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Subject Mugga Quarry Overburden Expansion Project - Surface Water Overview

# 1 Introduction

This memorandum describes the existing surface water environment and proposed water management measures for Boral's Mugga Quarry Overburden Expansion Project. The project comprises:

- the Eastern Emplacement area which is a temporary emplacement area that is located within the approved pit extent;
- the Northern Emplacement area which is a permanent emplacement area that is located to the north of the approved pit extent;
- a perimeter access road (assumed to be 6 m wide); and
- surface drainage and three sedimentation dams.

Figure 2 shows the layout of the above-mentioned project features. A total disturbance area has been established based on the expected layout with additional areas set aside for construction contingency. Disturbance of contingency areas will only be required if the emplacement footprint is larger than expected.

The following sections describe the surface water environment and proposed water management measures. A more detailed surface water report will be prepared as part of the Assessment of Environmental Effects.

# 2 Existing surface water environment

The project area is located to the north of the Mugga Hard Rock Quarry pit. The area is characterised by moderately steep to steep terrain that drains through a number of discrete ephemeral drainage lines into four separate waterways. Figure 1 shows the existing waterways, dam locations and catchment divides (or ridge lines) relative to the proposed emplacement area and existing and proposed pit extents. It is noted that the term waterway refers to waterways shown on a 1:25,000 scale topographic map. It is noted that there are no waterways shown on a 1:25,000 scale topographic map within the project area. Drainage lines that are not shown as waterways on a 1:25,000 scale topographic map are referred to as ephemeral drainage lines in this document.

Waterways and drainage lines within the project area were inspected by a Water Resource Engineer on 4 December 2017. The inspection was undertaken shortly after significant rainfall, with 64 mm of rainfall recorded at the Bureau of Meteorology's (BoM) rainfall gauge at Parliament House (BoM gauge 70246) over 2 and 3 December 2017. The characteristics of each of the four catchment areas are discussed further below.

## 2.1.1 Area 1

Area 1 is located to the north-west of the existing pit and drains to the north via a number of natural and excavated drainage lines. The area drains into a small farm dam that is located on the southern side of Mugga Lane. Overflow from the dam passes under Mugga Lane through a culvert structure before continuing to flow to the north towards the O'Malley residential area. Runoff ultimately enters Yarralumla Creek, 5 km downstream of the project area. Photograph 1 shows an excavated drainage line in Area 1.



Photograph 1 – An excavated drainage line in Area 1.

#### 2.1.2 Area 2

Area 2 is located to the north of a berm that has been constructed adjacent to the final pit extent (as indicated in Figure 1). Runoff from this area drains into an ephemeral drainage line that is located in a well defined gully that drains to the east through the Callumbrea Nature Reserve before joining Jerrabomberra Creek, 3.5 km downstream of the project area. Moderate gully and bank erosion was observed in some sections of this drainage line. Photograph 2 shows a typical section of the incised ephemeral drainage line that is located in Area 2.



Photograph 2 – A typical section of the incised ephemeral drainage line that is located in Area 2.

## 2.1.3 Area 3

Area 3 drains to the east and receives runoff from the area immediately to the north and north-east of the existing quarry pit. As indicated in Figure 1, the majority of this catchment is within the approved pit extent and will be removed as the quarry progresses. Runoff from Area 3 drains to the east via a discreet drainage line through the Callumbrea Nature Reserve before joining Jerrabomberra Creek, 3.5 km downstream of the project area. A small spring was located on this drainage line, immediately to the west of the final pit extent (refer to Figure 1 for the spring location). The spring was interpreted to be associated with the change in slope and significant rainfall that occurred prior to sampling. The spring waters retuned to subsurface flows shortly downstream of the spring location.



Photograph 3 – Shows the terrain in Area 3 to the east of the existing pit. Surface drainage is via subtle ephemeral drainage lines.

### 2.1.4 Area 4

Area 4 is located to the east of the existing pit. Runoff from Area 4 drains to the south in a steep ephemeral drainage line that flows through the Callumbrea Nature Reserve before joining Jerrabomberra Creek, 3.5 km downstream of the project area. Minimal disturbance is proposed in Area 4.

### 2.1.5 Existing surface water regime

All drainage lines within the project area are ephemeral, with surface flows only occurring for short periods of time during and shortly after material rainfall. This was substantiated by observed conditions during EMM's site inspection on 4 December 2017, which observed drainage lines to be generally dry, despite significant rainfall (64mm) occurring over 2 and 3 December 2017. Note Photographs 1, 2 and 3 were taken on 4 December 2017.

## 3 Proposed water management methods

The following water management measures are proposed:

- Surface drains will be established to manage runoff from the overburden areas. The drains will be designed and constructed in accordance with the methods recommended in the guideline titled Environment Protection Guidelines for Construction and Land Development in ACT (EPA, 2011) and Managing Urban Stormwater: Soils and Construction (Landcom, 2004). Rock armouring will be used to manage scour and erosion risks.
- All runoff from disturbance areas will be captured in three sedimentation dams that will be designed in accordance with the methods recommended in the guideline titled Environment Protection Guidelines for Construction and Land Development in ACT (EPA, 2011). The sedimentation dams will treat all runoff from the disturbance area.
- Following rainfall events, the sedimentation dams will be dewatered with water used for haul road dust suppression. Dewatering the dams will reduce the frequency and volume of dam overflows.
- Boral will implement a surface water monitoring program. If monitoring identifies that the sedimentation dams are not providing effective treatment during overflow conditions, the following additional measures can be implemented to reduce water quality risks:
  - gypsum (or chemical flocculants such as alum) can be applied to the basin water bodies to improve sedimentation rates; and
  - water from the dams can be dewatered to the open pit where it will be temporarily stored and used for process water make.

Figure 2 shows the location of the proposed major drainage, sedimentation dams and their associated catchment areas relative to the emplacement areas. The emplacement and surface water designs have been developed to  $\pm 30\%$  level of confidence. The area defined as project contingency is an additional area that may be disturbed within the overall project footprint if required.

## 4 Expected changes to the local surface water regime

This section discusses expected changes to the local surface flow and surface water quality regimes.

#### 4.1 Changes to surface flow regimes

Changes to surface flow regimes can occur due to the realignment of existing catchment boundaries and due to harvesting runoff that has been captured in the sedimentation dams. These changes are discussed further below.

### 4.1.1 Changes to catchment boundaries

The proposed emplacement design will seek to minimise the realignment of catchment boundaries, hence no material redistribution of surface flows are expected. However, it is noted that the upper portion of the Area 3 catchment will be removed as the quarry pit progresses to it approved extraction limit.

### 4.1.2 Changes due to sedimentation basin

The sedimentation basins will be designed and operated in accordance with the guideline titled Environment Protection Guidelines for Construction and Land Development in ACT (EPA, 2011), which recommends the following design and management practices:

- The basins will be sized to capture the initial 150 m<sup>3</sup> of runoff per hectare (ha) of disturbance area. This is equivalent to 15 mm of runoff. Accounting for soil losses, approximately 30 to 50 mm of rainfall is expected to be required to produce 15 mm of runoff.
- Following rainfall, the basins will be dewatered to 20% capacity to provide capacity to capture the next runoff event.

As the sedimentation basins will capture the initial 15 mm of runoff from each rainfall event it is expected that the frequency of stream flows in the immediate receiving waters will reduce. The magnitude of this change will progressively diminish in downstream sections of waterways as the contributing catchment area increases.

### 4.2 Changes to water quality

The proposed sedimentation dams will be designed, constructed and operated in accordance the guideline titled Environment Protection Guidelines for Construction and Land Development in ACT (EPA, 2011) and are therefore expected to provide effective sedimentation treatment.

Boral will implement a surface water monitoring program. If monitoring identifies that the sedimentation dams are not providing effective treatment during overflow conditions, the following additional measures can be implemented to reduce water quality risks:

- Gypsum (or chemical flocculants such as alum) can be applied to the basin water bodies to improve sedimentation rates; and
- Water from the dams can be dewatered to the open pit where it will be temporarily stored and used for process water make.

## 5 Closing

This memorandum describes the existing surface water environment and proposed water management measures for Boral's Mugga Quarry Overburden Expansion Project. A more detailed surface water report will be prepared as part of the Assessment of Environmental Effects.



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