

APPENDIX 1 - SEDIMENT RETENTION POND CALCULATIONS

GENERAL SITE DRAINAGE CALCULATIONS

For the purposes of this stormwater runoff analysis the Long Hill Quarry site will be divided into three distinct catchments.

- Stockpiling, weighbridge and crushing and screening
- Rehabilitation area
- Stages 3 & 4 extraction areas

$$T_c = 91L/(A^{0.1} * Se^{0.2})$$

TABLE 1: TIME OF CONCENTRATION CALCULATIONS

| Catchment reporting | Area A (ha) | Flow line L (km) | Fall (m) | Equal area Se (m/km) | Slope | Time of concentration Tc (min) |
|---------------------|-------------|------------------|----------|----------------------|-------|--------------------------------|
| Stockpiles | 4.0 | 0.30 | 15 | 50 | | 11 min |
| Rehabilitation | 6.25 | 0.25 | 12 | 48 | | 9 min |
| Extraction | 7,35 | 0.33 | 20 | 60 | | 11 mins |

$$Q = \frac{C \cdot I \cdot A}{360}$$

Intensity is derived from the Intensity Frequency Duration chart for the area acquired from the Bureau of Meteorology website (BOM, 2015). A 1 in 20 year reoccurrence event curve is used. The land has a low slope but the trafficked surfaces are well compacted but other surfaces will rough and permeable. The runoff coefficient for this land will be at the mid end of the scale.

TABLE 2: FLOW RATE CALCULATION

| Catchment reporting | Coefficient of runoff C (no units) | Intensity of rain event I (mm/hr) | Catchment Area A (ha) | Flow rate Q (m ³ /s) |
|---------------------|------------------------------------|-----------------------------------|-----------------------|---------------------------------|
| Stockpiles | 0.35 | 79 | 4.00 | 0.307 |
| Rehabilitation | 0.35 | 79 | 6.25 | 0.480 |
| Extraction | 0.35 | 79 | 7.35 | 0.565 |

The Stockpile, weighbridge and crushing / screening area reports to a series of swale drains alongside the traffic paths that collect on the southern edge of the improved area. The drains discharge over the bank into an intercept drain (swale) on the edge of the woodland. The intercept drain has a sediment retention capacity and also reports to a sediment retention pond. The sediment retention pond discharges into vegetated land. Discharge will travel a further 100 metres through vegetation before intercepting a defined drainage path.

The rehabilitation catchment reports to the reservoir and will maintain sufficient water for processing and dust suppression needs for the operation. Runoff from the haul road (access) will be diverted from the haul road sediment retention pond to the water reservoir.

The stage 3 & 4 extraction area has been treated as one catchment whereas progressive rehabilitation will reduce the area that will run off as activities advance into the stage 4 extraction area.

TABLE 3: REQUIRED SURFACE AREA COMPARED TO ACTUAL SURFACE AREA

| Catchment reporting | Flow rate Q (m ³ /s) | Retention basin area from WSUD Figure 4.2 (m ²) | Actual pond surface area (m ²) | Actual pond capacity (m ³) |
|---------------------|---------------------------------|---|--|--|
| Stockpiling | 0.307 | 150 | 150 | 75 |
| Rehabilitation | 0.480 | 180 | 4 000 | 2 000 |
| Extraction | 0.565 | 180 | 1 500 | 990 |

Assume storage 50% of total capacity.

$$S_t = A \times R \times L_o \times F_r \text{ or}$$

$$F_r = S_t / (A \times R \times L_o)$$

TABLE 4: DESIRED CLEAN OUT FREQUENCY

| Catchment reporting | Capture efficiency (R) | Contributing catchment A (ha) | Storage Volume S _t (m ³) | Sediment loading rate L _o (m ³ /ha/yr) | Desired clean out frequency F _r (yrs) |
|---------------------|------------------------|-------------------------------|---|--|--|
| Stockpiling | 0.90 | 4.0 | 37 | 4 | 2.5 |
| Rehabilitation | 0.90 | 6.25 | 1 000 | 4 | 44 |
| Extraction | 0.90 | 7.35 | 445 | 4 | 16 |

The sediment retention pond servicing the stockpiling, weighbridge and crushing / screening area has a minimum clean out frequency of 2.5 years. To provide an adequate factor of safety this basin should be cleaned out annually.

A substantial portion of the catchment reporting to the reservoir will be rehabilitated as part of this upgrade proposal. The reservoir should not need to be cleaned out during the life of the Long Hill Quarry.

The catchment reporting to the stage 3 & 4 extraction area sediment retention pond will be progressively cleared and rehabilitated. The area used for this calculation is conservative. It is likely that the extraction area sediment retention pond will need to be cleaned out only infrequently.

REFERENCES

- BOM. (2015). *Rainfall Intensity Frequency Duration Data*. Retrieved November 1, 2015, from Australian Government Bureau of Meteorology:
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