



Hume Food Organics and Garden Organics Facility

Water Impact Assessment

Transport Canberra and City Services

31 July 2024



The Power of Commitment



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1. Introduction

1.1 Overview

The Australian Capital Territory (ACT) Government is working to reduce waste to landfill and increase resource recovery. The strategic direction for the management of waste in the Territory is set out in the 'ACT Waste Management Strategy 2011-25' (ACT Government, 2011). The strategy commits the ACT Government to minimise organic waste going to landfill and recovering organic waste resources. It also sets a target of increasing the rate of resource recovery to over 90 percent by 2025, with no recoverable waste sent to landfill.

The Federal Government also has a target of halving the amount of organic waste sent to landfill for disposal by 2030, as set out in the 'National Waste Policy Action Plan' (DCCEEW, 2019).

A waste feasibility study was established in mid-2015 to identify a pathway towards achieving the ACTs waste management targets and examine options to drive better resource recovery. In 2018, the ACT Government released the final recommendations from the study as the 'Waste Feasibility Study: Roadmap and Recommendations Discussion Paper' (ACT NOWaste, 2018). Key recommendations from this were to identify a site and establish an organics progressing facility to process food organics and garden organics (FOGO) and the implementation of a kerbside FOGO collection.

The 'ACT Climate Change Strategy 2019 to 2025' (ACT Government, 2019) also identifies FOGO collection for all households and the investigation of organic waste processing as key priorities. An opt-in FOGO collection pilot is currently underway in the ACT (Belconnen), which has so far diverted more than 480 tonnes of material from landfill (ACT Government, 2022).

There is currently no processing facility within the ACT that can accept and process FOGO material. ACT NOWaste is therefore proposing to develop a new FOGO facility (the 'proposal') in Hume to strengthen the Territory's circular economy and help meet Territory and Federal Government landfill diversion and resource recovery targets.

The proposal is defined as the construction and operation of a new FOGO facility with the capacity to receive up to 70,000 tonnes per year of FOGO for in-vessel composting.

1.1.1 Approval and assessment requirements

This report has been prepared by GHD Pty Ltd (GHD) as part of the environmental impact statement (EIS) for the proposal. The EIS supports the application for approval of the proposal and to address the requirements provided by the ACT Department of Environment, Planning and Sustainable Development Directorate dated 7 June 2022.

The proposal is subject to approval by the planning and land authority within the Environment, Planning and Sustainability Development Directorate.

1.1 Proposal location

The proposal is situated on Block 5, Section 26 Hume, off John Corey Road on Territory Land in the ACT. The proposal site is located in proximity to a number of industrial facilities. ACT Skip Hire is on the adjacent block to the south. Further south on John Cory Road, the Soft Landing Mattress Recycling facility is located. The Mugga Lane Landfill is located approximately 200 metres northwest of the proposal site.

Figure 1.1 shows the site proposed for the FOGO facility, including a preliminary site boundary configuration to accommodate these operations (subject to detailed design and final vendor process selection). In total, this area comprises approximately 4.3 hectares (ha) of land.

1.1.2 Key features

The proposal involves the construction and operation of a new FOGO facility with capacity to receive and process up to 70,000 tonnes per annum of FOGO waste using in-vessel composting technology.

In-vessel composting technologies have been successfully implemented in other Australian locations for FOGO waste processing, and a variety of technology providers and site configurations are possible. They all broadly involve an enclosed and odour-controlled waste receival area, enclosed composting vessels or tunnels with forced aeration and process control, and maturation areas for compost.

The proposal would involve the following key features, subject to detailed design:

- Receival hall.
- Primary composting tunnels and tunnel hallway.
- Maturation and refining hall.
- Product storage shed.
- Odour management system.
- Ancillary supporting infrastructure including:
 - Administration building.
 - Machinery shed/workshop.
 - Weighbridges.
 - Access roads and pavements.
 - Hardstand parking.
 - Stormwater and leachate management.

Figure 1.2 shows the indicative concept design for the FOGO facility, including a preliminary configuration and approximate area requirements to accommodate these features (subject to detailed design and final vendor process selection).

Key features with respect to the management of surface water include:

- Roadways.
- Hardstand and parking area.
- Roofed buildings like the new processing facility and loading bay.
- Reuse dams.
- Rainwater tanks.
- Bioretention system.
- Drainage network.

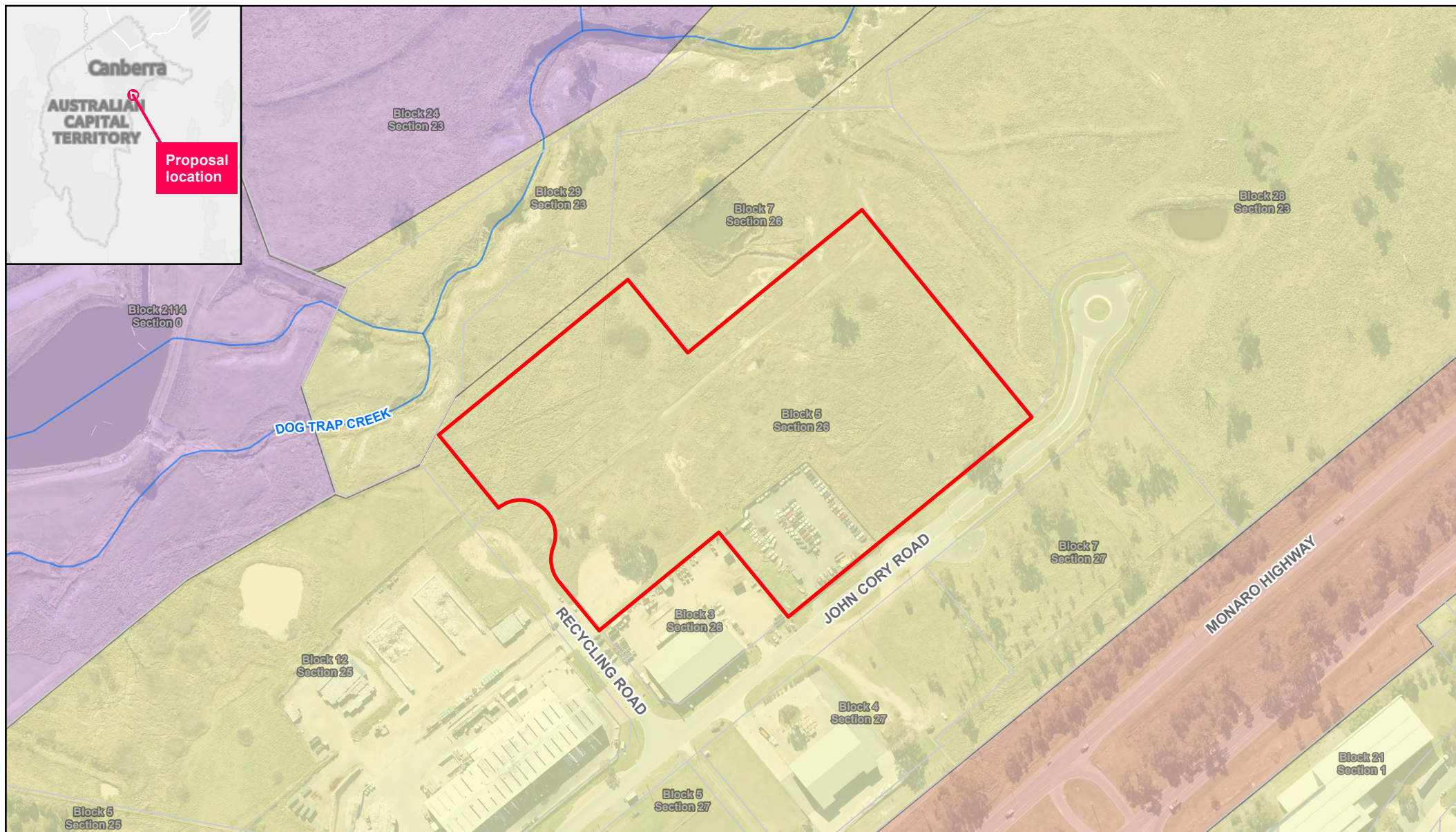
1.1.3 Construction overview

Subject to final vendor tender submission, construction activities are expected to include:

- Clear existing site and preparation for instruction.
- Proposal site preparation and establishment of temporary ancillary construction infrastructure including:
 - Site offices and amenities
 - Fencing
 - A temporary main switchboard and electrical riser to provide power during construction.
- Bulk earthworks for site levelling.
- Detailed excavation for lift and stair raft pads.
- Pouring concrete foundation slab, footings, hardstand, and suspended slabs for the main buildings.
- Construction of pavement areas for car park, hardstand, and access roads.
- Construction of weighbridges and weighbridge office.

- Installation of steel truss frameworks for structures.
- Erection of pre-cast concrete panels for external and internal partition walls and metal roof for site buildings.
- Installation of processing equipment.
- Installation of firewater tanks.
- Installation of fencing and signage.
- Commissioning.

Construction and delivery timeframes will be subject to the procurement of the contractor responsible for the detailed design, construction and ongoing operation and maintenance of the facility. Construction is expected to take up to two years, to be confirmed with the contractor.



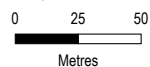
Legend

- Proposal site
- Cadastre
- Watercourses

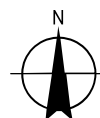
Land use

- Broadacre
- Designated
- General industry

Paper Size ISO A4



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

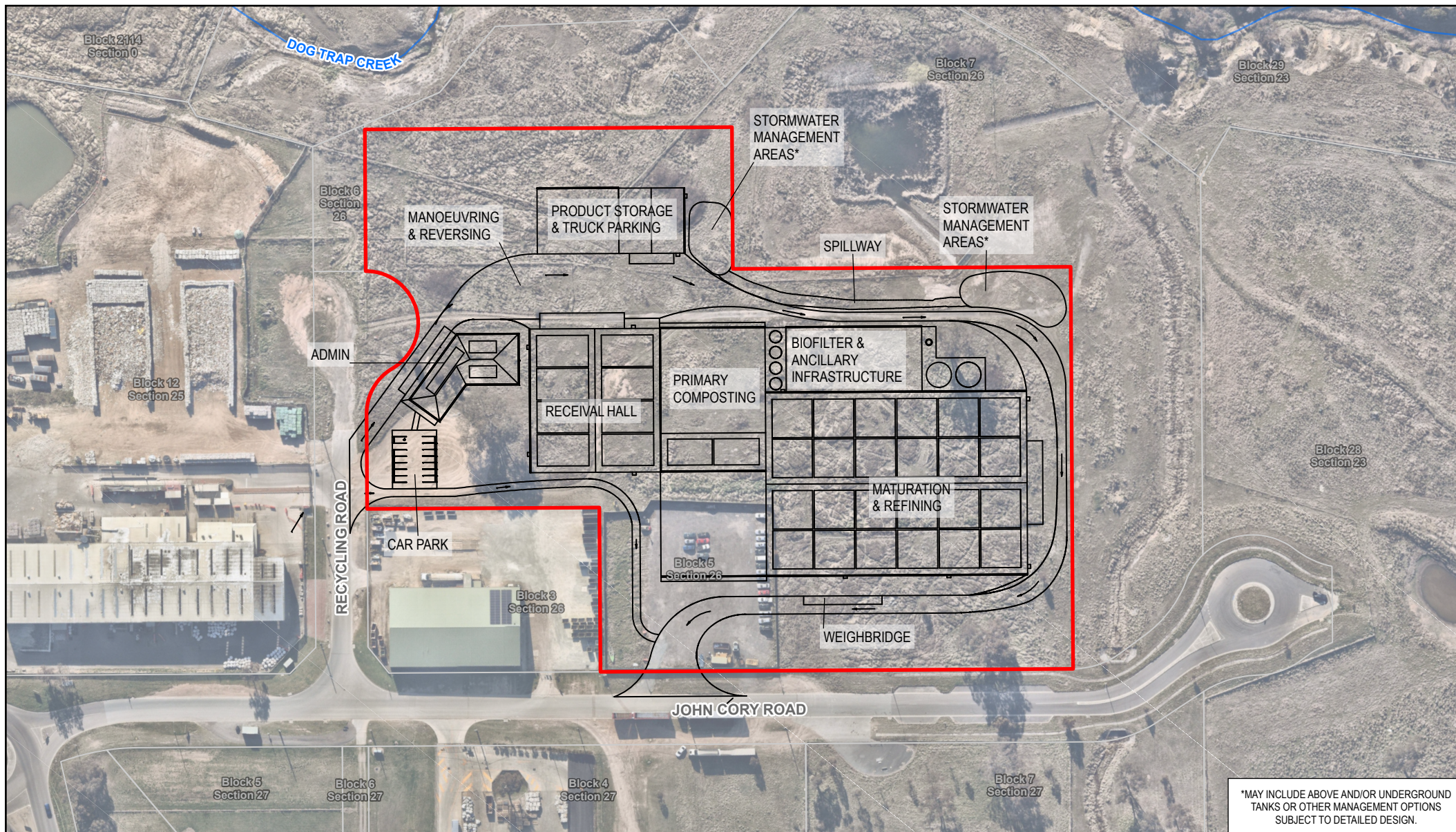


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Proposed site and existing land uses

FIGURE 1.1



*MAY INCLUDE ABOVE AND/OR UNDERGROUND TANKS OR OTHER MANAGEMENT OPTIONS SUBJECT TO DETAILED DESIGN.

Legend

- ▬ Proposal site
- ▬ Cadastre
- ▬ Proposal site layout
- ▬ Watercourses

Paper Size ISO A4
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Metres

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



Transport Canberra and City Services
Hume Food Organics and Garden Organics Facility
Water Impact Assessment

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Revision No. 1
Date 17/10/2023

Proposal layout

FIGURE 1.2

1.2 Assessment requirements

This report has been prepared by GHD Pty Ltd (GHD) as part of the environmental impact assessment (EIS) for the proposal. The EIS supports the application for approval of the proposal and to address the requirements provided by the ACT Department of Environment, Planning and Sustainable Development Directorate (EPSDD) dated 19 July 2022.

The proposal is subject to approval by the planning and land authority within the EPSDD. The scoping document requirements for impacts related to water quality are summarised and listed in Table 1.1 below.

Table 1.1 Assessment requirements relevant to the water impact assessment

Requirement	Where is it addressed in this report
Describe the surface water and groundwater features of the area.	Section 2.2 Section 2.3
Investigate the impact the proposal will have on erosion in the Dog Trap Creek and investigate the need for erosion and sediment control structures in the creek to mitigate this impact.	Section 2.5 Section 5.1 Section 5.2
Provide an assessment of peak stormwater discharge and stormwater discharge volume from the facility and consideration of the impact of stormwater discharges to the Dog Trap Creek.	Section 2.3 Section 3.1
Describe how runoff from the proposal site will be treated before entering the receiving environment.	Section 3.2 Section 3.3 Section 3.4
Provide information on stormwater retention and reuse capabilities at the proposal site.	Section 3.2 Section 3.3 Section 3.4
Describe the potential impacts of leachate/contaminant spills on local groundwater and surface water.	Section 3.5 Section 4
Provide information on measures to manage leachate/contaminants emanating from the facility to avoid impacts on groundwater and surface water	Section 3.5

1.3 Purpose and scope

The purpose of this report is to:

- Address the assessment requirements prepared by the planning and land authority (the Authority) within the EPSDD listed in Table 1.1.
- Describe the existing environment of the proposal site relevant to surface water, erosion, and sediment control.
- Assess the impacts of constructing and operating the proposal on surface water, erosion, and sediment controls.
- Recommend mitigation measures based on the impacts identified.

1.4 Structure of this report

The structure of the report is outlined below.

- Chapter 1 – This chapter introduces the report, providing information like the background information, key stakeholders, assessment requirements, purpose and scope, and structure of report.
- Chapter 2 – This chapter describes the existing environment of the proposal site, including climate, hydrology and land use, flooding, and soils.
- Chapter 3 – This chapter describes the proposed soil and water management, noting a focus on the in-built measures in the proposal.

- Chapter 4 – This chapter provides an impact assessment.
- Chapter 5 – This chapter specifies the mitigation measures based on the impact assessment identified in Chapter 4.
- Chapter 6 – This concludes the report with the relevant findings and assessment.

2. Existing environment

This section summarises the key features of the existing environment with respect to soil and water management.

2.1 Climate

The proposal site is in a temperate zone characterised by mild/warm summers and cold winters, under the Koppen Climate Classification (Bureau of Meteorology, 2023).

The climatic data for the proposal site is sourced from SILO Long Paddock patched point grid data which provides spatial and temporal continuous climatic data. The data is summarised and graphically presented in Figure 2.1. It generally indicated that:

- By observing the accumulative annual total rainfall and potential evapotranspiration curve, potential evapotranspiration exceeds precipitation. The potential evapotranspiration rates are higher during the late-spring and summer months (November to February).
- Precipitation is generally steady across the year, with the mean of the monthly total rainfalls falling below 100 mm. The wettest month is found to be November, and the driest month April.
- Months with the highest temperatures occur during late spring, summer, and autumn between November and February. Months with the coldest temperatures occur during winter, between June and August.

2.2 Hydrology and land use

The proposal site location and layout are shown in Figure 1.1 and Figure 1.2. The proposal site's elevation ranges 611 – 614 m AHD and falls in a generally northerly direction towards Dog Trap Creek (Woden Creek). No natural watercourses pass through the proposal site. However, Dog Trap Creek (Woden Creek) is an identified waterway 80 m north of the site.

Dog Trap Creek is a 2nd order stream according to the Strahler stream ordering system, increasing to a 3rd order stream immediately downstream of the proposal site. The stream flows in a north-easterly direction, flowing through culverts and under the Monaro Highway before it reaches Jerrabomberra Creek.

The proposal site is part of the Murrumbidgee River Catchment. This catchment covers an area of 84,000 km² which is 8% the size of the Murray-Darling Basin and contributes to 16% of the basin's water. Its tributaries include Cotter, Yass, and Tumut, and the towns of this catchment includes Cooma, Canberra, Yass, Tumut, Gundagai, Cootamundra, Wagga Wagga, Narrandera, Leeton, Griffith, Hay, and Queanbeyan. The Murrumbidgee River flows towards the east, into the Murray River downstream of Balranald.

The following types of land use were identified in proximity to the proposal site:

- Several mixed industrial businesses can be found across the Monaro Highway, located south-east of the proposal site.
- A large landfill and mining facility is located west of the proposal site with several dams overflowing into a tributary of Dog Trap Creek.
- Southwest of the proposal site and upstream of Dog Trap Creek is the proposed Material Recovery Facility (MRF) (not part of this assessment).
- Nearby land located north-east of the proposal site is used majorly as grazing lands and modified pastures with minor vegetation along the riparian zones of the creek.

Data sourced: SILO Long Paddock Continuous Patched Point Data
 Lat: -35.4, Long: 149.15, Accessed: 2023-02-07
 Data extent: 1 Jan 1970 - 30 Dec 2022

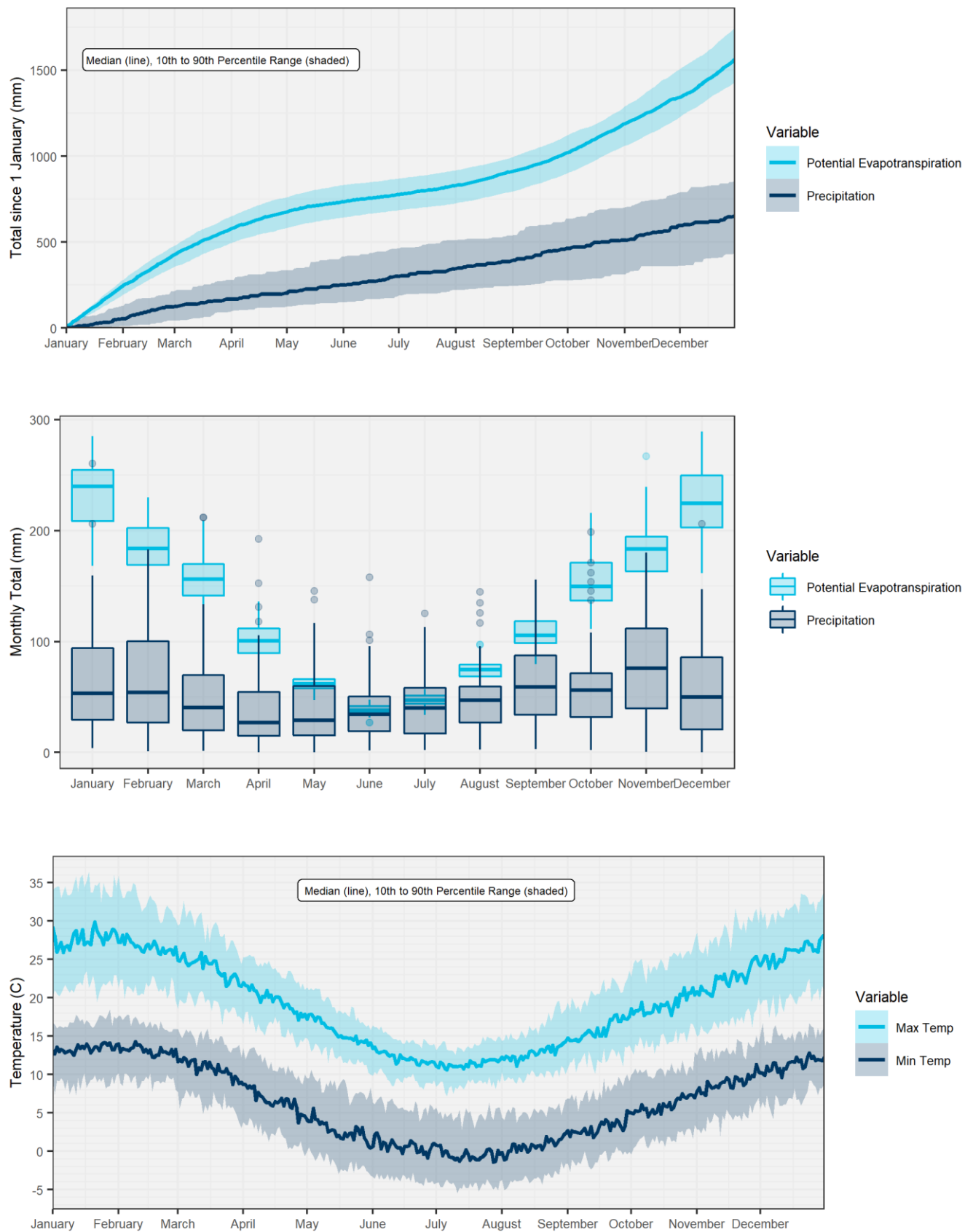


Figure 2.1 Climate data (Queensland Government, n.d.)

2.3 Geology, soils and geomorphology

The local geology comprises Silurian Rhyodacitic ignimbrite (i.e., pyroclastic origin) with minor intrusions of siltstone, shale, sandstone, and limestone. Bedrock tends to be highly weathered ([MinView | Regional NSW | Mining, Exploration and Geoscience](#)). Alluvial reworking and deposition are associated with Dog Trap Creek and tributaries.

Local soils generally demonstrated characteristics associated with the mapped Williamsdale Soil Type (Jenkins, 2000; [eSPADE v2.2 \(nsw.gov.au\)](#)), and with alluvial soils mapped downstream (Ginderra Creek / Quaternary Alluvium). The area is also mapped as having highly disturbed terrain, in keeping with the developed local land-use (see Section **Error! Reference source not found.**). Relevant characteristics described as follows:

- Soils associated with lower rises and drainage lines are typically deep, imperfectly drained Sodosols with the following soil profile:
 - Brownish black loam to sandy loam, strongly acid topsoil which is susceptible to water / wind erosion, particularly concentrated flows.
 - Yellowish brown light-medium, strongly pedal, moderately dispersive, plastic clay (i.e., well-structured) subsoils, which can be highly susceptible to sheetwash and concentrated flow erosion.
- Alluvial soils (Rudosols) appear to extend further upstream than mapped, and are coarser than *in situ* soils, comprising sandy clay loams / clayey sand, containing quartz sand and pebbles to cobble-sized gravel. These soils are susceptible to concentrated flow erosion, limited by shallow bedrock (<2 m).
- Minor gully erosion is common and widespread.
- Soils may be susceptible to waterlogging which can influence urban development.

Environmental boreholes drilled by GHD in April 2023 are broadly consistent with the mapped soils. Alluvial soils comprising clayey and silty sands typically overlie residual low plasticity clayey sand and sandy clay, with some silty sand encountered. The sand fraction is logged as fine to medium, with occasional gravel.

Site observations by the environmental and cultural heritage teams as part of the proposal indicate that the alluvium exposed in Dog Trap Creek has calcite nodules, and appears to be weakly cemented. Naturally cemented alluvium and clay-rich residual bank material can develop steep or near-vertical slopes along the lower banks.

The Dog Trap Creek valley is dominated by the incised creek channel and tributary gullies. The main creek and major tributaries have eroded to bedrock, exposing blocky ignimbrite in the channel bed and lower banks. A 1915 map of the site and Dog Trap Creek shows a deep gully with a washout (provided in Navin Officer Heritage Consultants' Cultural Heritage Assessment, June 2023). 1961 imagery (from [Historical Imagery \(nsw.gov.au\)](#)) shows major erosion along the creek, with headcutting tributaries. It is likely that this erosion was triggered by land clearance for agriculture. Since this time, although the upper banks show periodic active erosion, with imperceptible bank retreat rates.

As shown in Figure 2.2, the current bank top has changed little since 1961. In some cases bank stabilisation has occurred. This indicates that the mechanism of retreat is through shallow translational slide failures or direct entrainment by runoff (sheetwash), rather than major deep-seated failures. Erosion activity has been episodic. More stable periods have allowed vegetation to become established along the creek and gully banks, with periods of erosion associated with prolonged drought causing vegetation die-off followed by intense / prolonged rainfall, runoff and flooding. Erosion has been limited by the presence of bedrock and weakly cemented or clay soils. This has caused the bank to form a steep to near-vertical lower bank in the bedrock / resistant material and less-steep, more erodible upper banks.

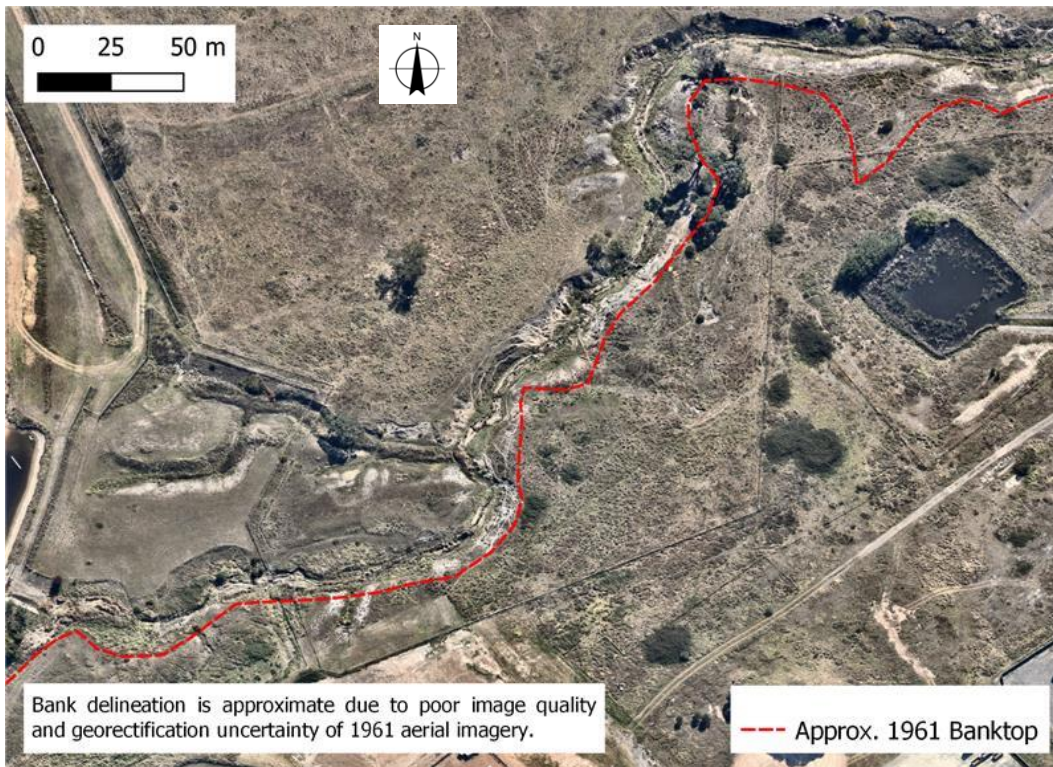


Figure 2.2 1961 bankline (from historic aerial image) superimposed onto 2024 aerial image, showing negligible bank retreat.

2.4 Flooding

The proposal site is located adjacent to the creek with a series of gullies and ephemeral channels flowing into Dog Trap Creek near the north-western border of the site. Some minor flow paths and trunk drainage lines also flow in from the south, mainly through the Hume industrial area and cross the Monaro Highway via transverse culverts. The proposal site is located within a floodplain and is anticipated be impacted within the extreme probability maximum flood (PMF). Flood modelling was undertaken (refer Section 3.1) which identified that the proposal site is not likely to be significantly impacted by a 1 in 100 Annual Exceedance Probability (AEP) flooding event, with flood waters generally confined to the northern and eastern extent side of the proposal site away from the proposed works. Upstream flood waters would be diverted around the existing operations.

2.5 Soils and geology

Soils were reviewed based on regional soil classification systems. This identified that soils in the region generally included soil characteristics associated with the Williamsdale Soil Type, as described as follows (Jenkins, 2000):

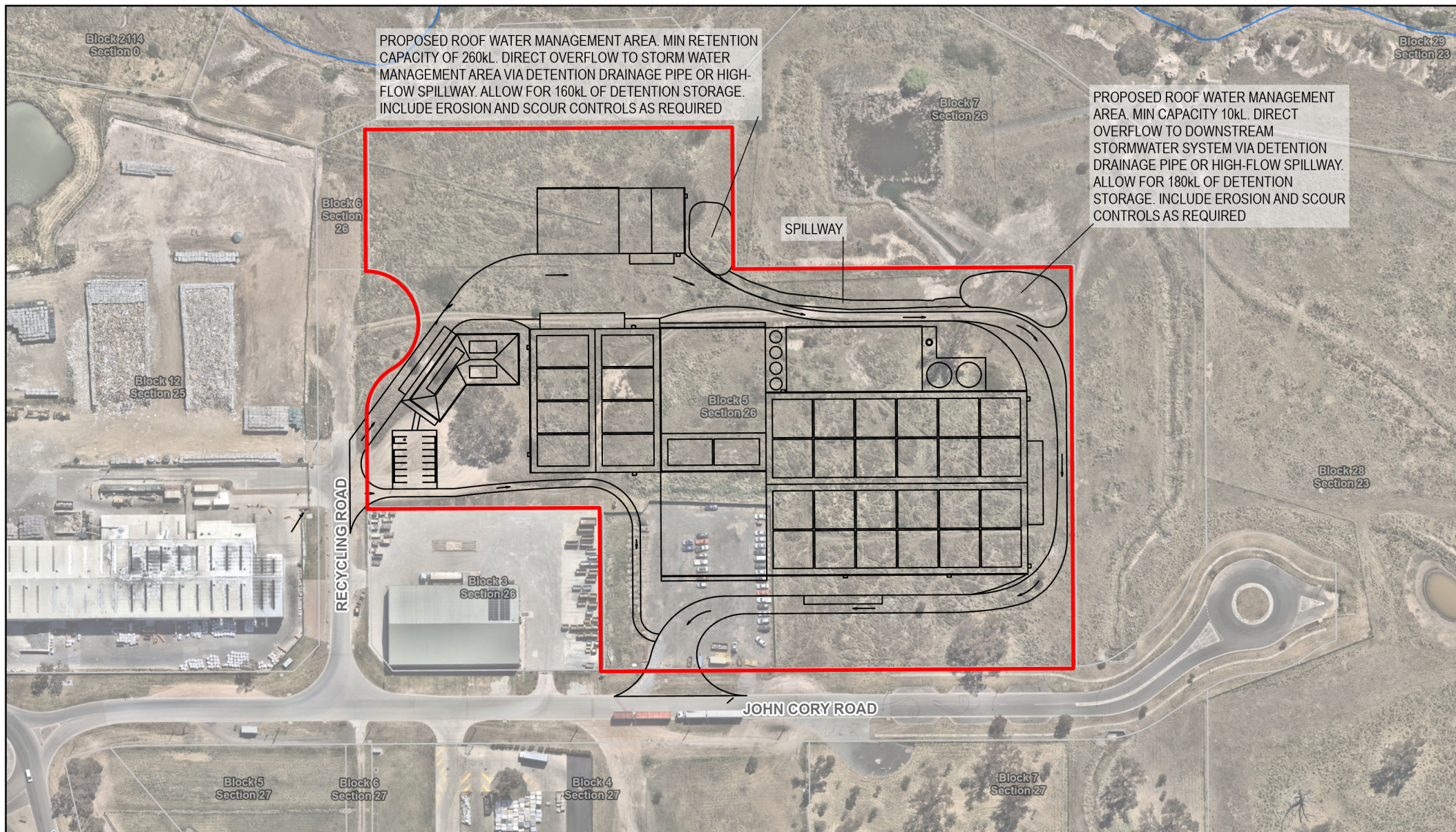
- Original savanna woodland is primarily cleared, with waterlogged grasslands being highly altered following introduction of exotic grass species. Land use shaping the local landscape follows sheep and cattle production.
- Gully erosion is common and widespread.
- Local geology comprises of Silurian volcanics with minor pockets of siltstone, shale, sandstone, and limestone. Bedrock tends to be highly weathered.
- Dominant soils include:
 - Brownish black loam topsoil.
 - Yellowish brown sandy clay loam subsoil with high erodibility.
 - Bright brown clay subsoil with high erodibility and low permeability.
 - Bleached dull brown sandy loam subsoil, moderate permeability, and high erodibility.
 - Bright yellowish brown pedal sandy clay subsoil, low permeability, and high erodibility.
 - Dark reddish brown clay loam subsoil with moderate permeability.

- Dark reddish brown clay loam subsoil slowly permeable and highly erodible.
- Soils at the proposal site are moderately to highly erodible with local soil types ranging from moderate to very-high erodibility from both non-concentrated and concentrated flows.
- Soils can be susceptible to waterlogging which may influence urban development.

3. Proposed soil and water management

A key component of the proposed soil and water management strategy for the proposal is the principle of providing important water management measures in-built into the proposal. This section details the methods adopted to derive these in-built measures and documents the corresponding measures developed and performance achieved. Subsequently, Section 4 assesses the impacts of the proposal with the measures included. Residual mitigation requirements are outlined in Section 5 .

The measures have been developed in accordance with the assessment requirements as well as relevant regulations such as the Environment Protection Regulation 2005. Figure 3.1 presents key measures relevant to all the following scenarios.



Legend

- Proposal site
- Cadastre
- Proposal site layout
- Watercourses

Paper Size ISO A4

0 20 40

Metres

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



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Revision No. **1**
Date **01/11/2023**

Soil and Water Management

FIGURE 3.1

3.1 Flooding

Hydraulic flood modelling of the proposal site was undertaken by GHD to inform the proposed pad level, as well as to identify and avoid flood impacts to nearby receptors. A TUFLOW hydraulic model received from Cardno (now Stantec), dated 06/12/2022, was used to simulate flooding for existing and design case conditions. Prior to this, Cardno had received the original TUFLOW model from Jacobs. The purpose of the original model was to assess a highway project in proximity to the proposed site, therefore, some adjustments were made for the proposed site. Cardno's model was adapted by GHD to simulate the existing case as follows:

- Adjustments to the model configuration included:
 - Two additional culverts were identified and added to the model.
 - The lengths and invert levels were adjusted for two culverts.
 - The Manning's roughness coefficient for relevant culverts were increased from 0.013 to 0.015.
 - The source-area inflow polygons in the model were adjusted to permit assessment for this proposal.
- The RORB hydrological model provided by Cardno identified that the critical storm at the proposal site resulted from temporal pattern 22, with a 1-hour duration. This storm was adopted in GHD's flood modelling for both the existing and design case scenarios, for the 1 in 100 Annual Exceedance Probability (AEP) storm event.

Results obtained from the model for the existing scenario were used to locate the pad to avoid impacts to the proposal from nearby waterways during the 1 in 100 AEP event, which showed the proposal site is located outside of the design storm event. No flood controls on the developed levels are proposed, however perimeter drainage would be required to divert any local runoff around the facility. As the proposal site is anticipated to be subject to extreme flooding during events larger than the design storm, consideration will be needed for flood evacuation procedures (refer Section 5.1).

Based on the flood modelling results of the existing scenario under a 1 in 100 AEP storm event, the proposal site is not likely to be significantly affected by flood. Nor would construction of the working pad significantly impact nearby downstream floodwaters for this event. The working pad can therefore be located higher with flood levels considering required freeboard. This would be further confirmed in the detailed design stage. Results indicate no notable impacts in downstream waterways based on minimal change in flood height.

Detailed flood mapping results for the existing and proposed design scenario are included in Appendix A.

3.2 Water sourcing

The proposed FOGO facility would be sized with at least 50,000 tonnes per annum (tpa) of initial processing capacity available from commencement of operations and is intended to receive a maximum composting capacity of 70,000 tpa. A crucial part of the FOGO processing in pasteurisation and composting which requires a significant volume of water to maintain optimal moisture content.

To be able to maintain FOGO processes working at maximum capacity, it is estimated that approximately 29% of moisture by weight is needed to maintain moisture conditions optimal for composting processes. A proposed throughput of 70,000 tonnes per year results in demand of approximately 20 ML/year of water.

To ensure that the water demands are met, dedicated stormwater management infrastructure, which may include stormwater tanks or equivalent storages, are proposed to reduce reliance on external sources. An assessment was carried out using a MUSIC model to provide for the appropriate sizing of water storage systems to supplement the required water demands on-site. The MUSIC model is further discussed and outlined in Section 3.3.

MUSIC modelling results (refer Section 3.3) showed that the reuse provided by rainwater tanks and stormwater management areas significantly reduced the reliance on potable water. The MUSIC model simulated that approximately 75% of water demands could potentially be sourced from on-site water collection. During extended dry periods external supply would need to be relied on to meet water demands in the order of approximately 5 ML/year.

3.3 Water quality

A water quality treatment train including a stormwater management areas, detention system, and rainwater tanks is inbuilt into the proposed design as indicated in Figure 3.1.

A key consideration in developing the treatment train was identifying where the FOGO processes would be taking place as this determines the degree of surface water management required. Identifying that FOGO processing would be undertaken indoors, it is noted that water quality risk is similar to that of a typical urban development. Therefore, the risks associated with the proposal would be similar to those of a typical urban development, such as an increase in runoff volume, sediment, and nutrients.

Noting this, best-practice methods were identified in assessing stormwater quality impacts for typical industrial urbanisation activities. An appropriate treatment strategy was subsequently developed.

The relevant water quality targets for the ACT require assessment based on development of a Model for Urban Stormwater Improvement Conceptualisation (MUSIC) stormwater quality model. Therefore, to inform the development of the stormwater treatment train a MUSIC model was developed in accordance with ACT government regulations and guidelines which includes the Environment Protection Regulation 2005, and the 'Waterways: Water Sensitive Urban Design General Code'.

The MUSIC stormwater quality model was developed in accordance with the 'Waterways: Water Sensitive Urban Design General Code'. Additionally, the ACT government has provided MUSIC-link functionality that was accessed through the software that pre-loads default parameters. The MUSIC-link incorporated the Local Government Area (LGA) -specific guidelines and targets. The output of the MUSIC-link provided validation results, showing the compliance status (pass or fail) of each parameter which indicates whether results are within allowable ranges.

As part of the MUSIC-link provided, default meteorological template of the climate data were in-built into MUSIC, sourced from the ACT Government database, however it was identified by the ACT Government that the meteorological template used was out of date. This template was revised based on information provided by the ACT Government includes relevant information including rainfall, potential evapotranspiration data and a range of climatic conditions for the climatic zone. The climatic data dates range from 1968 to 1977 on a 6-minute timestep.

The proposal site was modelled as impervious urban mixed nodes consisting of sealed roads and a roof catchment.

A stormwater quality treatment train was developed and specified as follows:

- Roof runoff would be conveyed, captured, and stored in two rainwater storage with capacity of 360 kL each. The captured water would be reused for toilet flushing in the building as well as for processes in the FOGO facility.
- Further runoff would be conveyed to a stormwater storage that would be located at the north-east of the proposal site with a storage of 830 m³. The storage would receive overflow from the rainwater storage.
- Discharge of waters from the treatment train would be via a level spreader or equivalent energy dissipation structure at the outlet to return flows to nearby waterways.

Reuse demands are outlined in Section 3.2.

Table 3.1 below presents the MUSIC model output for the proposal site with the treatment train implemented.

Table 3.1 MUSIC modelling pollutant load results

Scenario	Annual pollutant load (kg/yr)		
	Total suspended solids	Total phosphorus	Total nitrogen
Source Generation	2679.3	3.875	46.187
Receiving Environment	75.46	0.388	5.506
% Reduction targets (Min)	85%	65%	45%
% Reduction results	97%	90%	88%
Pass or fail?	Pass	Pass	Pass

The MUSIC model generated indicated that all requirements post-development would be achieved in accordance with the ACT WSUD Design Code. That is the total suspended solids, total phosphorus, and total nitrogen reduction was at least 85%, 65%, and 45% respectively through the treatment train.

The annual discharge would be 2.8 ML/year, a reduction of 85%.

3.4 Water retention and detention

3.4.1 WSUD Infrastructure

Increases to impervious areas at the proposal site have the potential to increase the quantity and rate of runoff. To manage these impacts, infrastructure is proposed to manage the quantity (retention) and rate of runoff (detention) and thus minimise impacts to downstream conditions. As part of this process, a water retention and detention system was considered in tandem to the water quality treatment infrastructure (refer Section 3.2).

During detailed design of the facility, the drainage network would be assessed to consider detailed sizes and infrastructure requirements to meet the stormwater quantity requirements. However, at this current stage a stormwater quantity system has been conceptually developed in accordance with ACT Government regulations and guidelines. This includes the Environment Protection Regulation 2005, and the 'Waterways: Water Sensitive Urban Design General Code'.

This conceptual stormwater quantity consisted of the following components to address the assessment's requirements:

- Water retention would be provided at a minimum rate of 1.4 kL of storage per 100 m² of impervious area to be provided for re-use to minimise reliance on external sources.
- Stormwater detention would be implemented at a minimum rate of 1 kL of storage per 100 m² of impervious areas to manage the rate at which stormwater leaves the proposal site. Detained stormwater is released over a period of 6 hours. Peak rate of runoff for the 1 Exceedance per Year (1 EY) event is lesser than an unmitigated (rural) site of the equivalent area.

A conceptual DRAINS model was developed to establish the baseline stormwater quantity assessment and to permit comparison to a proposed scenario. The model included the following methodology:

- A baseline, pervious catchment was established with an equivalent area to the development to estimate runoff from the proposal area under current conditions. A single-node, initial-loss-continuing-loss model was established using loss parameters sourced from the ARR Data Hub (Ball, et al., 2019). A background impervious fraction of 5% was adopted to consider for rock and other impervious features with loss values of 1 mm and 0 mm/hr.
- A model was established for the proposed development comprising of the following:
 - The catchment draining to the detention system comprised of 2.94 ha with a pervious fraction of 0% and a conservative time of concentration of 5 minutes.
 - Roof water was connected to the drainage network and tanks and other retention infrastructure were assumed to be full prior to the storm event.
 - All areas of the proposal site reported to the stormwater detention system, which comprised of a dedicated stormwater detention zone located above the retention zones of the stormwater management storages. An engineered pipe-outlet was used to control discharge from the stormwater detention zones.
 - During events larger than the 1 EY event (as required by the WSUD General Code), flows would flow via pipe outlets and/or overland flow routes, which will be appropriately sized during detailed design.

Using the DRAINS model, a conceptual detention system was developed based on the following:

- Detention storage is proposed to manage stormwater quantity impacts in accordance with the ACT WSUD regulations and will be configured for both stormwater management areas at the proposal site.
- Releases from the stormwater management storage occurs via an engineered pipe-outlet located above the retention zone. The engineered pipe-outlet collects flow from a grated inlet pit and is comprised of a HDPE in the order of 225 mm pipe, resulting in a peak flow during the 1 EY event of 65 L/s compared to the 'existing'

baseline of 69L/s. This provides 340 kL of temporary storage which is solely drained through the engineered pipe-outlet (equivalent to 1.15 kL of detention per 100 m² of impervious areas). The outlet typically drains longer duration events over a 6-12 hour period.

- During rarer events, up to the 1 in 100 AEP storm, would flow through overland flow routes to allow for large events to be safely passed through the system.

3.4.2 Erosion control

Soils in the site and vicinity are typically clayey sand or sandy clay (loams, silty loams, or sandy loams), with some silty sand, clay and gravel. This soil texture would typically indicate a high proportion of erodible material. As well as soil type, erodibility is influenced by:

- Weak cementation: the clay matrix can act as a binding agent, and alluvial soils formed from Rhyodacite can be weakly cemented by calcium, particularly within the lower banks.
- Rock outcropping: within the channel bed and lower banks.
- Vegetation cover: The presence of vegetation has a significant impact on surface stability and erodibility. Foliage / stems limit direct rain-splash erosion and retard surface runoff velocities. Root systems bind the soil. Vegetation cover at the site is typically dense grassland, with occasional shrubs and trees. The upper banks can become bare during periods of instability, increasing their susceptibility to erosion.
- Climate and flow patterns: Intense or prolonged rainfall can cause soil saturation, increasing susceptibility to erosion. Dispersion of clays requires interaction with pure water and clear water is more erodible than turbid water. However, runoff at the site is likely to become turbid due to the presence of silt and fine sand.
- Flood duration is also an important factor, with a longer flood peak more likely to result in erosion than a short, flashy hydrograph. GHDs hydrologic assessment indicates that the rainfall / runoff response at the site is rapid, with short-duration, peaked hydrographs typical of a low permeability system.

Given these factors, it is challenging to determine critical velocities and shear stresses for the site. Therefore, an erosion threshold velocity range is provided, based on published guidelines for the specific site conditions (Hewlett *et al.* 1987; the “Blue Book”, Landcom, 2004; Gippel (2020, using guidelines by Fischenich, 2001).

Erosion along Dog Trap Creek and its tributaries has been mapped as early as 1915, with the 1961 aerial imagery indicating an incised, eroding channel.

- Where the bank is inundated by > 100 mm water during the 1% AEP flood, modelled velocities under existing conditions reach approx. 1.6 m/s – 3.6 m/s, with peak velocities of over 4 m/s experienced mid-channel. As discussed in Section **Error! Reference source not found.**, over the last 60 years, bank retreat under these conditions has been minor.
- The Dog Trap Creek channel is characterised by a clayey sand upper bank, but a more resistant sandy clay and clay lower bank, which appears to be weakly cemented. Therefore, soils at the site have very variable erodibility. The most erodible soils at the site are located in the upper bank and are considered moderately erodible due to the presence of clays and slow retreat rates.
- Erosion at the site is also influenced by the short peak flood duration, with total storm duration modelled as 90 minutes for the 1% AEP flood and generally being in the order of hours. Duration of inundation of higher proportions of the banks would be lesser than the storm duration.
- The presence of vegetation significantly improves bank stability. Channel bank vegetation at the site is variable. The steep lower banks are typically bare, with the less-steep upper banks covered by 30 % – 100 % grass (depending on recent rainfall / flooding events). The floodplain is well-vegetated, with dense grass cover, which stabilises the bank top. During droughts, grass die-off does not completely remove the protective influence of the grass, with the root structure providing effective surface stabilisation.

Given these considerations and guideline values, GHD has adopted an erosion threshold velocity (ETV) of 1.3 m/s for bare soil and 2.5 m/s for banks with grass cover (based on a 90 minute duration and moderately erodible upper bank material soils; Gippel, 2020). This could increase to as much as 4 m/s for banks with good grass cover (Hewlett *et al.*, 1987; Gippel, 2020). It is noted that “Blue Book” values for grassed, moderately erodible soils are significantly lower (1.8 m/s), but percentage vegetation cover and flood duration are not considered.

The more resistant cemented / clay lower bank and bedrock bed material is able to withstand significantly higher velocities and shear stresses than the more erodible upper bank material. The lack of morphological change over the last 60 years has indicated that this section of the channel is resistant to the modelled flows of over 4 m/s.

Figure 3.2 provides the modelled pattern of flow velocities exceeding the bare, moderately erodible soil threshold of 1.3 m/s (depths > 100 mm). This indicates that, during smaller flow events, such as the 1 year flood, velocities exceeding the upper bank ETV are confined to the bed and lower banks. ETVs are exceeded at the base of the erodible material during the 20% AEP and mid-way up the erodible material during the 1% AEP.

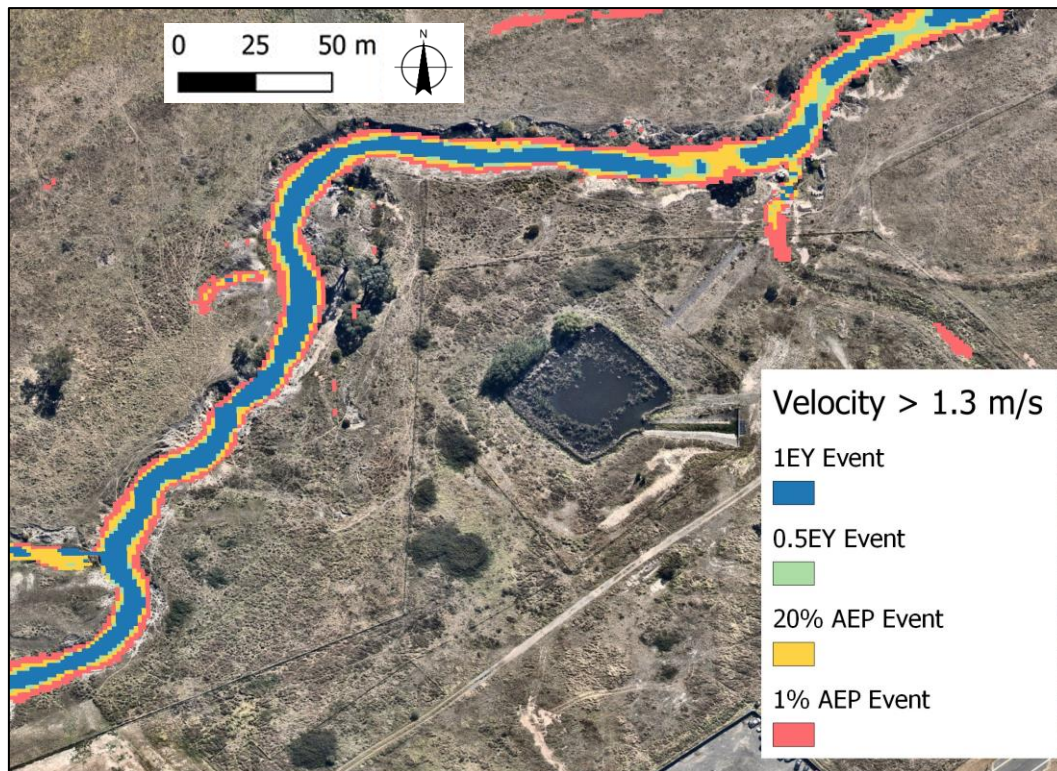


Figure 3.2 Flow pattern for the modelled flood events where velocities exceed bare, moderately erodible upper bank material ETV of 1.3 m/s (flow depths > 100 mm)

3.5 Wastewater management

Material processing would be undertaken within buildings and under roofed areas, limiting the potential for rainfall derived, leachate generation. To maintain moisture content during FOGO material processing, FOGO processing sites operate on a water deficit, with water required to be sourced to 'make-up' water lost during processing (refer Section 3.2).

As material is processed, bleed water, and condensate would be collected in a fully contained, engineered system. Wastewater collected from initial processing of the material can be re-used in the initial processing stages as material is composted. In later stages, any bleed water collected during maturation can be reused and applied to all stages of material processing. Clean water collected from roof-water and storm-water runoff can be reused in all stages of material processing.

Other potential sources of wastewater include generation associated with on-site facilities and typical of domestic wastewater. Trade waste connection may be required, subject to detailed design.

Design of the wastewater system, including the connection to the ACT sewerage network (owned by Icon Water) would be finalised during detailed design of the facility. No impacts from connecting to the existing wastewater network are anticipated.

4. Impact assessment

The potential soil and water impacts were assessed and the key in-built measures for the proposal are:

- Hydraulic modelling was undertaken confirming that the proposal site is located outside of the 1 in 100 AEP design flood level. Accordingly, no off-site impacts during this event are anticipated (refer to Section 3.1).
- The appropriate sourcing of water demands has been confirmed as outlined in Section 3.2.
- Based on the MUSIC modelling results and location of FOGO processes indoors, the proposal was developed providing in-built management to achieve reduction targets on water quality during operation (refer Section 3.3). As in-built management measures are implemented to manage water quality, impacts to the receiving environment, surface water, groundwater and downstream ecosystems are appropriately managed.
- Water quantity and discharge rates can be met through in-built management measures to manage stormwater flow rates and to reduce the risk of erosion and scour to nearby waterways, such as Dog Trap Creek, as outlined in Section 3.4.
- The erosion assessment indicates that:
 - Historic rates of bank erosion have been slow, despite the apparent erodibility of the upper bank. This indicates that the resistant materials of the lower bank and channel bed, combined with stabilising bank and floodplain vegetation cover, effectively limits bank retreat.
 - Under existing conditions, resistant materials of the lower bank and bed are capable of withstanding anticipated flood flow velocities of over 4 m/s. Bare sections of the upper bank and areas of the lower bank are subject to velocities that exceed the site-specific erosion threshold velocity. Therefore, some upper bank erosion would be expected the 20% AEP flood events and above.
 - Hydraulic modelling was undertaken confirming that the proposal site is located outside of the 1 in 100 AEP design flood level, negating the risk of changing flow regimes through interaction with the floodplain in this event. Also, stormwater retention and detention measures are provided in accordance with ACT WSUD requirements. Accordingly, no off-site impacts are expected that would worsen the erosion risk from that experienced under existing conditions.
- Wastewater generated onsite would be managed in a dedicated collection and conveyance system. As waste materials would be located indoors or roofed, rainfall derived wastewater would not be generated. Wastewater generated would generally be from water applied to processes. The appropriate management of wastewater has been confirmed as outlined in Section 3.5, including an engineered system to contain wastewater onsite such that impacts to receiving environments are not predicted.

The assessment identified additional mitigation required for the following areas:

- The basis of the water quality approach is that runoff generated would be typical of an industrial catchment. An operational management plan is necessary with a particular focus that materials are always stored indoors and suitable housekeeping to manage waters and spills is implemented. While no significant impacts are anticipated from the wastewater and hazardous materials, the operational management plan would also include the management of the wastewater system, responses to spills or contamination and flood evacuation procedures during extreme rainfall events.
- Significant erosion and sedimentation control measures are required to manage the disturbance associated with clearing and construction works adjacent to the waterways, which are unavoidable. Control measures implemented would manage disturbance and potential water quality impacts to downstream waterways and associated aquatic ecosystems with regards to suspended solids.

As per the in-built measures and the additional mitigation measures provided in Section 5, the proposal is not predicted to result in significant soil and water related impacts.

5. Mitigation

As outlined in Section 4, the following mitigation measures have been identified.

5.1 Operational water management plan

The water quality approach would take on the approach where runoff generated is similar to that of a typical industrial catchment. Therefore, an operational water management is required. It is important that materials such as plastics are always stored indoors, and appropriate housekeeping measures are implemented.

Before the commencement of the FOGO operations, a detailed operational management plan would be developed and updated on a yearly basis. Some key features of proposed activities that would be specified and maintained are as follows:

- Materials inside trucks are not to be removed until truck is fully inside the indoor receiving area.
- Fast action roller doors are to be installed so they can close promptly after trucks have entered the building.
- Products are to be fully repackaged before leaving indoors on instances where they are transferred off-site or between buildings.

With the previously mentioned mitigation measures in place, risks of litter falling outside of the FOGO building and conveyed by stormwater are minimised. However, as an additional protection, daily visual inspection would be specified in the plan with any waste located outside to be collected. Inspections would be done by verified and authorised personnel with clearly mandated responsibilities. Instances where materials waste are found outside would be logged by the person inspecting.

The operational water management plan would also include details of the following:

- Maintenance of the wastewater system, including the containment and conveyance system to ensure wastewater is not discharged offsite.
- Emergency management procedures, such as management of uncontrolled spills, including where engineered controls of areas containing hazardous materials are required such as bunding or similar to intercept pollutants from the receiving environment.
- Emergency evacuation procedures during extreme rainfall events, including forecasting procedures, evacuation pathways and muster locations.

It is proposed that the implementation and updating of the plan would be stipulated in the Environment Protection Authorisation. No license discharge points are proposed to be included in the license, as water quality discharged on-site are modelled to meet requirements in accordance to ACT WSUD Code.

5.2 Construction phase erosion and sediment control

Erosion and sediment control is an important consideration as there would be an extensive amount of disturbance during the construction phase of the proposal, with potential to impact Dog Trap Creek adjacent to the facility if not appropriately managed. Therefore, soil and sediment control measures are required.

Before the commencement of construction, a Soil and Water Management Plan would be developed to address erosion and sediment control. This plan would be developed in accordance with *Environment Protection Guidelines for Construction and Land Development in the ACT*, which references the NSW Guide: *Managing Urban Stormwater: Soils and Construction – Volume 1*, commonly known as ‘The Blue Book’. The plan would be finalised after the detailed construction approach and method are confirmed. However, key principles of the Soil and Water Management Plan to be adopted are highlighted in Section 5.2.1. With the implementation of this plan, the performance of erosion and sediment control measures in the construction phase is expected to be acceptable and accordingly no impacts to downstream sediment loads, water quality, or aquatic ecosystems are anticipated to be appropriately managed using typical erosion and sediment controls.

5.2.1 Soil and Water Management Plan

The Blue Book is a primary resource of stormwater management design and construction, particularly erosion and sediment control of urban developments (Landcom, 2004). Therefore, it would be used as the primary source in the development of the Soil and Water Management Plan for the proposal site. The Blue Book outlines management, operations, and controls procedures as well as monitoring and maintenance processes to ensure compliance requirements are satisfied.

A key component of the Soil and Water Management Plan would be integration with the final water management configuration and appropriate staging of the work. Key activities in the staging, in chronological order, are listed below:

- Install the proposed northern basins initially as unlined sediment basins.
- Convey upstream run-off around the proposal site disturbance area.
- Convey the proposal site disturbance areas to the northern basins via dirty water drains.
- Undertake the main site construction activities.
- Once disturbance activities are complete, convert the basins into their final operational phase form.

Final sediment basin sizing requirements would be undertaken in the development of the plan, with the basins operating as Type D/F 'wet' basins based on the soil conditions of the proposal site. It is anticipated that the operational phase requirements for the basins will govern the sizing, in which case a greater volume will be provided than required strictly for construction phase sediment control.

The plan would include construction phase water quality monitoring of the sediment basins, as well as any discharge during construction hours. A daily rainfall record would also be kept. Where a discharge of greater than 50 mg/L of suspended solids occurs when the design rainfall event has not been exceeded this would be considered a non-compliance and remedial action taken.

The Blue Book specifies numerous general requirements that would apply to the plan. This would be in areas including:

- Minimising the extent and duration of disturbance.
- Handling of soils.
- Stockpiling.
- Site access and egress.
- Management of drainage.
- Water quality monitoring.
- Roles, responsibilities, and incident reporting.
- Fuel storage.
- Inspection requirements.

6. Conclusions

This soil and water impact assessment has been prepared to address the water quality and hydrology related requirements of the EPSDD. The report covers surface water management and construction phase erosion and sediment control.

The report identifies existing environmental factors relevant to surface water management and erosion and sediment control. It also outlines the assessment method adopted to analyse flooding, water quality, water retention and detention, water sourcing and wastewater management. The assessment carried out informed the appropriate in-built measures and specified mitigation measures specific to relevant risks.

A critical component of the proposed soil and water management strategy for the proposal is the principle of providing water management measures in-built into the proposal. These included:

- Flood modelling to confirm that the proposal site is located outside of the 1 in 100 AEP design flood event.
- On the basis that FOGO processes would take place indoors and based on MUSIC modelling results, the proposal was developed providing in-built management to achieve water quality standards in accordance with the ACT government regulation and relevant guidelines.
- Based on DRAINS modelling results, the proposal was developed providing appropriate in-built management of stormwater quantity to minimise the impacts of downstream flooding conditions in accordance with ACT government regulations and guidelines.
- Reusing site runoff for water demand as much as practicable, whilst securing an external potable supply to supplement full site demand during dry periods.
- Securing a sewer disposal capability with Icon Water to accommodate the full wastewater demand from all activities taken place on the proposal site.

Relevant mitigation measures specific to the operational and construction phase are specified in Section 5 of this report. No unacceptable residual soil and water impacts are anticipated with the implementation of these measures.

7. References

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Appendices

Appendix A

Flood mapping

Note:
1. Flood depths below 0.2 metres have been filtered out. This filtered extent has been maintained for flood level, velocity and hazard outputs.

Legend

Flood Level

Contours

(mAHD)

Flood Depth

(m)

0.20 - 0.30

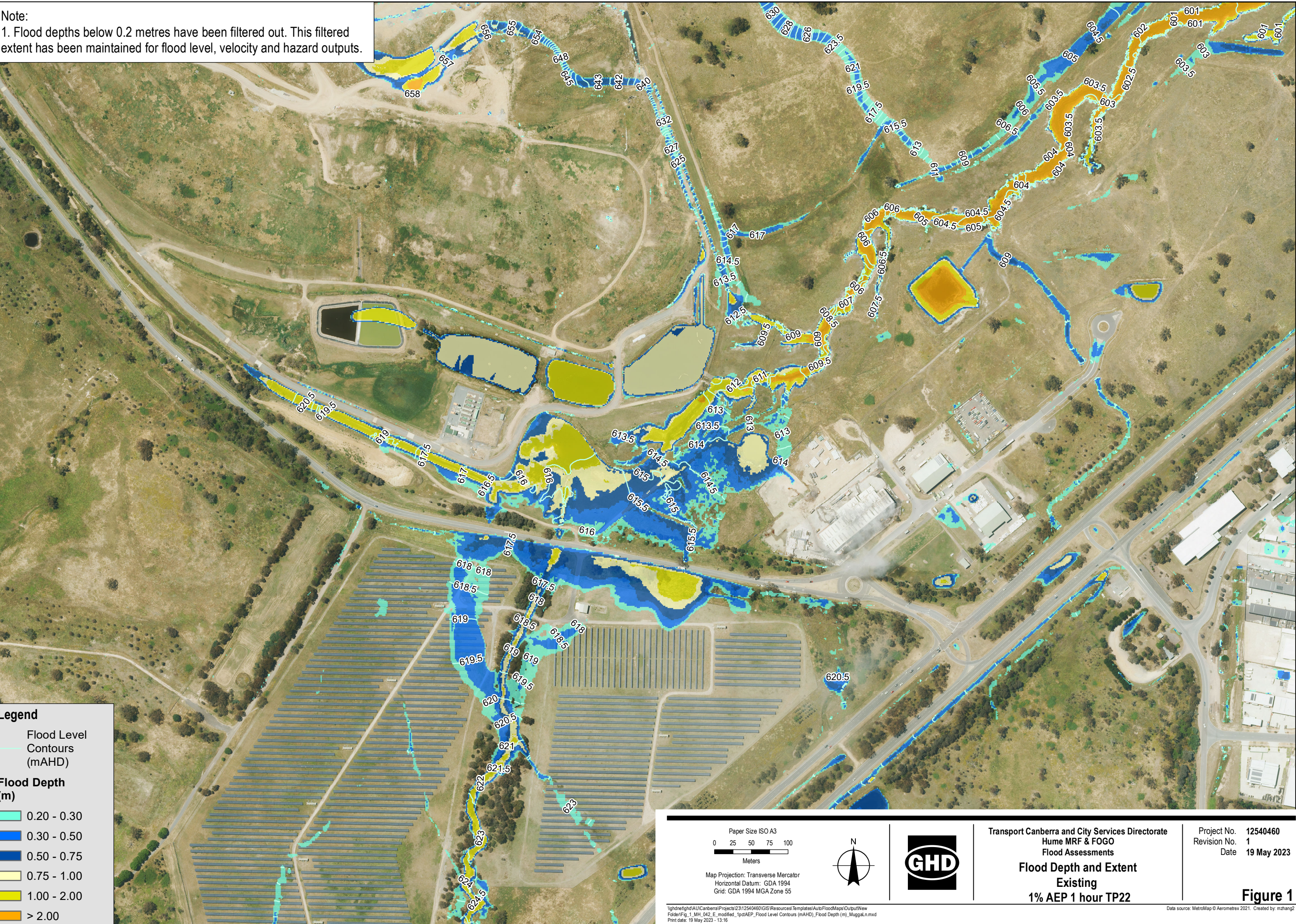
0.30 - 0.50

0.50 - 0.75

0.75 - 1.00

1.00 - 2.00

> 2.00



Paper Size ISO A3

0 25 50 75 100

Meters

Map Projection: Transverse Mercator

Horizontal Datum: GDA 1994

Grid: GDA 1994 MGA Zone 55

Transport Canberra and City Services Directorate

Hume MRF & FOGO

Flood Assessments

Flood Depth and Extent

Existing

1% AEP 1 hour TP22

Project No. 12540460

Revision No. 1

Date 19 May 2023

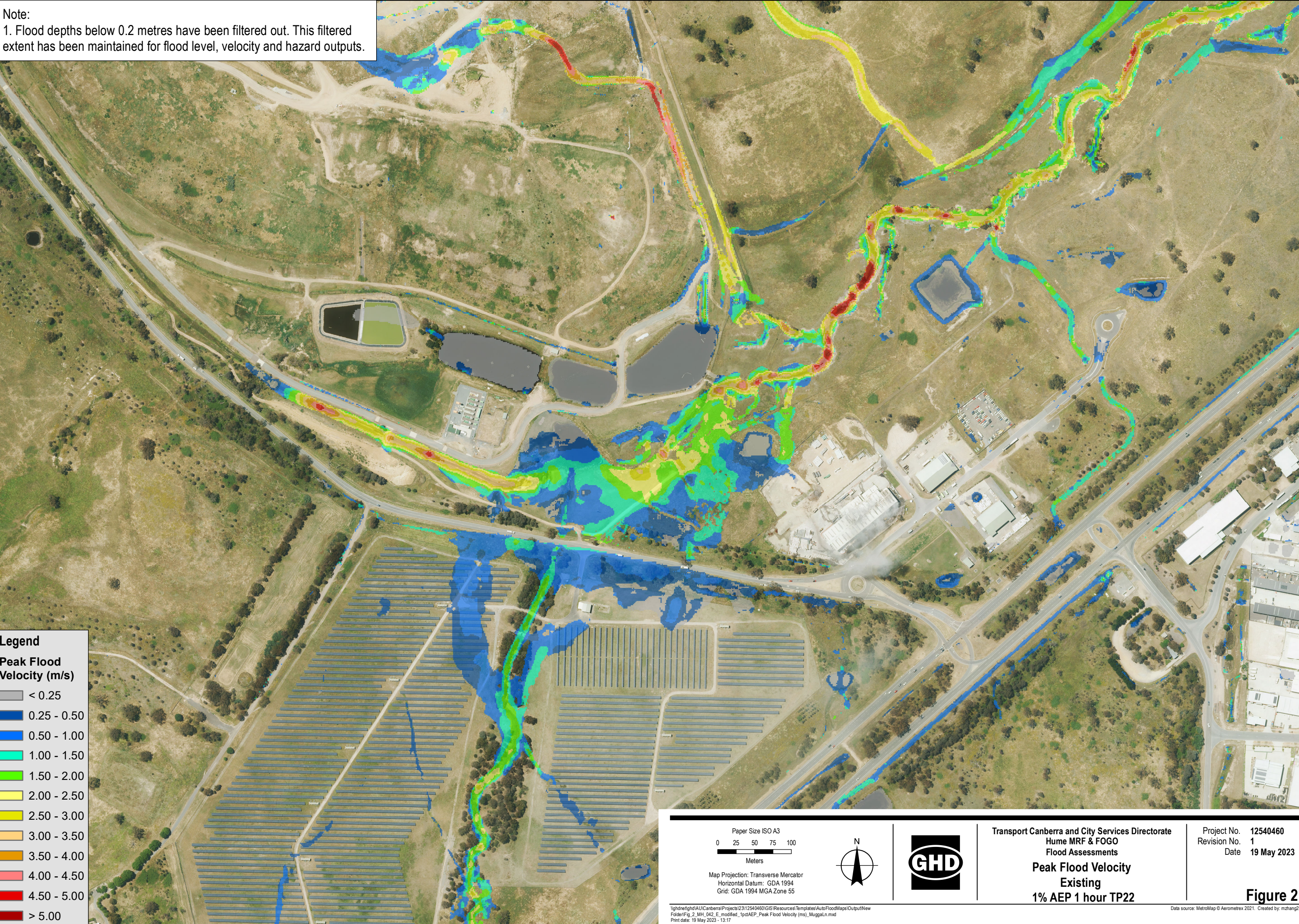
Figure 1

Data source: MetroMap © Aerometrex 2021. Created by: mhang2

Note:
1. Flood depths below 0.2 metres have been filtered out. This filtered extent has been maintained for flood level, velocity and hazard outputs.

Legend
Peak Flood Velocity (m/s)

< 0.25
0.25 - 0.50
0.50 - 1.00
1.00 - 1.50
1.50 - 2.00
2.00 - 2.50
2.50 - 3.00
3.00 - 3.50
3.50 - 4.00
4.00 - 4.50
4.50 - 5.00
> 5.00



Paper Size ISO A3

0 25 50 75 100

Meters

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

Transport Canberra and City Services Directorate
Hume MRF & FOGO
Flood Assessments

**Peak Flood Velocity
Existing
1% AEP 1 hour TP22**

Project No. 12540460
Revision No. 1
Date 19 May 2023

Figure 2

Data source: MetroMap © Aerometrex 2021. Created by: mhang2

Note:
1. Flood depths below 0.2 metres have been filtered out. This filtered extent has been maintained for flood level, velocity and hazard outputs.

Legend

Hazard

H1 - generally safe for people, vehicles and buildings

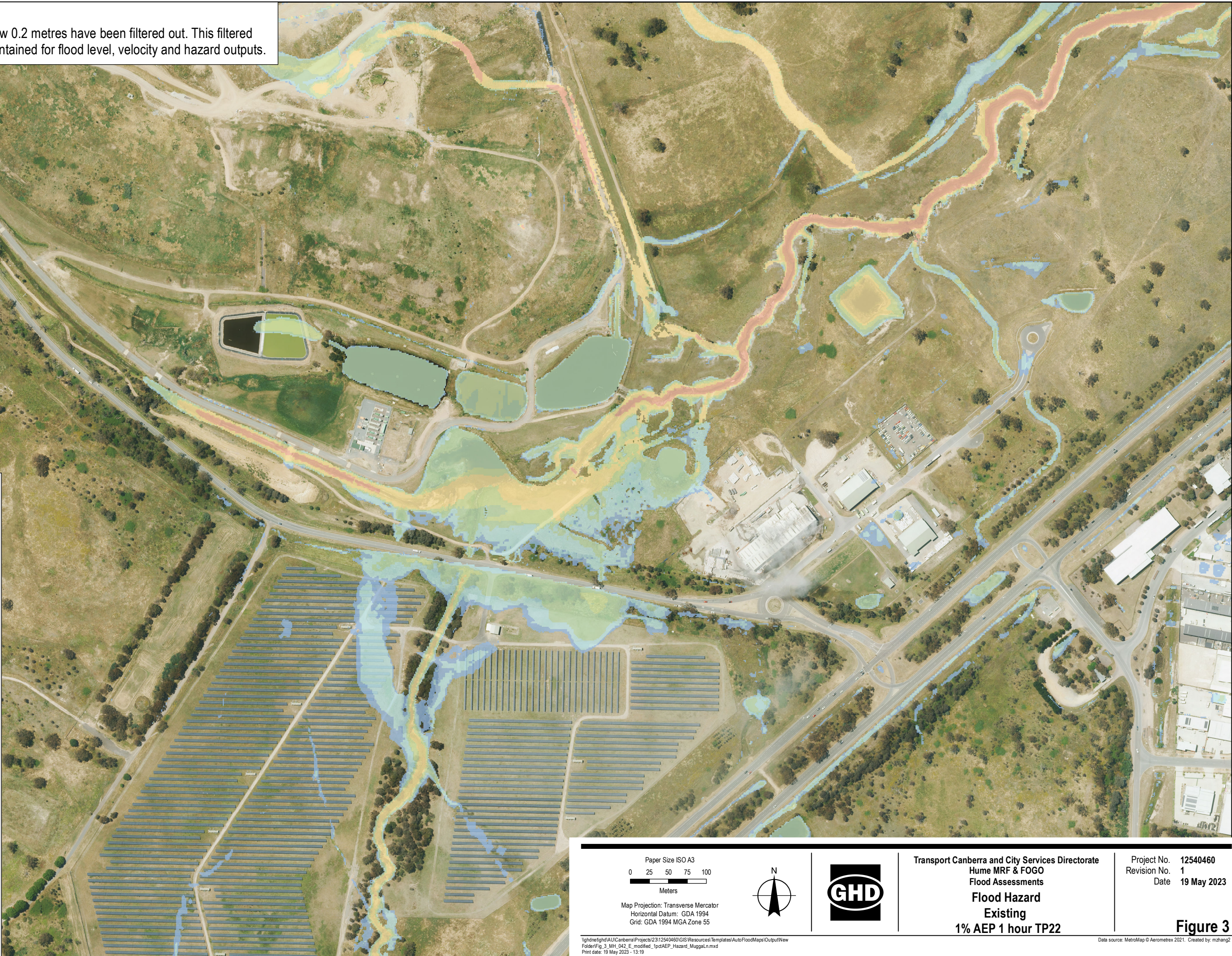
H2 - unsafe for small vehicles

H3 - unsafe for vehicles, children and elderly

H4 - unsafe for people and vehicles

H5 - unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust building types vulnerable to failure

H6 - unsafe for vehicles and people. All building types considered vulnerable to failure





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