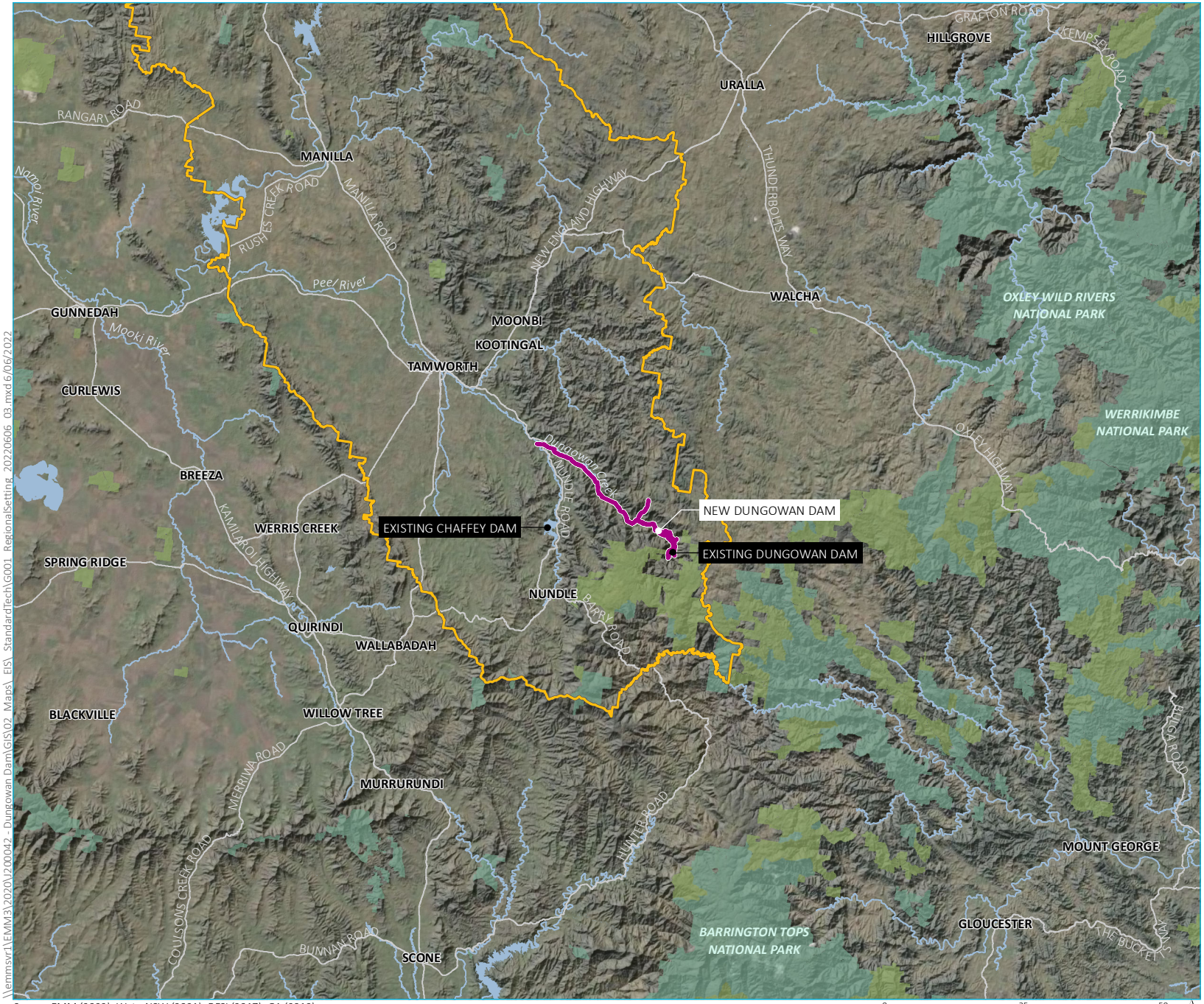
1.2 Project location

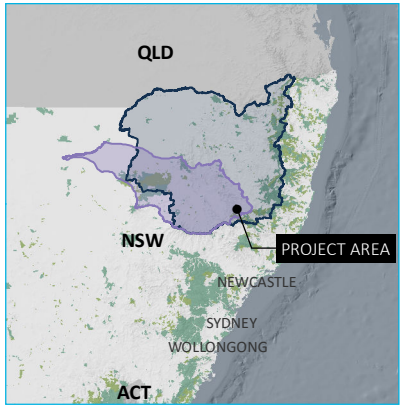
The project is located in the Tamworth Regional local government area (LGA), the New England Tablelands bioregion and part of the New England and North West region of NSW, west of the Great Dividing Range (DPE 2017). The New England and North West region is home to approximately 186,900 people and has a total area of around 99,100 km2 (ABS 2018).

The city of Tamworth is the nearest (and largest) town to the project with over 40,000 residents. Other nearby regional towns include Quirindi (70 km west), Manilla (90 km north-west), Gloucester (90 km south-east), Armidale (100 km north) and Gunnedah (110 km west of the project).

The existing Dungowan Dam is in the Namoi River catchment approximately 50 km south-east of Tamworth in NSW. The Namoi catchment covers 4,700 km^2 and borders the Gwydir and Castlereagh catchments and is bounded by the Great Dividing Range in the east, the Liverpool Ranges and Warrumbungle Ranges in the south, and the Nandewar Ranges and Mount Kaputar to the north.

The existing Dungowan Dam is on Dungowan Creek, which is a tributary of the Peel River. Dungowan Creek is confined by the existing Dungowan Dam, while the Peel River system is regulated by Chaffey Dam, located in the upper catchment near the town of Woolomin, approximately 45 km from Tamworth. The project's regional setting is shown in Figure 1.1.





KEY

- Project footprint
- Major road
- Named watercourse
- Named waterbody
- NPWS reserve
- State forest
- Tamworth Regional local government area

INSET KEY

- Namoi River catchment
- New England North West region

Source: EMM (2022); WaterNSW (2021); DFSI (2017); GA (2013)

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Regional setting

Dungowan Dam and pipeline project
Figure 1.1

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1.2.1 Project impact areas

In outlining the project, a project footprint has been defined to facilitate the assessment of direct impacts from the project:

- Project footprint: all areas where direct impacts may be experienced during construction and/or operation.

The project footprint has an area of 315 ha and is comprised of the construction and operational footprints, of which there is some overlap:

- Construction footprint: areas where vegetation clearing and/or ground disturbance is required for construction of the dam, pipeline and ancillary facilities, including the area needed to decommission and rehabilitate the existing dam.

- Operational footprint: areas where there will be permanent operational elements or easements, including infrastructure needed to operate the new Dungowan Dam and pipeline. The operation footprint includes the inundation area, being the area defined by the proposed full supply level (FSL) for the project.

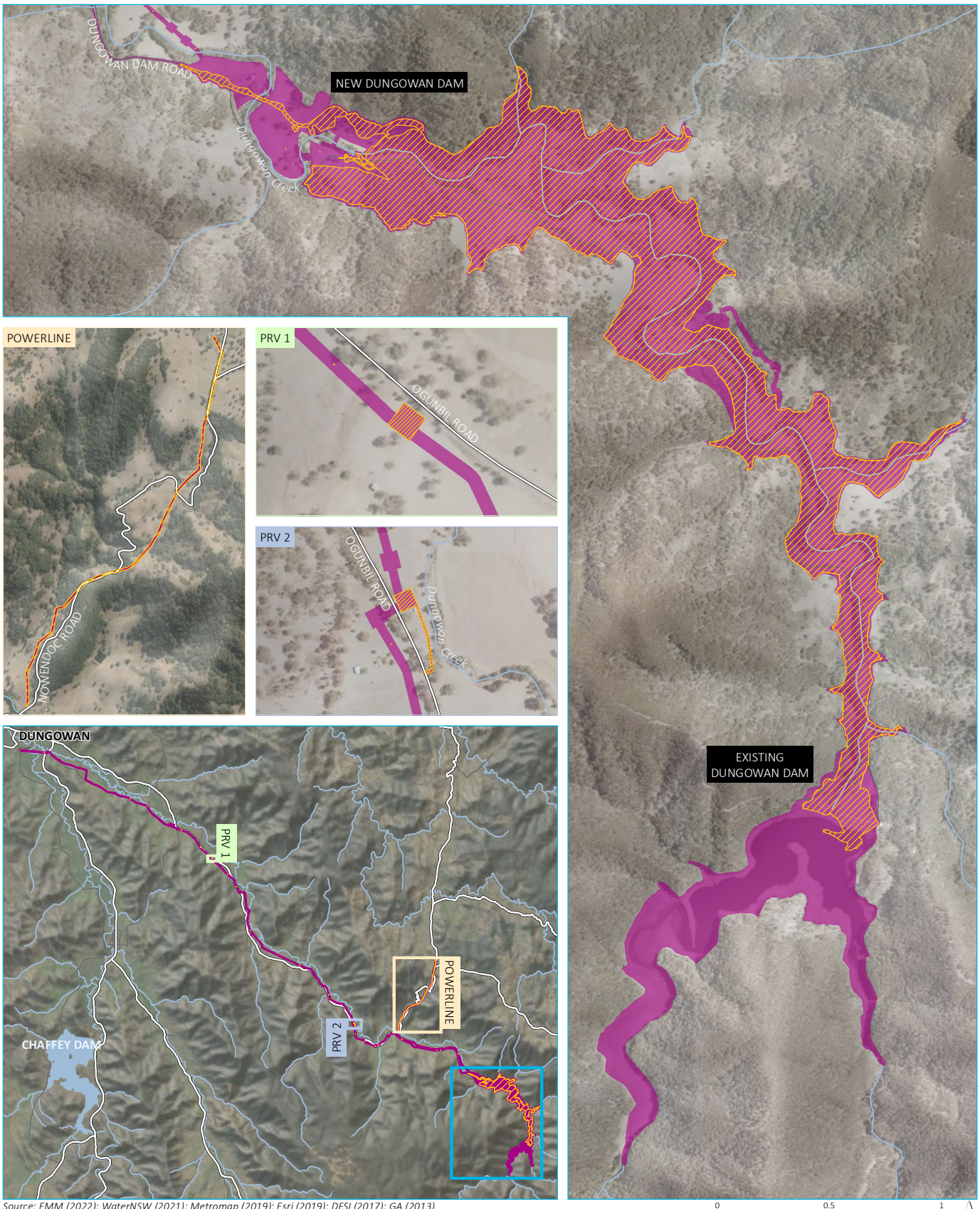
The study area as well as the project construction and operational footprints are shown in Figure 1.2.

Additional areas outside the project footprint have also been considered where relevant to the assessment of project impacts and include:

- Upstream flood extent: An area above the FSL to the level of a probable maximum flood (PMF) event that would be inundated for relatively short periods during operation associated with extreme rainfall events.

- Project area: A 10 km buffer around the project footprint defined to allow for assessment of potential indirect impacts.

- Downstream impact area: the area where hydrological changes may occur due to the project. This area is discussed in detail in the Surface Water Assessment (EMM 2022a) as well as other technical reports subject to changed flow regimes as a result of the new Dungowan Dam operation. The downstream impact area includes Dungowan Creek and also the Peel River downstream of Chaffey Dam.



Source: EMM (2022); WaterNSW (2021); Metromap (2019); Esri (2019); DFSI (2017); GA (2013)

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KEY

- Construction footprint
- Operational footprint

Existing environment

- Major road
- Minor road
- Named watercourse
- Named waterbody

Project footprint

Dungowan Dam and pipeline project
Figure 1.2

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1.3 Purpose of this report

This Waste Management Assessment supports the EIS for the project. It aims to identify waste to be generated from the project, its impact on the surrounding environment and mitigation measures to address any potential impact. It can be read in conjunction with the Surface Water Assessment (EMM 2022a), Groundwater Assessment (EMM 2022b), Land, Soils and Erosion Report (EMM 2022c) and Contamination Preliminary Site Investigation (EMM 2022d) prepared for the project, as these reports further define mitigation measures relevant to the management of wastewater, sedimentation and erosion.

1.4 Assessment guidelines and requirements

1.4.1 Secretary's Environmental Impact Assessment

This Waste Management Assessment has been prepared in accordance with the Secretary's Environmental Assessment Requirements (SEARs) for the Dungowan Dam and pipeline project as well as relevant government assessment requirements, guidelines and policies, and in consultation with the responsible government agencies.

The SEARs must be addressed in the EIS. Table 1.1lists the matters relevant to this assessment and where they are addressed in this report.

Table 1.1 Relevant matters raised in SEARs

Requirement	Section addressed
63. Details of the quantities and classification of all waste streams to be generated during construction, operation and decommissioning of the project, including spoil and other excavated materials.	Chapter 3
64. Details of waste storage, handling and disposal during construction and operation of the project and potential sources of disposal.	Chapter 3
65. Details of the measures that would be implemented to ensure that the construction and operation of the project is consistent with the aims, objectives and guidance in the NSW Waste Avoidance and Resource Recovery Strategy 2014-2021.	Chapter 4
66. Details of the proposed scope of demolition works associated with the project, including any proposed works to the existing dam wall, identifying the likely volume of demolition waste and consideration of the potential for re-use of materials on site.	Section 3.2

To inform preparation of the SEARs, DPE invited relevant government agencies to advise on matters to be addressed in the EIS. These matters were taken into account by the Secretary for DPE when preparing the SEARs.

1.4.2 Legislation and strategies

i *NSW Waste and Sustainable Materials Strategy 2041 Stage 1: 2021–2027*

The *NSW Waste and Sustainable Materials Strategy 2041 Stage 1: 2021–2027* (NSW EPA 2021) replaces the *Waste Avoidance and Resource Recovery Strategy 2014–2021*. The *NSW Waste and Sustainable Materials Strategy 2041 Stage 1: 2021–2027* (NSW EPA 2021) focuses on the environmental benefits and economic opportunities in how waste is managed in NSW. The document sets out actions and targets for the strategy through to 2027. Key targets of the strategy are to:

- reduce total waste generated by 10% per person by 2030;
- have an 80% average recovery rate from all waste streams by 2030;
- significantly increase the use of recycled content by governments and industry;

- phase out problematic and unnecessary plastics by 2025; and
- halve the amount of organic waste sent to landfill by 2030.

A key priority of the strategy is to support the development of the circular economy. A circular economy is an economic system aimed at minimising waste and promoting the continual reuse of resources. The circular economy is based on three key principles:

- design out waste and pollution;
- keep products and materials in use; and
- regenerate natural systems.

The project approach to waste management will be consistent with principles of the circular economy and will incorporate management measures to ensure waste is appropriately reused, recycled or disposed of. The primary aim of waste management for the project will be to prevent and avoid waste followed by the use of renewable and recycled materials. Waste management is further discussed in Chapter 3.

ii NSW Protection of the Environment Operations Act 1997

The NSW *Protection of the Environment Operations Act 1997* (POEO Act) is the key piece of environmental legislation administered by the NSW Environment Protection Authority (EPA).

Schedule 1, part 3, clause 49 of the POEO Act outlines the different types of waste classifications, including general solid waste (non-putrescible), general solid waste (putrescible), hazardous waste, liquid waste, restricted solid waste, and special waste. The different types of waste to be generated from the project have been classified as per the POEO Act (and the Waste Classification Guidelines (NSW EPA 2014a)) and are further discussed in Chapter 3.

Section 48 of the POEO Act requires an environment protection licence (EPL) for scheduled activities to be undertaken at a premise, as listed in Part 1 Schedule 1 of the POEO Act. The scheduled activities potentially relevant to the project with respect to waste are provided in Table 1.2.

Table 1.2 Premise-based scheduled activities of the POEO Act

Premise-based scheduled activity under Schedule 1 Part 1 of the POEO Act	Relevance to the project
39 Waste disposal (application to land) *1) This clause applies to waste disposal by application to land, meaning the application to land of waste received from off site, including (but not limited to) application by any of the following methods:* *a) spraying, spreading or depositing on the land,* *b) ploughing, injecting or mixing into the land,* *c) filling, raising, reclaiming or contouring the land.* *2) However, this clause does not apply to an activity that involves any of the following:* *a) sites inside the regulated area that, over any period of time, receive from off site a total of no more than 200 tonnes of the following waste (and no other waste):* *i. building and demolition waste only,* *ii. building and demolition waste mixed with virgin excavated natural material,*	Spoil produced from the existing dam decommissioning is expected to be placed at two key locations, one on the peninsula immediately upstream of the existing Dungowan Dam embankment, the other to fill redundant spillway infrastructure on the left abutment. Excess spoil produced from the new dam construction would be emplaced in the proposed reservoir area, preferably below the reservoir minimum operating level (MOL) to minimise impacts on the reservoir storage capacity. Refer to section 3.2. However, as no spoil or waste would be received from off site, the project is

Table 1.2 Premise-based scheduled activities of the POEO Act

Premise-based scheduled activity under Schedule 1 Part 1 of the POEO Act	Relevance to the project
b) sites outside the regulated area that, over any period of time, receive from off site a total of no more than 200 tonnes of the following waste (and no other waste): *i. building and demolition waste only,* *ii. building and demolition waste mixed with virgin excavated natural material, being waste generated inside the regulated area,* *c) sites outside the regulated area that, over any period of time, receive from off site a total of no more than 20,000 tonnes of the following waste (and no other waste):* *i. building and demolition waste only,* *ii. building and demolition waste mixed with virgin excavated natural material, being waste generated outside the regulated area,* *d) sites that receive from off site no more than 5 tonnes of waste tyres per year or 500 waste tyres in total over any period (and no other waste),* *e) sites where only virgin excavated natural material is received from off site and applied to land,* *f) sites that are outside the regulated area, but only if:* *i. the site is owned by and operated by or on behalf of a local council, and* *ii. the site was in existence immediately before 28 April 2008 and was not required to be licensed before that date, and* *iii. details required under clause 47 of the Protection of the Environment Operations (Waste) Regulation 2005 were provided, in relation to the site, before 28 April 2008, and* *iv. the site receives from off site less than 5,000 tonnes per year of waste, and* *v. that waste has been generated outside the regulated area and consists only of general solid waste (putrescible), general solid waste (non-putrescible), clinical and related waste, asbestos waste, grease trap waste or waste tyres (or any combination of them).* *3) The activity to which this clause applies is declared to be a scheduled activity.* *4) For the purposes of this clause, 1 litre of waste is taken to weigh 1 kilogram.*	unlikely to trigger this scheduled activity.
16 Crushing, grinding or separating *1) This clause applies to **crushing, grinding or separating**, meaning the processing of materials (including sand, gravel, rock or minerals, but not including waste of any description) by crushing, grinding or separating them into different sizes.* *1A) However, this clause does not apply to the processing of materials by crushing, grinding or separating that occurs as part of an activity that is declared to be a scheduled activity by—* *(a) clause 33 (Railway activities—railway infrastructure construction), or* *(b) clause 35 (Road construction).* *b) The activity to which this clause applies is declared to be a scheduled activity if it has a capacity to process more than 150 tonnes of materials per day or 30,000 tonnes of materials per year.*	Excavated spoil will be reused during construction of the project (refer to Chapter 3). This requires processing, screening and crushing, including operation of the proposed on-site quarry. This is triggered under subclauses 16(1) and 16(2), as the material to be processed, crushed, separated will be over 30,000 tonnes per year. As noted in subclause 16(1A), this is not relevant to the re-use of materials for road construction.

iii NSW Protection of the Environment Operations (Waste) Regulation 2014

The NSW *Protection of the Environment Operations (Waste) Regulation 2014* (POEO Regulation) provides a regulatory framework to enforce penalties in support of the POEO Act.

Under Part 2 of the POEO Regulation, unlicensed waste (waste that is not controlled by an EPL) can be disposed of at a licenced waste facility, however a levy liability will be placed on the disposer for all waste received at the licenced waste facility. A levy payment will be triggered if waste is stored for more than 12 months or stockpiled illegally at the licenced waste facility or disposed of to landfill. The levy payment is then required to be paid by the disposer, licenced waste facility and landfill facility. The levy liability is extinguished if the waste is transported off-site of the licenced waste facility to be lawfully recovered, recycled, or processed.

This would apply to any construction and demolition waste resulting from the project that is taken to licensed waste facility. The types of construction and demolition waste expected from the project are discussed in Chapter 3.

In some circumstances, the application of waste to land may be exempt from an EPL or payment of waste levy, if a resource recovery order or exemption is granted by the EPA under the POEO Regulation. Resource recovery orders and exemptions can be granted if it can be demonstrated that a waste can be safely and effectively used for another purpose without causing harm to the environment or human health (NSW EPA 2015).

iv Waste Classification Guidelines

The Waste Classification Guidelines (NSW EPA 2014a) outlines a step by step process for classifying waste. It is split into 4 parts, which cover classifying waste, immobilising waste, waste containing radioactive material, and acid sulfate soils.

Waste generated from the project will be classified in accordance with Waste Classification Guidelines: Part 1 Classifying Waste (NSW EPA 2014a) and as defined in schedule 1, part 3, clause 49 of the POEO Act.

1.5 Other relevant reports

This Waste Management Assessment has been prepared with reference to other technical reports that were compiled as part of the EIS. The other relevant reports referenced in this Waste Management Assessment are listed below.

- Surface Water Assessment (EMM 2022a) – Appended to the EIS;
- Groundwater Assessment (EMM 2022b) – Appended to the EIS;
- Land, Soils and Erosion Report (EMM 2022c) – Appended to the EIS; and
- Contamination Preliminary Site Investigation (EMM 2022d) – Appended to the EIS.

2 Description of the project

This chapter provides a summary of the Dungowan Dam and pipeline project. It outlines the permanent infrastructure required to operate the project, as well as the key construction elements and activities required to construct the project. A comprehensive and detailed description of the project is provided as Appendix B1 of the EIS, which has been relied upon for the basis of this technical assessment.

2.1 Project overview

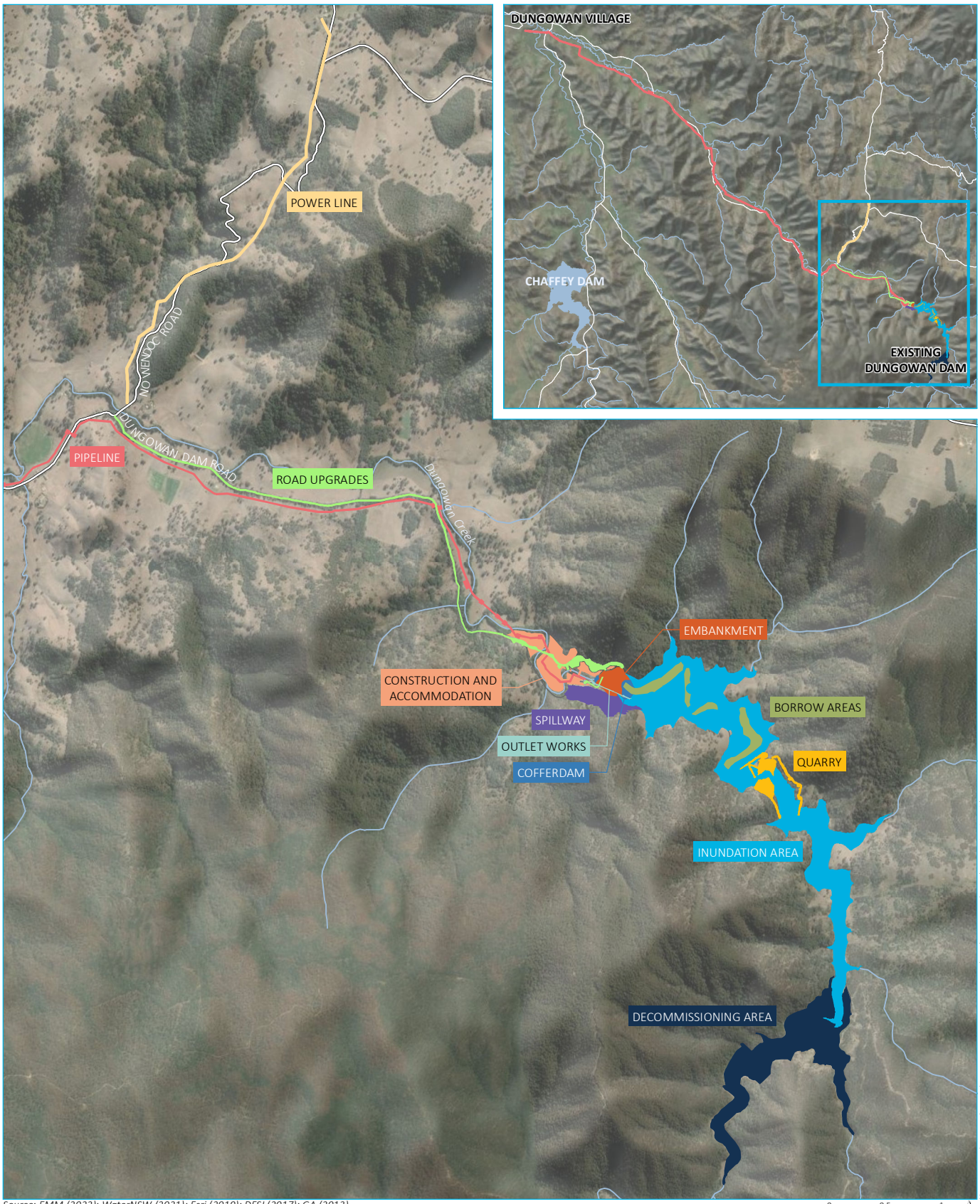
Water Infrastructure NSW proposes to build a new dam at Dungowan (new Dungowan Dam) about 3.5 km downstream of the existing Dungowan Dam and an enlarged delivery pipeline from the new Dungowan Dam outlet to the tie in point to the existing pipeline from Dungowan Showground to the Calala WTP. The existing pipeline from Dungowan Showground to the Calala WTP is not part of the Dungowan Dam and pipeline project. A summary of project elements is provided in Table 2.1. An overview of the project is provided in Figure 2.1.

Table 2.1 Overview of the project

Project element	Summary of the project
New Dungowan Dam infrastructure	Earth and rockfill embankment dam with height of ~58 m and a dam crest length of ~270 m.
	Storage capacity of 22.5 GL at full supply level (FSL) of RL 660.2 m AHD.
	The new Dungowan Dam on Dungowan Creek has a catchment size of 175 km^2 and is part of the Peel Valley and Namoi River catchment.
	Inundation extent (to FSL) of 130 ha (1.3 km^2)
	Spillway to the south of the dam wall including an approach channel, uncontrolled concrete ogee crest, chute and stilling basin. Free standing multiple-level intake tower connected with a bridge to the embankment, diversion tunnel with outlet conduit, valve house and associated pipework and valves.
	A permanent access road over the Dam crest to the valve house for operation and maintenance.
	Water diversion works including a diversion tunnel and temporary pipeline and upstream and downstream cofferdams to facilitate construction of the dam wall embankment.
Pipeline infrastructure	31.6 km of buried high density polyethylene (HDPE) pipe between 710 mm to 900 mm nominal diameter.
	Maximum 71 ML/day from the proposed dam to the junction with the pipeline from Chaffey Dam to the Calala Water Treatment Plant, to replace the existing 22 ML/day pipeline. The pipeline would connect to the valve house on the left abutment of the embankment. Valve infrastructure would include control valves installed in two above ground buildings along the pipeline.
	10 m wide easement for the 31.6 km length of the pipeline. The replacement pipeline extends from the new Dungowan Dam to a connection point with the existing pipeline between Dungowan Showground and Calala WTP.
Ancillary infrastructure and works	Road works to improve existing roads to provide construction access, temporary establishment and use of a construction compound, an accommodation camp, two upstream quarries and four borrow areas within the inundation area.
	A new 4.2 km long 11 kV overhead powerline (including a new easement and access track) connecting to an existing overhead line approximately 6 km north west of the dam. The existing overhead line that extends approximately 13.2 km to the Niangala area would also require minor upgrades, including re-stringing of new overhead wiring and replacement of some poles.
Decommissioning of existing Dungowan Dam	Dewatering of existing dam, removal of existing Dungowan Dam infrastructure and full height breach of the existing Dungowan Dam wall. Rehabilitation of inundation area of the existing Dungowan Dam.

Table 2.1 Overview of the project

Project element	Summary of the project
Disturbance	Areas of disturbance have been identified based on the direct impacts of the project. There is some overlap in the areas disturbed during construction and operation, with a resulting total disturbance area proposed for the project of 315 ha (project footprint). Disturbance would occur in a staged manner, with construction requiring disturbance of approximately 315 ha (construction footprint). Following construction and once rehabilitation is completed, there would be a permanent disturbance of approximately 158 ha comprising the inundation area and permanent infrastructure (operational footprint).
Construction	Construction duration of approximately 6 years.
	Construction workforce of approximately 125 workers at construction peak.
Operation	WaterNSW will be responsible for management, operation and general maintenance of the new dam. Tamworth Regional Council will be responsible for the management, operation and general maintenance of the pipeline. Public use and access to the dam would not be permitted and there would be no public facilities available during operation.
	One to two new full time workers plus part time work for existing WaterNSW operations team. Due to the new Dungowan Dam being prioritised over Chaffey Dam for Tamworth's future water supply, the water reserved for town water in Chaffey Dam would increase from 14.3 GL to 30 GL to ensure that water is set aside to meet Tamworth's town water supply water demand in years when rainfall is low.
Design life	100 years for zoned earthen embankment, structural concrete elements of the dam and the pipeline. 15 to 50 years for other non-structural project elements and pavements.
Assessment period (operational)	The assessment end point is when the water system performance reaches a level when an additional water supply option or change to the Water Sharing Plan is required. This has been estimated to be when the mean average annual water demand from Tamworth increases to 11 GL/year.



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Source: EMM (2022); WaterNSW (2021); Esri (2019); DFSI (2017); GA (2013)

0 0.5 1 km

GDA 1994 MGA Zone 56

N

KEY

- Inundation area
- Borrow areas
- Construction and accommodation camp
- Outlet works
- Cofferdams
- Embankment
- Quarries
- Spillway
- Road upgrade
- Decommissioning area
- Power line footprint
- Pipeline construction footprint

Existing environment

- Major road
- Minor road
- Named watercourse
- Named waterbody

Project overview

Dungowan Dam and pipeline project

Figure 2.1

EMM creating opportunities

3 Waste and spoil management assessment

3.1 Overview

This section provides an overview of the different types of wastes expected to be generated from the construction and operational phases of the project, as classified in the POEO Act and Waste Classification Guidelines: Part 1 Classifying Waste (NSW EPA 2014a).

During construction of the project, waste expected to be generated includes general liquid waste, general solid waste (non-putrescible), general solid waste (putrescible), hazardous waste and spoil. It is expected that there will be negligible waste generated during the operational phase of the project. The amount of waste to be generated will be identified during the detailed design phase of the project and documented in a Construction Environmental Management Plan (CEMP), however it is anticipated that the key waste streams will include waste from the existing Dungowan Dam decommissioning (including concrete and up to 300,000 m^3 of spoil), vegetation clearing from within the construction footprint and inundation area, excavated material that is not suitable for use in the dam construction and general construction waste.

These waste streams are further defined below, including any potential impact to the surrounding environment.

3.2 Construction waste

The identification of waste streams in Table 3.1 is based on the project's concept design. Multiple types of waste will be generated from each construction area, including the new 22.5 GL Dungowan Dam and ancillary infrastructure (access roads, construction compounds/laydown areas, and facilities including utilities and quarry), new augmented delivery pipeline, and the demolition and decommissioning of the existing Dungowan Dam. The type and sources of waste that would be produced during construction are summarised in Table 3.1 below.

Table 3.1 Construction waste types and source

Type of waste	Main sources of waste
General solid waste (non putrescible)* primarily concrete and metal, and other general materials such as glass, plastics, cardboard, packaging, virgin excavated natural material and cleared vegetation	• Spoil generated during excavations including: – Spillway excavation. – Embankment foundation works. – Decommissioning the existing dam embankment. – Site establishment earthworks for all ancillary infrastructure including construction compounds, accommodation camp and access roads. – Potential for spoil containing acid sulfate soils (ASS) during excavations for the pipeline, dam infrastructure and ancillary infrastructure. • Concrete and other solid waste from decommissioning of old dam and concrete batch plant at the construction compound. • Vegetation clearance within the reservoir area. • Vegetation clearance during site establishment for permanent and ancillary infrastructure. • General waste produced during construction activities and demobilisation at all locations including construction compounds.
General liquid waste, such as process water, grey water and sewage	• Process water for concrete and grouting works at construction compounds, embankment and spillway. • Grey water and sewage at construction compounds, accommodation camp and temporary facilities at quarries, borrow areas and existing dam decommissioning.
General solid waste (putrescible), such as food waste	• Food waste from the accommodation camp and construction compounds.

Table 3.1 Construction waste types and source

Type of waste	Main sources of waste
Special waste	• Spoil containing naturally occurring asbestos (NOA) that could be encountered during excavations for the pipeline. • Spoil containing asbestos or other contaminated material from past land uses

*Note that types of waste include pre-classified and wastes classified following analysis

3.2.1 General solid waste (non-putrescible)

During construction of the project, general solid waste (non-putrescible) would be generated in the form of vegetation, asphalt waste, concrete and other demolition waste, excavated natural material (ENM) and recyclables.

All general solid waste (non-putrescible) will be recycled, emplaced or disposed of at an appropriately licenced waste facility. The management of solid waste (non-putrescible) will be in accordance with the waste hierarchy and as outlined in Table 4.1 and Table 4.2 including preparation of a Construction Waste Management Plan (CWMP) for the project.

The overall potential impacts associated with the generation of general solid waste (non-putrescible), is potential contamination of construction areas or surrounding areas from uncontrolled waste disposal. Appropriate erosion control measures would be implemented at each construction area to ensure the different waste types do not enter surface water runoff and pollute surrounding waterways. A Land, Soils and Erosion Report (EMM 2022c) and Surface Water Assessment (EMM 2022a) have been completed for the project and appended to the EIS, which discusses further mitigation measures to limit surface water runoff from the construction of project elements.

i Virgin Excavated Natural Material / Excavated Natural Material

Virgin excavated natural material (VENM) and/or excavated natural material (ENM) would be produced during construction of various project elements. The primary sources of VENM and ENM would include:

- excavation of the spillway;
- quarry and borrow pits within the dam inundation area;
- diversion tunnel excavation;
- decommissioning the existing dam;
- earthworks during site establishment for ancillary facilities; and
- road upgrades.

The POEO Act defines VENM as natural material (such as clay, gravel, sand, soil or rock fines):

- that has been excavated or quarried from areas that are not contaminated with manufactured chemicals, or with process residues, as a result of industrial, commercial, mining or agricultural activities; and
- that does not contain any sulfidic ores or soils or any other waste; and
- includes excavated natural material that meets such criteria for virgin excavated natural material as may be approved for the time being pursuant to an EPA Gazettal notice.

VENM is a waste that has been pre-classified as general solid waste (non-putrescible).

ENM is naturally occurring rock and soil (including materials such as sandstone, shale, clay and soil) that has:

- been excavated from the ground;
- contains no less than 98 per cent (by weight) natural material;
- does not contain potential or actual acid sulphate soils; and
- does not meet the definition of VENM.

The overall potential impacts associated with the generation of this waste include potential contamination of construction areas or surrounding areas, including soil and surface water runoff from uncontrolled storage or disposal of excavated spoil which could enter surface water runoff and ultimately impact the water quality of Dungowan Creek. Sampling and analysis of ENM material should be undertaken in accordance with the *Excavated natural materials order 2014* (NSW EPA 2014b). Mitigation and management measures are provided in Table 4.2 and the management of ENM (or spoil) is further discussed in Section 4.3.

The following sections provide details of the primary sources of VENM and ENM during construction.

a Dam construction

The dam construction involves large excavations for construction of the spillway, embankment and the diversion tunnel. The geometric design of the spillway (eg spillway width, founding levels, depth of cut, alignment, proximity to main embankment) have been developed to provide a suitable material balance between the volume of material produced by the spillway excavation and the volume of material required for the main embankment. In total up to 1.9 million m^3 of the excavated material would be generated by the spillway excavation and re-used for the embankment. Excess excavated material that cannot be re-used would require management. The exact quantity of excavated material that could be reused would depend upon the type of materials encountered during the project construction and would be determined through the project detailed design and construction.

Excess excavated material would be emplaced in dedicated areas that would be sited in the proposed reservoir area to limit environmental impacts beyond the existing reservoir footprint. The emplacement areas would be located in low lying areas preferably below the reservoir minimum operating level (MOL) to minimise impacts on the reservoir storage capacity. Excess excavated materials may also be managed by backfilling borrow areas within the reservoir area.

All excavated materials would be placed in dry conditions prior to inundation of the reservoir. The placement of excess spoil would follow a material testing process to ensure that materials are suitable for emplacement. The emplacement areas would be designed with consideration of long-term stability. A spoil management plan would be prepared prior to construction and would provide details of how excess excavated materials would be managed. This plan would include details of the measures that would be implemented to minimise impacts of excavated material placement on the environment.

b Existing dam decommissioning

The proposed full height breach excavation for the existing dam decommissioning would generate approximately 300,000 m^3 of spoil materials that would require management.

Spoil material would be placed in the following locations:

- spoil from the embankment breach would be used to form the channel downstream of the embankment toe

- spoil would then be used to fill in the redundant spillway structures on the left abutment of the existing dam
- any excess spoil would be placed in a profiled placement area within the former inundation area of the existing dam.

It is expected that an excess volume of spoil material would be created by the embankment breach excavation, exceeding what is required for the downstream levelling and left abutment remediation. The excess material would be used to construct an additional profiled placement area within the existing reservoir.

Based on the bathymetric survey undertaken of the existing inundation area, the excess spoil is expected to be placed on the peninsula immediately upstream of the embankment. A typical section of the profiled placement area is presented in Figure 3.1. The excess spoil would be placed below the existing full supply level to limit any incremental environmental impact beyond the existing reservoir footprint (Figure 3.2). The profiled placement area would be appropriately compacted and feature maximum slope gradients of 2.5H:1V to comply with long term stability requirements. Revegetation of the profiled placement area and contouring into the surrounding natural surface would also be undertaken.

Concrete rubble from the demolition works would be encapsulated in the final profiled spoil placement area.

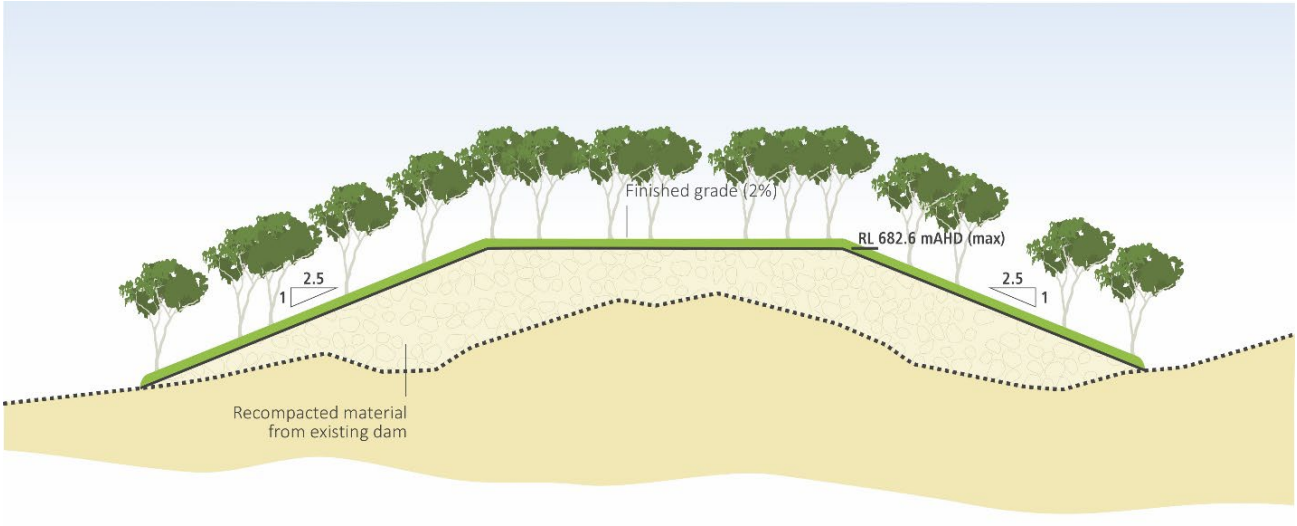

Figure 3.1 Schematic section of profiled placement area

Source: EMM (2022); WaterNSW (2021); Metromap (2019); Esri (2019); DFSI (2017); GA (2013)

0 250 500 m

GDA 1994 MGA Zone 56

N

KEY

- Project footprint
- Decommissioning and filling of redundant spillway
- Full height breach of existing dam wall embankment
- Profiled placement area
- Profiled placement area
- Decommissioning area

Existing environment

- Minor road
- Named watercourse
- Named waterbody

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Existing dam decommissioning works

Dungowan Dam and pipeline project
Waste report
Figure 3.2

EMM
creating opportunities

c Contamination

The Contamination Preliminary Site Investigations (EMM 2022d) identified a low-medium risk of acid sulfate soils (ASS) and potentially acid forming (PAF) rock being encountered during excavations within the construction footprint. As outlined in the Contamination Preliminary Site Investigations (EMM 2022d), further assessment will be carried out at identified low - medium risk areas of potential contamination to better understand these risks and identify suitable methods for management of any contaminated material.

The CWMP would include procedures for handling and storing excavated rock and/or stockpiled materials, including potentially or known contaminated soil/fill in accordance with the POEO Act. Material which has been assessed as not suitable for reuse or management (eg via encapsulation or treatment) will be appropriately characterised prior to offsite disposal.

Further details of measures that would be implemented to manage contaminated materials during construction are provided in the Contamination Preliminary Site Investigations (EMM 2022d).

d Storage and handling

Prior to re-use or emplacement, spoil would be temporarily stockpiled within the construction footprint or decommissioning area. A spoil management plan would be prepared prior to construction and would provide details of temporary spoil stockpiling and handling including measures that would be implemented to minimise impacts to the environment.

ii Vegetation

Vegetation would be cleared to ground level to allow construction of project infrastructure, including the construction compounds/laydown areas, utilities, quarry, new augmented delivery pipeline from the new Dungowan Dam and access roads. All trees within the inundation area and up to 2 m above FSL would be cut to stump height and the stumps left in situ.

In total it is estimated that the following volumes of vegetation waste would be generated by the project:

- 5,500 t woody material from tree removal;
- up to 1,400 t non-woody material; and
- 1,100 t weed infested material requiring treatment.

The management of vegetation waste would follow the principles of the circular economy to design out waste and pollution, keep products and materials in use and regenerate natural systems to the greatest extent practical. It is expected that the majority, and likely all, of the vegetation waste would be re-used or recycled through the construction and rehabilitation of the project. The options for management of vegetation waste that would be implemented and maximum quantities that could be re-used or disposed of are outlined in Table 3.2.

Table 3.2 Vegetation waste management options and indicative volumes

Priority	Waste hierarchy	Indicative maximum volumes required (tonnes)	Waste management activities
1	Avoid and reduce waste	-	Rerouting of infrastructure to avoid maximum possible ground disturbance.
2	Reuse waste	280	Cleared vegetation used onsite or through rehabilitation to provide wildlife habitat.
3	Recycle waste	13,200	Processing as compost or mulch for onsite or offsite use.
4	Recover energy	0	Using removed wood as fuel for power generation or heat.
5	Treat waste	1,100	Destruction of problematic weeds via biological control or herbicides.
6	Dispose waste	1,400	Disposal of residual vegetation at authorised landfills or burning.

Descriptions of the vegetation waste management options identified in the table above are provided in the following sections.

a Vegetation re-use

Some of the removed vegetation would be re-used in the project landforms and rehabilitation. This would be mainly in the form of using wooden logs without further processing for opportunities such as wildlife habitat, walkway delineation, silt control etc. The suitability of areas for reuse of vegetation is largely determined by their proximity to the felled trees, which can only be moved short distances economically. Reuse of cleared vegetation to provide wildlife habitat would be completed following consultation with an ecologist and in accordance with measures outlined in the project biodiversity management plan.

The potential reuse of trees in such manner will be opportunistic. About 5% of the total estimated tree volume is nominated as an aspirational diversion rate for this approach. Consultation with an ecologist will be essential in identifying suitable locations for such use.

There is potential for additional re-use of vegetation in the rehabilitation of the existing dam site where wooden logs will likely be required for wildlife habitat and scour protection. The volume of materials required are not known at this time and would need to be developed through the rehabilitation design. The estimate provided does not include allowance for this re-use and it is expected that through the design development opportunities will be identified to increase the re-use of vegetation waste where practical.

b Vegetation recycling

Removed vegetation could be recycled in the form of mulch, compost or more readily as woodchips. A beneficial use in processed form can be expected during the project rehabilitation. The size of the area to be rehabilitated by the project is sufficient to accommodate recycling of all vegetation waste that would be generated. It is expected that all vegetation waste that could not be re-used including woody, non-woody and treated weed materials could be recycled for use in the project rehabilitation.

The indicative volumes of recycled vegetation waste required during the project rehabilitation are provided in Table 3.3 below. The total volume required of 13,200 t far exceeds the volume of vegetation waste that would be generated by the project (ie. 8,000 t).

Table 3.3 Recycled vegetation volumes likely required during rehabilitation

Location	Description	Area (ha)	Woodchips (tonnes)
Existing Dam	Rehabilitation of the reservoir area at the existing Dungowan Dam	30.8	11,706
Quarry 1	Rehabilitation of Quarry Area	1.6	589
Quarry 2	Rehabilitation of Quarry Area	1.4	528
Spillway	Area between construction and spillway	1	376
Total			**13,200**

c Treatment of weed infested vegetation

Treatment of waste refers to management of weed infestation across the project footprint. Based on the project vegetation mapping it is estimated that approximately 1,100 tonnes of weed infested vegetation would require treatment.

The treated waste is expected to be benign and usable for onsite rehabilitation of borrow pits or elsewhere when mixed with other suitable materials such as surplus excavation or topsoil. Given the significant capacity for recycling vegetative material onsite, it is expected all material will be recycled. However, if reuse of treated waste is not possible, then offsite removal will be required.

d Vegetation disposal

The residue from removal of trees such as barks, stems, undergrowth and soil may also be generated during the works and may require disposal via onsite burning. A conservative approach towards estimation of residual waste has been applied considering the terrain and sporadic tree density. A wastage of 25% has been adopted for this estimation purpose. It is estimated that up to 1,400 tonnes of non-woody vegetation waste may be generated by the project on this basis.

It is expected that there is sufficient capacity in the proposed rehabilitation areas to recycle all of this waste on site, so burning of waste is not expected. Nonetheless, the potential waste management requirements have been estimated in case the non-woody waste is found to be unsuitable for use in the project rehabilitation.

Where non-woody vegetation burning is required, the residual waste would be pushed into a stockpile within 50 m to 100 m of the clearing area depending on topography. Controlled burning of the stockpiles would then be undertaken. In the unlikely event that disposal of non-woody vegetation via burning is required, stockpiles would be sited based on the following criteria:

- away from the toe of vegetated batter located upslope;
- down gradient of areas with sparse vegetation;
- near a source of water; and
- within proximity to clearing areas.

Indicative locations where vegetation disposal via burning may occur are shown in Figure 3.3 and would be confirmed during detailed design. Vegetation burning would be undertaken in accordance with relevant fire management requirements detailed in the Bushfire Hazard Assessment, appended to the EIS.

Mitigation and management measures to minimise the impacts of storage, handling and disposal of this waste are provided in Table 4.2 of Section 4.3.

iii Co-mingled construction and demolition waste

During construction, general construction waste from the establishment of construction areas would be produced. This may include, but not be limited to:

- packaging waste including pallets;
- excess construction material (eg brick, concrete and rubble) resulting from the establishment of construction hardstand areas to support dam construction; and
- excess material from establishing drainage areas.

This type of waste will also be generated during decommissioning of the construction areas and existing Dungowan Dam, which includes the demolition or removal of various features. The existing dam decommissioning works are likely to include the following demolition works and related activities:

- intake tower demolition;
- outlet tunnel decommissioning (by concreting/grouting);
- primary spillway gate demolition (including recycling and/or heritage display);
- downstream buildings demolition (including valves/pipework);
- concrete demolition (as required) – concrete rubble to be buried;
- excess excavated material to be placed in spillway chutes/stilling basins; and
- reshape/contour abutments.

Where possible and suitable, excess inert construction and demolition waste would be incorporated into the spoil placement area described in Section 3.2.1i to avoid the requirement for offsite disposal. Notwithstanding, some components (eg valves and pipework) may require offsite removal or disposal.

Co-mingled construction and demolition waste would be stored in skips and segregated where possible for reuse, recycling or disposal at an appropriately licenced waste disposal facility in accordance with the Waste hierarchy and managed in accordance with the measures outlined in Table 4.2.

Source: EMM (2022); WaterNSW (2021); Metromap (2020); DFSI (2017); GA (2013)

0 250 500 m

GDA 1994 MGA Zone 56

N

KEY

- Project footprint
- Proposed burn stockpile location
- Minor road
- Named watercourse
- State forest

Indicative locations for vegetation burning

Dungowan Dam and pipeline project
Waste report
Figure 3.3

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iv Recyclables

Recyclables, such as cardboard, paper, plastics, glass and aluminium cans, would be generated from the office facilities and construction workforce working at the construction areas and along roads. As noted above, the construction workforce would be working at most of the construction areas, including along the alignment of the pipeline and new and existing roads to be upgraded. Office facilities are proposed to be located at the site of the new Dungowan Dam, immediately downgradient of the spillway.

Recyclables would be stored in designated labelled and covered recycling areas before being transported to an appropriately licenced facility for recycling. The nearest waste and recycling facility is the Tamworth Waste Management Facility at 123A Forest Rd, North Tamworth. Mitigation and management measures for recyclable waste are provided in Table 4.2 and would be further defined in the CWMP.

v Asphalt waste

Although most of the proposed road upgrades, including Dungowan Dam Road, would be of unsealed roads there may be some minor generation of asphalt waste, which would comprise a mixture of bitumen and aggregate.

Asphalt waste, including sediment, grit and other contaminants, could run into surface water during a rain event, if inappropriately stored or dumped. This could contaminate the construction areas and the surrounding environment.

Reclaimed asphalt may be recycled during road upgrades via the re-application to land for road construction or maintenance. Under Part 9 of the POEO Act, the application of reclaimed asphalt to land for the purposes of road construction or maintenance is exempt from certain provisions of the POEO Act, including:

- section 48 of the POEO Act in respect to scheduled activities described in clauses 39, 40 and 42 of Schedule 1 of the POEO Act – requirement of an EPL in relation to waste disposal (application to land), waste disposal (thermal treatment) and waste storage;
- section 88 of the POEO Act – requirement of contributions to the EPA by the licensee of waste facility;
- part 4 of the POEO Regulation – tracking of certain waste transported within, out of or into NSW;
- clause 109 of the POEO Regulation – reporting requirements for non-paying waste facilities and landfill sites outside of regulated areas; and
- clause 110 of the POEO Regulation – notification to EPA of newly established landfill sites where a licence is not required.

The application of any exemptions would be discussed in a CWMP. Any excess asphalt waste would be temporarily stockpiled prior to disposal off-site. Mitigation and management measures for storage, handling and disposal of asphalt waste are provided in Table 4.2.

3.2.2 General solid waste (putrescible)

i Food waste

General solid waste (putrescible) would be generated in the form of food waste from the construction workforce who would be working at most of the construction areas, including along the alignment of the pipeline and new and existing roads to be upgraded. As noted above, a larger quantity of waste would be generated from the construction workforce at the new Dungowan Dam site. If stored incorrectly or dumped, food waste could result in pests and vermin at each construction area. This presents a hazard to human and environmental health.

This type of waste would be stored in large, covered waste receptacles before being disposed off-site to an appropriately licenced facility. The management of solid waste (putrescible) is outlined in Table 4.2 and would be further defined in the CWMP.

3.2.3 General liquid waste

i Grey water and sewerage

Grey water and sewage will be generated from the construction workforce. The construction workforce will be working at most construction areas, including the new Dungowan Dam, construction compounds/laydown areas, utilities, quarry, new augmented delivery pipeline from the new Dungowan Dam, the demolition and decommissioning of the existing Dungowan Dam, and along the alignment of new and existing roads to be upgraded. The majority of liquid waste is anticipated to be generated from activities associated with the construction of the new Dungowan Dam, as this comprises the construction camp and quarry including spoil emplacement facility (spoil dump). It will therefore have a greater concentration of the workforce and will encompass a greater array of waste generating activities.

The accommodation camp will include a wastewater treatment system that would be either a pump out system or an aerated wastewater treatment system (AWTS). Portable toilets may also be utilised during the construction stage at each construction area, including for the pipeline, for which sewage will be collected by a licenced waste contractor. The location and liquid waste management will be confirmed in detailed design of the project.

The overall potential impacts associated with the generation of this waste, is potential contamination of construction areas or surrounding areas from uncontrolled waste disposal. Mitigation and management measures are provided in Table 4.2. In addition, the potential impacts of construction activities on surface water, including from grey water and sewerage, and mitigation measures that would be implemented to minimise impacts are also described in the Surface Water Assessment (EMM 2022a).

ii Spoil de-watering

During excavation, spoil may be saturated by water used in the construction process or from groundwater. Should saturated spoil eventuate from the excavation areas, it would be transported to a designated space within the construction area associated with the source material. Construction areas will have a designated de-watering area that will be constructed with a gravel bed and drainage blanket and with perimeter trenches to collect the water. Water collected from the de-watering area would be tested prior to disposal. As with the detention basins, this collected water has the potential to impact the receiving water environment if released in an untreated state. The potential impacts of construction activities on surface water, including from spoil dewatering, and mitigation measures that would be implemented to minimise impacts are described in the Surface Water Assessment (EMM 2022a).

iii Surface water run-off

In a rain event, rainwater will run from the roofs of any buildings in the construction area and onto the compacted foundations. The run-off to surrounding areas could then carry sediment, grit and other contaminants present (such as oils and sludges). Surface water run-off will also be generated from cleared and levelled land during construction. Rainwater could cause uncontrolled run off, which could increase erosion and sedimentation of non-hard stand areas or detention basins and pollute surrounding areas.

The potential impacts to surrounding areas and corresponding mitigation measures relevant to erosion and sedimentation control is discussed in detail in the Surface Water Assessment (EMM 2022a), Groundwater Assessment (EMM 2022b) and Land, Soils and Erosion Report (EMM 2022c).

iv Construction wastewater

Wastewater generated from construction activities such as rock drilling, wetting of construction materials, quarrying, batch plants and general excavations would require management throughout construction. The potential impacts to surrounding areas and corresponding mitigation measures relevant to construction wastewater management are discussed in detail in the Surface Water Assessment (EMM 2022a) and Groundwater Assessment (EMM 2022b).

3.2.4 Hazardous waste

Hazardous wastes generated by the project may include substance and chemical containers, electrical waste, grease/oil drums, and oil filters. Hazardous waste would be generated from the majority of the construction areas including the existing dam decommissioning and decommissioning of existing transmission line infrastructure. Management measures for hazardous waste are outlined in Table 4.2 and would be further defined in the CWMP.

If stored incorrectly or dumped, hazardous waste could pose a significant risk to human and environmental health, including surface water, groundwater and soil. During a rain event, contaminants could enter surface water runoff and negatively impact the surrounding waterways, including the water quality of Dungowan Creek.

All hazardous wastes generated at the construction areas will be classified, stored in sealed containers in a bunded area and then removed and disposed of in accordance with appropriate regulations and guidelines and best practice for the removal of these materials. Hazardous materials will only be removed by suitably qualified and licensed contractors and disposed at an appropriately licenced waste disposal facility.

Mitigation and management measures for hazardous waste are provided in Table 4.2 and would be further defined in the CWMP.

3.2.5 Special waste

Two areas near the far western end of the proposed pipeline and another near the central portion of the pipeline have been assessed as a low probability of formation occurrence of NOA in the Contamination Preliminary Site Investigation (EMM 2022d).

A site-specific Asbestos Management Plan (AMP) will be prepared in accordance with the measures recommended in the Contamination Preliminary Site Investigation (EMM 2022d). The AMP will include stockpile management procedures for segregating materials and preventing cross contamination of clean material (VENM or ENM) with NOA. It is noted that NOA is not proposed to be transported offsite and would be reused/managed as part of the project. Specific protocols will be stipulated for separation, monitoring, validation and clearance of asbestos.

In the event that non naturally occurring asbestos containing material (ACM) is identified (eg in historic building structures or materials), the material would be segregated, managed and disposed of as Special Waste and transported and disposed offsite in accordance with *Protection of the Environment Operations (Waste) Regulation (2014).* Where more than 100 kg of asbestos waste or more than 10 m^2 of asbestos sheeting is required to be transported, the NSW EPA online tool WasteLocate would be used.

The handling and disposal of asbestos waste for the project will be tracked and recorded in accordance with relevant legislation and as further detailed within the CWMP.

3.3 Operational waste

It is anticipated there would be negligible waste generated during the operational phase of the project. This is primarily because once operational, the Dungowan Dam and pipeline project will not require a significant operational workforce or additional materials to function. Any waste generated during operation would be disposed off-site by a suitably licensed waste disposal contractor.

4 Mitigation measures

4.1 Waste avoidance and management

A number of safeguards would be implemented during construction and operation of the project to ensure waste is appropriately managed.

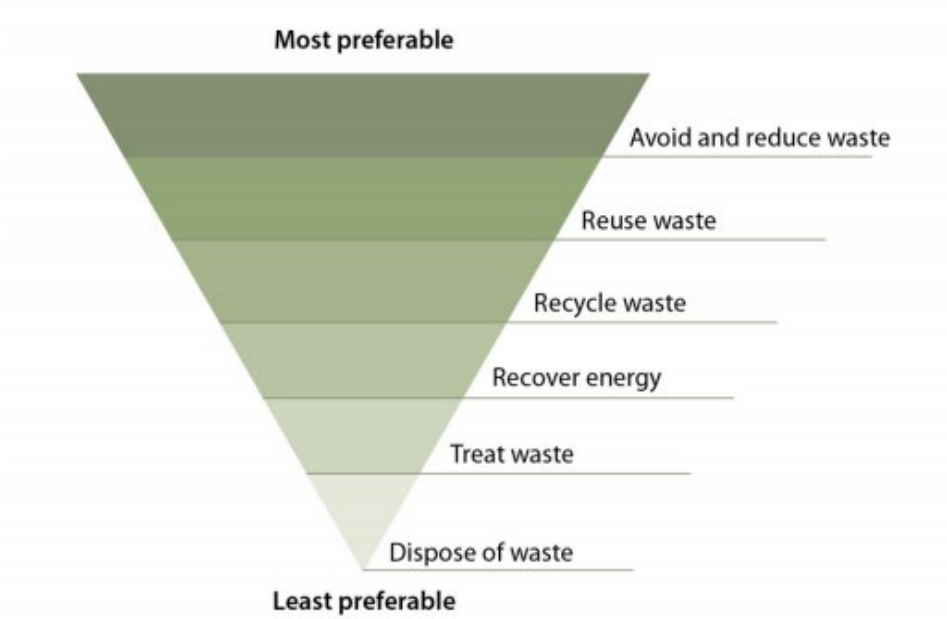
A CWMP would be prepared by the successful construction contractor for the construction phase of the project and would incorporate the applicable provisions of the POEO Act, NSW *Protection of the Environment Operations (General) Regulation 2009* (POEO Regulation) and all applicable EPA guidelines. It would also implement the mitigation measures noted below in sections 4.2 and 4.3.

The project's CWMP would be prepared in accordance with the above listed legislative and policy objectives and would address the volume and type of waste streams to be generated by the project and the correct classification method, storage and treatment facilities at each construction area. It will note:

- conditions of consent and license conditions;
- collection procedures, frequency, and licensed collectors;
- waste testing procedures;
- disposal points and procedures;
- waste truck routes;
- roles and responsibilities of site personnel;
- communication of the CWMP to all construction staff;
- auditing of the plan and corrective action procedures; and
- reporting and tracking.

In line with the principles of the circular economy outlined in the *NSW Waste and Sustainable Materials Strategy 2041 Stage 1: 2021–2027*, the primary aim of waste management for the project is to prevent and avoid waste followed by the reuse and recycling of materials. This approach follows the preferences of the NSW EPA waste hierarchy which is provided in Figure 4.1. The principles of the circular economy and the waste hierarchy would be incorporated into the project CWMP.

In addition, no waste would be littered or illegally dumped, and would be collected by an appropriately licenced waste contractor or disposed of at an appropriately licenced waste disposal facility. This approach will contribute to achieving the targets in the *NSW Waste and Sustainable Materials Strategy 2041 Stage 1: 2021–2027*.



Source: NSW EPA(2021b)

Figure 4.1 The waste hierarchy

4.2 General management measures

The following general management measures would be implemented for the project.

Table 4.1 Summary of general management measures

Impact	Ref#	Mitigation Measure	Timing
Waste	WS_01	A Construction Waste Management Plan (CWMP) will be prepared and implemented as part of the CEMP. The CWMP will include but not be limited to: • measures to avoid and minimise waste associated with the project • classification of wastes and management options (re-use, recycle, stockpile, disposal) • statutory approvals required for managing both on and off-site waste, or application of any relevant resource recovery exemptions • procedures for storage, transport and disposal • spoil management measures and emplacement locations and designs • monitoring, record keeping and reporting.	Pre-construction Construction Post Construction
Waste	WS_02	Wastes will be managed and disposed of in accordance with relevant Waste Classification Guidelines (NSW EPA, 2014a) and government policies.	Pre-construction Construction Post Construction

Impact	Ref#	Mitigation Measure	Timing
Resource Recovery	WS_03	Resource recovery will be applied to the management of construction waste and will include: • Recovery of resources for reuse – reusable materials generated by the project will be segregated for reuse on site, or off site where possible, including the reuse of the major waste streams (VENM) • Recovery of resources for recycling – recyclable resources (such as metals, plastics and other recyclable materials) generated during construction and demolition • Resources will be segregated for recycling and sent to an appropriate recycling facility for processing • Recovery of resources for reprocessing – cleared vegetation will be mulched or chipped on-site and used for landscaping, in the absence of a higher beneficial use being identified.	Detailed design Pre-construction Construction
Management of unexpected waste materials	WS_04	Suitable areas will be identified to allow for contingency management of unexpected waste materials, including contaminated materials. Areas will be hardstand or lined areas that are appropriately stabilised and bunded, with sufficient space for stockpile storage.	Detailed design Pre-construction Construction

4.3 Specific management measures

On site management measures specific to each waste classification and type are outlined in Table 4.2.

The management of the different types of general liquid waste is outlined in Table 4.2. In addition to these, potential management and mitigation measures to address spoil dewatering and ensure erosion and sedimentation does not pollute surface water run-off, are provided in the Surface Water Assessment (EMM 2022a), Groundwater Assessment (EMM 2022b) and Land, Soils and Erosion Report (EMM 2022c) appended to the EIS.

Table 4.2 Management measures per waste classification and type

Waste classification and type	Management method
General liquid waste	
Grey water and sewerage	The amount of grey water and sewerage to be generated from the construction workforce would be finalised during detailed design. This will inform the quantity of portable toilets to be located at each construction area. Sewerage would be collected by an appropriately qualified waste contractor. Portable toilets would be utilised during the construction stage at each construction area, for which sewage would be collected by a licenced waste contractor. Any discharge to the existing sewage system would be agreed with Tamworth Regional Council. The location and liquid waste management would be confirmed in detailed design of the project. The management of grey water and sewerage would be further defined in the Soil and Water Management Plan (SWMP) to be prepared for the project.
General solid waste (non-putrescible)	
Vegetation	Vegetation would be mulched and reused where possible, otherwise it would be temporarily stockpiled within the construction footprint and inundation area for future re-use, sale or burning. The management of vegetation waste would be further defined in the CWMP.

Table 4.2 Management measures per waste classification and type

Waste classification and type	Management method
Vegetation burning	Stockpiles required for the controlled burning of excess vegetation would be sited based on the following criteria: • away from the toe of vegetated batter located upslope; • down gradient of areas with sparse vegetation; • near a source of water; and • within proximity to clearing areas.
Concrete and construction waste	Where possible and suitable, excess inert construction and demolition waste would be encapsulated in the spoil placement area upstream of the existing dam to avoid the requirement for offsite disposal.
Asphalt waste	Asphalt can be recycled and reused for road construction. Rejected or excess asphalt would be collected by an appropriately qualified waste contractor for recycling. The management of asphalt waste would be further defined in the CWMP.
VENM/ENM	VENM/ENM would be excavated during construction of each project element. The management of ENM or spoil would be further defined in the CWMP. The CWMP would include procedures for handling and storing excavated rock and/or stockpiled materials, including potentially or known contaminated soil/fill in accordance with the POEO Act. Material that has been assessed as not suitable for reuse or management (eg via encapsulation or treatment) would be appropriately characterised prior to disposal. Further details of measures that would be implemented to manage any contaminated materials encountered during construction are provided in the Contamination Preliminary Site Investigations (EMM 2022d).
Recyclables	Recyclables would be stored in designated labelled and covered recycling areas and would be collected for recycling or disposal by an appropriately qualified waste contractor. The management of recyclable waste would be further defined in the CWMP.
General solid waste (putrescible)	
Food waste	Food waste would be segregated where possible, and deposited in large waste receptacles, which would be covered and collected as required by a licensed waste removal contractor. The management of food waste would be further defined in the CWMP, including the potential for beneficial reuse in nearby agricultural operations.
Concrete batching plant	
Concrete washout waste and cementitious wastewater	Management measures would be included in the project CEMP and SWMP to ensure concrete washout waste and cementitious wastewater is captured and appropriately recycled or disposed of, so it does not enter surface water runoff and pollute receiving waters.
Hazardous waste	
Chemical containers, grease/oil drums and oil filters	All hazardous wastes generated at the construction areas would be classified, stored in sealed containers in a bunded area and then removed and disposed of in accordance with appropriate regulations and guidelines and best practice for the removal of these materials. Hazardous materials would only be removed by suitably qualified and licensed contractors and disposed at an appropriately licenced waste disposal facility.
Special waste	
Asbestos containing material	A site-specific Asbestos Management Plan (AMP) would be prepared in accordance with the measures recommended in the Contamination Preliminary Site Investigation (EMM 2022d) and relevant legislation for the handling and disposal of asbestos.

5 Conclusion

This Waste Management Assessment has identified waste streams to be generated from the project, potential impact on the site and surrounding environment and management and mitigation measures to address these potential impacts. The report should be read in conjunction with the Surface Water Assessment (EMM 2022a), Groundwater Assessment (EMM 2022b) and Land, Soils and Erosion Report (EMM 2022c) prepared for the project and amended to the EIS which further defines mitigation measures relevant to the management of wastewater, sedimentation and erosion.

Waste generated from the project will likely include a mixture of general liquid waste, general solid waste (non-putrescible), general solid waste (putrescible), hazardous waste and may identify waste classified as Special Waste during construction. The key waste generating activities include spoil from excavations at the spillway, embankment, decommissioning the existing dam, site establishment and road upgrades; wastewater from concrete and grouting works, greywater and sewage at construction ancillary facilities; concrete and other solid waste from dam decommissioning; vegetation clearance within the reservoir area and for site establishment; and food waste at the accommodation camp and ancillary facilities.

Management measures noted in Chapter 4 are proposed to be implemented by the project, which will ensure potential waste generation has a negligible impact upon the surrounding environment. A CWMP will be prepared to include the management measures outlined in this report and to comply with the POEO Act, POEO Regulation and the *NSW Waste and Sustainable Materials Strategy 2041 Stage 1: 2021–2027* (NSW EPA 2021a), and will aim to prevent, avoid, reuse and recycle project related waste.

References

EMM 2022a, Surface Water Assessment – Appended to the EIS

EMM 2022b, Groundwater Impact Assessment – Appended to the EIS

EMM 2022c, Land, Soils and Erosion Report – Appended to the EIS

EMM 2022d, Contamination Preliminary Site Investigation – Appended to the EIS

NSW EPA 2014a*, Waste Classification Guidelines: Part 1 Classifying Waste*

NSW EPA 2014b, *Resource Recovery Order under Part 9, Clause 93 of the Protection of the Environment Operations (Waste) Regulation 2014, The excavated natural material order 2014*

NSW EPA 2015, *Resource recovery orders and exemptions,* EPA2015/0107, March 2015

NSW EPA 2021a, *NSW Waste and Sustainable Materials Strategy 2041 Stage 1: 2021–2027*

NSW EPA 2021b, Waste Hierarchy, https://www.epa.nsw.gov.au/your-environment/recycling-and-reuse/warr-strategy/the-waste-hierarchy, accessed 31 May 2021

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