Lightweight Concrete Aggregate Facility
780 Wallgrove Road, Horsley Park

Soil and Water Report

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The design described in this report is considered to have been finalised.

Signature **Date**

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Director 08/09/15

Notes: The finalisation signatures shown above do not provide evidence of approval to the design. Approval signatures are shown on the title sheet of the design plans.

Contents

1 Introduction

AT&L was commissioned by Brickworks Limited to prepare a Soil and Water Report in support of an Environmental Impact Statement (EIS) associated with a State Significant Development Application for a proposed industrial development on their site at 780 Wallgrove Road, Horsley Park.

The site is situated within the Fairfield City Council local government area but the provisions of the State Environmental Planning Policy (Western Sydney) 2009 take precedence over local planning instruments due to the scale of the proposed development. Therefore this report has been prepared based on the Secretary's Environmental Assessment Requirements as issued 17 December 2014.

2 Site Description

2.1 Existing Site

The larger parent site on which the development is located covers an area of approximately 85 hectares in Horsley Park, Western Sydney. The site is bounded by Wallgrove Road to the west, Ferrers Road to the east, the Sydney Catchment Authority bulk water supply pipelines to the north and a Veolia quarry and private rural properties to the south.

The site comprises an existing brick-making facility with associated factory buildings, access roads, carparks, material stockpiles, basins, offices and amenities. A 1.8km-long paved internal road runs along the northern edge of the site between Wallgrove Road and Ferrers Road.

Eastern Creek, classified as a fourth order or higher stream by the NSW Office of Water, runs through the centre of the parent site. It falls south to north through the site within a densely vegetated riparian corridor.

The topography of the site generally falls from Ferrers Road (RL 68.0m) and Wallgrove Road (RL 62.0m) towards Eastern Creek in the centre (RL 55.0m), although there are several other localised low-points around the site.

2.2 Proposed Development

The proposed development is a production facility for lightweight concrete aggregate. The technology involved in the manufacturing process will be specially imported from Europe and America as it is not currently available in Australia. Once fully operational the plant will have capacity to manufacture 600,000 tonnes of aggregate per year.

The new plant will include two new rotary kilns, an aggregate crushing and screening building and conveyors to transport the product to stockpiles. Associated works will include the upgrade/construction of access roads, loading areas, stormwater basins, offices, car parking and a weighbridge.

The parcel of land on which the new development is proposed sits within the eastern half of the parent site (east of Eastern Creek) and is predominantly covered by existing stockpiles and a large waterbody. The extent of the new development works will cover an area of approximately 7 hectares to the immediate south and west of the existing Plant No.2 brick factory.

3 Bulk Earthworks

3.1 Existing Geology

A geotechnical investigation of the site has recently been undertaken by Douglas Partners. Please refer to the report No.84821.00 dated June 2015.

This included drilling fifteen boreholes at various locations throughout the proposed development footprint in order to ascertain the existing subsoil conditions and strata. Lab testing of soil samples was subsequently undertaken by a NATA registered laboratory.

The investigation generally found that the site contains a layer of fill up to 8m thick (containing ripped shale, clay and crushed bricks) over residual stiff, high-plasticity silty clays. This is underlain by Bringelly shale typically of low to medium strength.

3.2 Proposed Bulk Earthworks

In order to create suitable levels for the various structures, pavements and associated components of the development a significant amount of bulk earthworks will be required.

3.2.1 Excavation

The required total cut volume is estimated to be approximately 125,000m^3 across the site. This is primarily generated from excavation of approximately 80,000m^3 of material from the existing bund to south of the Plant 2 factory in order to form the proposed kiln pad.

It should be noted that total earthworks volume quoted does not include excavation of the existing stockpiles on the site i.e. Stockpiles No.1, No.2 and No.4 which have a total volume of approximately 140,000m^3. Brickworks intend to use this material in the brick-making process prior to commencement of construction or alternatively relocate the stockpiles elsewhere on the wider site. This will help to limit the total volume of bulk earthworks required for the construction of the development.

The Douglas Partners geotechnical report states that excavation of the filling, clay and very low/low strength rock layers (in which almost all of the proposed works will take place) could be carried out using conventional earthmoving equipment up to a medium bulldozer. Should any deeper excavations be required into the higher strength shale or siltstone (e.g. for foundations) rock breaking equipment may be required.

3.2.2 Filling

Filling is required in order to raise existing ground levels across the site to form the crusher/screener pad, loading area, access road and office areas. This amounts to a total volume of approximately 50,000m^3. The raised ground levels will provide flood immunity to the development during the 100 year flood event in Eastern Creek (refer Section 5). Some fill will also be required to form the proposed detention/sediment basin embankments.

Whilst at this stage there is clearly an excess of cut over fill, there will be the opportunity to reduce/eliminate the surplus by a combination of the following factors:

- raising finished levels on the building pads at detailed design stage
- shrinkage factors will be applicable for the material excavated from the existing factory bund as it is likely to have been placed there with minimal compaction i.e. at low density.
- using surplus clay/shale material in the manufacturing process

All structural filling for the development will be controlled filling undertaken with qualified Level 1 supervision and certification by a geotechnical engineer to ensure proper compaction standards are achieved. Refer to Douglas Partners geotechnical report for further information on the required filling methodology.

The maximum permanent batter slope recommended by the Douglas Partners report is 1V:2H, subject to stabilisation measures.

Appropriate erosion and sediment control measures will be installed and maintained for the duration of construction to ensure that sediment-laden runoff does not enter the Eastern Creek riparian zone untreated. Refer to Section 8 for further detail.

3.2.3 Earthworks Staging

A possible sequencing for the proposed bulk earthworks is outlined below, subject to further refinement during the design and construction planning phase.

1. Dewatering of the existing dam. The water will be treated prior to discharge into Eastern Creek.
2. Excavation and treatment of saturated material at the base of the dam which is unsuitable for subgrade of the proposed basins.
3. Construction of new basin embankments using compacted fill from Stockpile No.2. The basins will then be operational for use as sediment control measures during bulk earthworks on the wider site.
4. Excavation of the existing bund south of the existing factory for use as fill across the site.
5. Controlled filling of the crusher/screener pad, main stockpile pad and access road.
6. Access road and building construction

Prior to construction commencing, it is expected that Stockpiles No.2 and No.3 will be used up in ongoing brick-making operations and not replaced. This minimises the amount of excavation required during bulk earthworks for the development.

Construction staging will be an important factor in the erosion and sediment control strategy employed on the site.

3.2.4 Eastern Creek Riparian Zone

All proposed bulk earthworks will take place outside of the defined 40m riparian setback zone from the top bank of Eastern Creek except for the formation of the western embankment and spillway of the on-site detention basin. The outer edge of the proposed basin embankment is approximately 26m from the top of bank.

According to NSW Office of Water Controlled Activity Guidelines, a 50% encroachment (i.e. up to 20m from top of bank) is acceptable if it is offset with an equivalent riparian area.

3.2.5 Groundwater

Refer to Section 9.6 below.

4 Stormwater Catchments

4.1 Planning Requirements

The Secretary's Environmental Assessment Requirements for the Development Application state that the Soil and Water Report must include:

- a description of the catchment and proximity of the site to waterways; and
- an assessment of potential surface water impacts associated with the development.

4.2 Existing Catchments

The portion of the parent site located to the east of Eastern Creek has been divided into a number of individual stormwater catchments as described in further detail below. Please also refer to the Existing Catchment Plan C15 included in Appendix A.

4.2.1 Catchment A

This catchment covers an area of 6.7ha and comprises the existing Plant No.2 brick making facility. This includes several large industrial buildings, smaller office and amenities buildings, internal access roads and storage areas.

The catchment generally falls from Ferrers Rd (the Brickworks eastern property boundary) to the southwest, eventually accumulating at the low point in the south-western corner of the main factory building.

There are several existing surface inlet pits located at the low-point which collect overland flows and convey them via a piped system running northwest towards an outlet point into the existing dam. However, in a major storm event the congregation of stormwater from Catchments A and B would exceed the inlet and pipe capacity of this system and as a result cause significant ponding/flooding of the local area.

4.2.2 Catchment B

This catchment covers an area of 8.9ha and comprises a number of varying types of clay material stockpiles used in the brick-making process. Runoff from this catchment drains north, across the existing haul road and down to the low-point at the south-western corner of the existing brick factory.

There are several existing surface inlet pits located at the low-point which collect overland flows and convey them via a piped system running northwest towards an outlet point into the existing dam. However, in a major storm event the congregation of stormwater from Catchments A and B would exceed the inlet and pipe capacity of this system and as a result cause significant ponding/flooding of the local area.

4.2.3 Catchment C

This catchment covers an area of approximately 7.0 ha along the southern boundary of the site. It comprises the southern half of a large existing shale stockpile (up to 40m high) and the southern portion of the clay stockpiles further east. The catchment drains to the south where

it is collected by an open channel near the site boundary. This channel falls west towards Eastern Creek. Therefore runoff from this catchment does not enter the proposed development site.

4.2.4 Catchment D

This catchment covers an area of approximately 5.9ha and comprises raw material stockpiles (clay and shale) up to 40m high. The catchment drains to the west, concentrating along the existing haul road which falls towards Eastern Creek. Therefore runoff from this catchment does not enter the proposed development site.

4.2.5 Catchment E

This catchment covers an area of 7.2ha and comprises clay stockpile areas and associated unpaved access roads. A vegetated bund up to 7m high separates this catchment from Catchments A and F to the east and north.

Runoff from this catchment discharges directly into the existing dam via overland flow.

4.2.6 Catchment F

This catchment covers an area of 4.9ha and mainly comprises a paved storage area to the north of the Plant No.2 factory. To the west of the storage yard there is a vegetated buffer zone, dirt access road and clay stockpile.

Runoff from the catchment is drained by an existing vegetated open channel which runs along the southern edge of the paved road and discharges directly into Eastern Creek (downstream of the dam). Flows in the channel cross under the existing dirt access road via a pipe culvert. There is also an auxiliary open channel which runs along the western edge of the brick storage yard and discharges into the main channel at its northern end.

4.2.7 Existing Dam

The existing dam located adjacent to Eastern Creek has an approximate surface area of 1.5 hectares and a maximum depth of 3.0m. This dam is not a natural waterbody – it has been created as a result of historical quarrying operations and has filled up over time. It serves as a convenient low-point for impounding runoff from existing catchments A, B and E as described above.

Water to be discharged from the dam is currently pumped to existing sediment ponds on the opposite (western) side of Eastern Creek for treatment prior to release into Eastern Creek. Some water is also extracted from the dam for regular dust suppression activities across the site.

It is noted that the proposed development involves dewatering and removal of the existing dam and creation of formal detention basins in the same vicinity. Refer to Section 4.3.5 below.

4.2.8 Eastern Creek

Eastern Creek conveys runoff from the rural Horsley Park catchment located to the south of the Brickworks site. The watercourse flows northwards through the centre of the site, surrounded by a vegetated riparian corridor.

The existing dam is located immediately to the east of Eastern Creek. In fact, the western portion of the dam is located well within the 40m riparian setback from the top of bank (refer Drawing C100) and also within 20m of the creek bed itself.

It should be noted that all functional parts of the existing Brickworks facility (including stockpiles and haul roads) are located outside of the 40m riparian setback.
Due to Eastern Creek's close proximity to the development site, flood modelling was undertaken in order to understand any impacts and effects from this watercourse on the development. It was also important in order to confirm that there are no adverse effects on upstream or downstream properties. Refer to Section 5 below for Eastern Creek flood analysis and results.

4.2.9 External Catchments

There are no other external upstream catchments from outside of the Brickworks property draining through the proposed development site.

4.3 Proposed Catchments

The new development has been divided up into its constituent catchments below. Please also refer to the Proposed Catchment Plan C16 included in Appendix A.

4.3.1 Catchment 1 - Kiln Pad

This catchment covers an area of 1.9ha surrounding the footings of the two proposed rotary kilns. This includes a gravel hardstand area to be constructed around the new kiln structures to allow access for operational and maintenance staff and also a building to house the proposed extruder facility. There will also be vegetated cut batters located around the perimeter of the kiln pad.

This catchment will be drained via surface inlet pits into the existing stormwater infrastructure located along the western edge of the existing Plant 2 building. This pit and pipe network currently discharges into the existing dam via a 1650mm diameter concrete outlet pipe, which will be preserved and extended underneath the new access road (refer Catchment 2 below).

Overland flows from major storms will be captured in an open channel drain which will skirt along the western edge of the new access road and discharge into the new detention basin. This represents a vast improvement over the existing scenario, in which stormwater is trapped in the sag point at the south-western corner of the brick factory, with no overland flow escape route. In the case that the existing pit and pipe network becomes blocked or has insufficient capacity there is currently a local flooding risk. The new arrangement will resolve this issue. Refer to Drawing C100 in Appendix A for the concept stormwater layout.

The existing catchment to the south (refer Catchment B above) will now be diverted via an open drain to be constructed along the southern side of the existing haul road. This will

prevent sediment-laden overland flow from this significant catchment from running down the proposed cut batter and flooding the kiln pad. The open drain will cross under the haul road in a new reinforced concrete culvert and connect into the open drain that runs along the western edge of the new access road.

4.3.2 Catchment 2 – Crusher/Screener Plant and Main Stockpile Areas

This catchment covers an area of 3.4ha and comprises the proposed crusher/screener plant and main stockpile for materials exported from the new kilns. Controlled filling will take place to grade the new pad so that it falls at a constant gradient to the west towards the new detention basin.

The area around the crusher/screener building and underneath the main stockpiles will be provided with a gravel pavement to allow maintenance access and prevent clay contamination of the processed materials.

Downpipes from the new crusher building will convey roofwater into new pits connected to the existing stormwater network. In major storm events runoff from this area will drain overland to the west, directly into the proposed detention basin.

4.3.3 Catchment 3 - Access Road

This catchment covers an area of 1.9ha area and comprises a paved access road and stockpile load-out area adjacent to the new crusher plant. Access is from a new intersection to be constructed on the existing internal road at the northern edge of the proposed development. The new access road will lead south, past the proposed office building, weighbridge and stockpile area and culminate in a turning head.

The access road will be used predominantly by trucks (up to B-double size) picking up processed aggregate from the facility for transport off site. Some light vehicles will also use it to access the proposed carpark adjacent to the office building. Maximum traffic volumes are 128 trucks per day and 45 cars per day. Refer to the Traffic Report for further details.

Pavement design for the road is yet to be finalised and will await geotechnical test results of subgrade strength. The northern portion of the access road will be more heavily trafficked and is likely to be sealed with a heavy duty asphalt mix, while the southern loading area will be unsealed to allow for front-end loader operations.

The majority of the access road catchment will be drained via one-way cross fall to a swale running alongside the road and discharging into the proposed detention basin. The edge of the access road will be provided with a flush concrete edge beam to allow sheet flow into the swale. Alternatively, the road could be kerbed to better define the edges of the trafficable pavement and regular cut-outs provided to allow stormwater to enter the swale.

A small portion of the access road (approx. 1500m^2) at the northern end must continue to fall back to the north towards the existing internal road because it is necessary to tie in with existing levels at the intersection. It is therefore included within Catchment F, which drains into the existing vegetated open swale drain which discharges into Eastern Creek. A new 600mm diameter reinforced concrete pipe culvert will be installed underneath the access road where the swale crosses the road alignment.

4.3.4 Catchment 4 – Basins

This catchment covers an area of 0.4ha area and comprises the proposed stormwater detention/sediment basins to be constructed to service the development. For information regarding the function and layout of these basins refer to Sections 6 and 7.

4.3.5 Catchment 5 & 6 – Revegetation Areas

Once the existing dam is dewatered, an area to the west of the proposed development (approx. 5,000m²) is not required for use as detention basins or for other infrastructure. It will be planted with riparian vegetation, which essentially extends and widens the Eastern Creek riparian zone at this location.

The former stockpile area (4,685m²) adjoining Eastern Creek at the northwest corner of the site is also to be revegetated with suitable plant species and will form part of the riparian offset. Refer to the ecological report by Travers Ecology for further information.

No downstream treatment or attenuation is required for these two vegetated areas.

4.3.6 Eastern Creek

The proposed development is located wholly outside the 40m riparian setback from the top bank of Eastern Creek except for a small portion of the on-site detention basin (up to 550m²). The outer edge of the proposed basin embankment is approximately 30m from the top of bank.

According to NSW Office of Water Controlled Activity Guidelines, a 50% encroachment (i.e. up to 20m from top of bank) is acceptable if it is offset with an equivalent riparian area. The offset area of 4,685m² offered greatly exceeds the proposed encroachment. A further riparian offset area of approximately 2,000m² will also be provided immediately west of Basin No.1. Refer to Drawing C03.

5 Flooding

5.1 Planning Requirements

The Secretary's Environmental Assessment Requirements for the Development Application state that the Soil and Water Report must include:

- A consideration of local and mainstream flooding impacts.

5.2 Council Flood Maps

Fairfield City Council's flood maps are available online and identify hazard areas within the Eastern Creek catchment.

The Rural Area Flood Study which includes Eastern Creek, was undertaken by BMT WBM and adopted by Council in 2013. Because of the dynamic nature of quarries, and the potential inaccuracy of flood storages, the subject site was modelled as an assumed gradient from the top of the site down to the creek (i.e. "filling" the quarry in). Because of this assumption, the subject site was **excluded** from flood mapping.

5.3 Pre-Development Scenario

Following discussions with Fairfield City Council, we were advised that any modelling conducted for development purposes should use 'actual' existing conditions as the base case, rather than the assumed conditions from the Rural Flood Study model. However, they encouraged us to use their existing flood model and associated flood modelling consultant BMT WBM as a starting point to ensure a consistent approach throughout the catchment. This was also considered a more time and cost-efficient option compared with creating an entirely new flood model.

AT&L provided BMT WBM with the 3d survey model of the subject site for incorporation into their TUFLOW flood model as the 'existing' pre-development scenario. This replaced the Rural Flood Study as the base case model.

For results of this modelling, including comparison with the base case used in the Rural Flood Study, please refer to the BMT WBM report included under Appendix B.

5.4 Post-Development Scenario

A proposed bulk earthworks 3d surface was provided by AT&L to BMT WBM for incorporation into their flood model as the proposed post-development scenario.

Analysis was conducted in two iterations:

1) A preliminary layout to check impacts and inform further refinements to the bulk earthworks design layout;

2) A revised final layout including minor amendments to minimise effects on the Eastern Creek active flow path.

Outputs from the flood model included mapping of the following variables:

1) Flood Level Impacts (Differences/Afflux)

2) Velocity-Depth Product

3) Peak Water Level

5.4.1 Results

The flood modelling showed that there are **no** flood level impacts on the upstream and downstream properties on Eastern Creek as a result of the proposed development. In the 1 in 100 year ARI storm event (1% AEP) the afflux at the points on the boundary of the site is zero.

Some localised afflux (up to 0.01m for 1% AEP) is created in Eastern Creek **within the extents of the site** in the immediate vicinity of the development.

All proposed building pads (minimum FFL 59.2) have in excess of 500mm freeboard to the adjacent 1 in 100 year ARI flood levels in Eastern Creek (approx. RL 57.1-58.1). This therefore satisfies the requirements of Fairfield City Council's *DCP Chapter 11: Flood Risk Management.*

For detailed modelling results and discussion please refer to the BMT WBM report included under Appendix B.

5.5 Localised Flooding

The BMT WBM analysis did not include localised flood impacts. Refer to Section 4.3 above for a description of the proposed stormwater drainage within each catchment. The conceptual drainage layout for the development has been designed to mitigate existing localised flooding issues (e.g. at the southwest corner of the existing factory building) and provide a free-draining site where overland flow will fall towards the proposed on-site detention basins.

Further analysis of the stormwater network using DRAINS software will be undertaken at detailed design stage, to ensure pipes and open drains are sized adequately to prevent localised flooding issues.

6 On-Site Detention

6.1 Planning Requirements

The Secretary's Environmental Assessment Requirements for the Development Application state that the Soil and Water Report must include:

- A description of the surface and stormwater management systems, including on site detention.

6.2 Proposed OSD Basin

The increase in impervious area on the site as a result of the development will cause increased stormwater flows to be generated. In order to minimise increases in flood levels on the creek system and ensure there are no adverse effects on downstream properties, peak stormwater flows from the development must be attenuated on the site.

It is proposed that the necessary attenuation will be provided by construction of two detention basins at the downstream end of the catchment. Refer to Drawing C06 enclosed under Appendix A.

6.2.1 Design Standard

Fairfield City Council's On-Site Detention Handbook 1997 states the following:

> In the case where it is proposed to re-develop a site which is currently partly developed, the existing magnitude of the runoff cannot be increased and OSD is the obvious solution. The runoff from the site is not to exceed the current site discharge for all storms up to and including the 1 in 100 year ARI storm events. The preliminary estimate of the required storage volume should be made by using Method 2 modified proportionally to amount of existing impervious area and professional judgement.

On this basis the OSD volume requirement for the site has been calculated using Method 2 in the Handbook, given as follows:

Method 2 - Runoff Routing and Reservoir (Basin) Routing Calculations

$V = 22 \times A / 1000m^2$ where V = Volume in m^3, A = Total site area in m^2

> Stage-Discharge-Storage relationship will impact on the performance of the detention system. This method of estimating the storage requirements will provide a reasonable, slightly over-estimation of the storage volume required for a "green field" development if proper engineering practices are exercised in the final design.

6.2.2 Sizing

A "total site area" of 21.6 hectares has been adopted which corresponds to the total catchment area draining to the low-point where the OSD basin is proposed. Refer to the Proposed Catchment Plan included under Appendix A.

It should be noted that 70% of this area comprises existing buildings and stockpiles which will not be affected by the proposed development. Generally on-site detention is only provided to limit post-development discharges to pre-development levels. However, as pre-development stormwater discharges are currently limited to some degree by ad-hoc detention being provided by the existing dam (to be removed under the proposal) the new OSD basin should consider the entire catchment.

Therefore:

Storage Volume Required = 22 x 216,000/1000

Storage Volume Required = **4,752m^3**

The capacity of the detention basins provided is approximately 6,700m^3 and therefore easily exceeds the minimum detention requirement and allows for increased freeboard to the embankment crest in the 100 year storm event.

Further to the preliminary sizing calculation above, a more detailed runoff routing analysis will be undertaken using DRAINS hydraulic modelling software at detailed design stage. This software utilises the ILSAX method for comparing inflow and outflow hydrographs for multiple storm events. As the preliminary sizing calculation is considered conservative, there may be the opportunity to decrease the size of the detention basin accordingly.

It should also be noted that the proposed detention basins will also act as sediment basins to perform the required water quality treatment function. Sediment basin sizing (to provide sufficient volume for settling and storage of sediment) is likely to be critical relative to detention basin sizing. Refer Section 7.3.1 for further information.

6.2.3 Outlets and Spillways

The levels and layout of basin outlets and spillways will be designed at detailed design stage using hydraulic modelling software. This will ensure that post-development discharges do not exceed:

- Pre-development discharges up to the 1 in 100 year ARI storm event; and
- Council's Permissible Site Discharge requirement of 140L/s/ha for the 9-hour 100 year ARI storm event.

The spillway chute will be rock-lined for scour protection.

6.2.4 Maintenance

Maintenance provisions for the basins will be determined by sediment removal requirements. Refer to Section 7.3.1.6.

6.2.5 Safety

The basins are of sufficient depth (4.0m) and batter slope (1V:2.5H) to be considered a public safety risk. However as they are located within a secure industrial site, fencing may not be required. Installation of a water depth marker in each basin is recommended.

7 Water Quality Treatment

7.1 Planning Requirements

The Secretary's Environmental Assessment Requirements for the Development Application state that the Soil and Water Report must include:

- A description of the surface and stormwater management systems, including measures to treat or re-use water.

7.2 Existing

Water quality treatment on the site is currently undertaken by Austral staff in accordance with the terms of their Environmental Protection License issued by the EPA. The overarching requirement is compliance with Section 120 of the Protection of the Environment Act 1997. However, there are also particular licence conditions relating to this site - the following is an extract from Pages 9 and 10 of the EPL concerning water discharge concentration limits:

L3 Concentration limits

L3.1 For each monitoring/discharge point or utilisation area specified in the table\s below (by a point number), the concentration of a pollutant discharged at that point, or applied to that area, must not exceed the concentration limits specified for that pollutant in the table.

L3.2 Where a pH quality limit is specified in the table, the specified percentage of samples must be within the specified ranges.

L3.3 To avoid any doubt, this condition does not authorise the pollution of waters by any pollutant other than those specified in the table\s.

Pollutant	Units of Measure	50 percentile concentration limit	90 percentile concentration limit	3DGM concentration limit	100 percentile concentration limit
Oil and Grease	milligrams per litre	-	-	-	10
pH	pH				6.5-8.5
Total suspended solids	milligrams per litre	-	-	-	50
Turbidity	nephelometric turbidity units	-	-	-	150

The quality requirements are consistent across all monitoring points on the site.

Runoff from the site is currently impounded in the existing dam adjacent to Eastern Creek. The method of treatment currently used to meet the water quality objectives is flocculation of the impounded runoff. Flocculent is applied within 24 hours of the conclusion of each storm event by broadcasting it over the surface by hand, ensuring an even spread over the basin surface.

Once the sediment has dropped out and the water reaches the target values for turbidity, total suspended solids, oil/grease and pH, it is pumped out into the Eastern Creek riparian corridor. Test results are documented and filed.

The sediment storage zone at the bottom of the basin is regularly excavated with suitable machinery to ensure that the required storage volume is available.

7.3 Proposed

The proposed development will be required to meet the same water quality discharge standards as the existing site i.e. the requirements of the EPL as stated in Section 7.1.

The process which is proposed to ensure compliance with the above involves treatment of runoff in constructed sediment basins and subsequent testing of discharges prior to release into Eastern Creek.

7.3.1 Sediment Basin

Due to the high suspended sediment content in runoff from a quarry site, a permanent sediment basin will be provided as a stormwater treatment facility to prevent sediment-laden stormwater from polluting Eastern Creek.

As described in Section 6 above, this basin will also provide the required on-site stormwater detention volume for attenuating peak flows into Eastern Creek.

7.3.1.1 Design Standard

In NSW the methodology for designing sediment retention basins is specified by *Managing Urban Stormwater – Soils and Construction Blue Book Volume 1, 4th Edition, March 2007 (the "Blue Book").*

7.3.1.2 Layout

The basin arrangement at the low-point of the site has been designed to allow for a two-stage operation. Basin No.1 will act as a sediment forebay/settling zone to remove the majority of medium to coarse sediment from runoff prior to discharge into Basin No.2. This will allow for a more efficient maintenance process because Basin No.1 can be cleaned out on a more regular basis, while Basin No.2 can have a reduced cleanout frequency.

The Blue Book states that the length to width ratio of basins should be minimum 3:1 (desirably 5:1) to ensure hydraulic efficiency. The dimensions of Basin No.1 are approximately 60m x 20m which will satisfy the minimum requirement. However, it is difficult to provide this ratio on Basin No.2 due to constraints from the proximity of the Eastern Creek floodplain. As the first basin provides the primary sediment removal function, this is not considered critical. Baffles could also be installed to increase the distance between the inlet and outlet and reduce the opportunity for short-circuiting.

Both of the proposed basins have a depth of 4.0m which exceeds the minimum required depth of 1.5m specified on the Blue Book standard drawing SD 6-4. This includes freeboard between the top of embankment and crest of the spillway weir. The internal batters will be 1V:2.5H and external batters 1V:3H.

The two basins will be separated by a weir, the level of which will be set based on the results of hydraulic modelling to be undertaken at detailed design stage. The weir will be constructed from an earth bund covered with a suitable lining to prevent erosion.

At the downstream end of Basin No.2 an outlet weir and associated spillway will be constructed to discharge flows into Eastern Creek. The spillway chute will be rock-lined to minimise scour from discharges and the weir/spillway will be designed to minimise outlet velocity into the creek. The levels and configuration of the weir will be modelled at detailed design stage.

7.3.1.3 Sizing

The total sediment retention basin volume required includes a settling zone volume and sediment storage volume determined in accordance with the formulas stated in the Blue Book.

As Emerson test results for dispersibility are not currently available, it is conservatively assumed that the site comprises "Type D" soils i.e. containing a significant proportion of dispersible materials. Flocculation will continue to be necessary for the proposed sediment basin.

$V_{total} = V_{settling} + V_{storage}$

$V_{settling} = 10 \times C_v \times A \times R_{(85\%, 5\text{-day})}$
C_v = Volumetric runoff coefficient (from Blue Book Table F2) = 0.64
A = Total catchment area = 21.6ha
$R_{(85\%, 5\text{-day})}$ = 5-day total rainfall depth not exceeded in 85% of rainfall events. The closest station to the site listed in the Blue Book Table 6.3a is Blacktown = 32.2mm
$V_{settling} = 10 \times 0.64 \times 24.2 \times 32.2$
$V_{settling} = 4451m^3$

Due to lack of available soil testing data, a RUSLE analysis (to calculate two-month soil loss) has not been undertaken and the storage volume has been assumed as 50% of the capacity of the settling zone. Therefore:
$V_{storage} = 4451 \times 0.50$
$V_{storage} = 2226m^3$

$V_{total} = 4451 + 2226$
$V_{total} = 6,677m^3$

This volume is considered very conservative because more than half of the contributing catchment is covered with pavements and building roofs which do not generate as much sediment as exposed soil areas. However a sediment basin is still required as there are significant stockpile areas draining towards it which have potential for high sediment yields.

The total volume required above can be supplied between proposed Basins No.1 and No.2 which have a total capacity of $6700m^3$.

7.3.1.4 Flocculation and Dewatering

The sediment basin shall be treated by flocculation after all rainfall events (>5mm) using gypsum, alum or another suitable compound. Manual dosage of the basin should be

undertaken using a minimum rate of 32kg/m3 for gypsum or 1.5-8.0kg/m3 for alum. Higher dosage may be required depending on soil type and application technique.

Flocculent shall be spread evenly over the basin surface area. The basin area should ideally be equipped with a pump system to spray the slurry of flocculants at an angle of 10-20 degrees.

Dewatering should occur within 5 days of the conclusion of a rainfall event so that capacity is restored in the basin. The treated basin should be dewatered using a pump system with a floating inlet to ensure settled sediment is not entrained and discharged.

7.3.1.5 Spillages

The proposed aggregate manufacturing facility will operate a process in which there is little risk of contaminants being released into the stormwater system. However should a spill occur the basin will detain the contaminated material at the low-point of the site until it can be removed via suction pumps or other equipment.

7.3.1.6 Maintenance Access

Maintenance access to the basins must be provided to allow for dredging of collected sediment from the basin floor/storage zone. This should occur once the sediment storage zone reaches 70% of its capacity. Captured sediment will be disposed of in an environmentally-sensitive manner so as not to cause contamination or downstream pollution.

A 3.0m-wide berm has been provided to allow a small excavator to track around the perimeter of the basins. Maintenance ramps constructed from concrete or geogrid (maximum grade of 1 in 6) can also be constructed to provide direct access from the adjacent access road onto the floor of the basins.

The floor of the primary sediment basin will be lined with rock (or concrete) to delineate the bottom of the sediment collection zone and provide an impermeable layer.

7.3.2 Gross Pollutant Traps

In addition to these requirements it is recommended that a gross pollutant trap be installed on the pipe network leading from the access road and carpark to the basin and creek outlet points. A proprietary device such as a Rocla CDS or Humes Humeguard will offer some pre-treatment screening of flows prior to discharge.

In the case of the creek outlet in particular (Catchment F), where there is no further downstream treatment, this unit could also be designed to provide secondary treatment of hydrocarbons and capture oil, fuel and grease in the event of a spillage. The exact specification of the device to be installed can be developed during the detailed design process via further consultation with the manufacturer about treatment capacities.

7.3.3 Nutrient Removal

Due to the high sediment content in runoff from a quarry site, a tertiary treatment system (e.g. bio-retention or filtration) would be likely to clog up very quickly and is not recommended. The Environmental Protection Licence for the site does not require specific targets to be met for nitrogen and phosphorous content in runoff.

If nutrient removal is required, it would be preferable to provide this via a bio-retention component located on the floor of the second stage of the detention basin.

8 Construction Erosion & Sediment Controls

8.1 Planning Requirements

The Secretary's Environmental Assessment Requirements for the Development Application state that the Soil and Water Report must include:

- a description of the construction erosion and sediment controls

8.2 Proposed Erosion and Sediment Controls

As a result of the proposed bulk earthworks to be undertaken on the site, an erosion and sediment control strategy is required in order to prevent sediment from polluting the natural environs of the Eastern Creek riparian corridor.

All erosion and sediment control plans will be prepared in accordance with the NSW Government's *Managing Urban Stormwater – Soils and Construction Blue Book Volume 1, 4th Edition, March 2007.*

A preliminary erosion and sediment control plan for the site is included under Appendix A. It is important to note that the measures identified on this plan are a conceptual approach to construction phase stormwater quality management. Erosion and sediment control is highly dependent on local site conditions and staging of the proposed earth disturbing activities. Therefore, further details of the erosion and sediment control systems and procedures will be provided at the detailed design stage when more information is available regarding in-situ soils and development staging.

8.2.1 Pre-Construction

The following erosion control measures will be implemented prior to commencement of construction to minimise disturbance and ensure the performance criteria for water quality are met:

- Designation and marking of transport routes across undisturbed portions of the site to ensure minimal vegetation disturbance. Transport routes will be provided with stabilised construction entry/exits (e.g. Blue Book SD6-14) at the designated access points;
- Installation of the sediment basin described in Section 7.2 will occur before bulk earthworks across the site begin so that sediment-laden runoff from the works can be captured and treated;
- Diversions will be constructed to divert clean stormwater away from exposed soils and development areas. The exact location and time of construction for each diversion measure will depend on construction staging.
- Existing vegetated buffer zones/bunds are to be fenced off;
- Filter rolls or geotextile inlet filters (e.g. Blue Book SD6-11&6-12) to be installed around all existing stormwater inlet gullies; and

- All site personnel to complete an environmental induction covering the erosion and sediment controls.

8.2.2 During Construction

Measures to mitigate water quality impacts during the construction phase will include:

- Sediment fences (e.g. Blue Book SD6-8) to be erected at the base of all batters to prevent sediment-laden stormwater from flowing into the Eastern Creek riparian zone;
- Regular dust suppression on exposed areas by water truck or use of chemical dust suppressant;
- Progressive stabilisation of filled and disturbed areas;
- Sediment fences to be erected around soil stockpiles;
- Regular inspections as soon as practicable after storm events to check and maintain controls;
- Sediment to be removed from fences when controls are 40% full and at the completion of construction. All material to be re-used or stored on-site in a controlled manner or taken off-site for re-use or disposal at a licensed waste disposal facility;
- Filter rolls or geotextile inlet filters (e.g. Blue Book SD6-11&6-12) to be installed around all new stormwater inlet gullies; and
- Monitoring of water quality to determine the effectiveness of the sediment and erosion control management practices (refer to Section 7).

9 Site Water Balance

9.1 Planning Requirements

The Secretary's Environmental Assessment Requirements for the Development Application state that the Soil and Water Report must include:

- A description of water balance including a description of the water demands and breakdown of water supplies, including any water licensing requirements; and
- Description of the measures to minimise water use.

9.2 Water Balance Overview

On a site of this size a large amount of surface runoff is expected throughout the year. Whilst storage has been provided to capture and detain some of this water (for OSD and treatment requirements described above), only a fraction of it will be used to meet the development's water demand and the vast majority of the water will ultimately leave the site via the Eastern Creek watercourse.

9.3 Runoff

9.3.1 Mean Annual Rainfall

Rainfall data was sourced from the BOM website for the nearby Prospect Reservoir station (BOM station 067019) and is as follows for the years 1887-2015:

Lowest Rainfall	394.6mm
Mean Rainfall	872.8mm
Highest Rainfall	1900.0mm

9.3.2 Catchment Areas

Site catchments (post-development) are summarised in the following table:

	Catchment Area	Volumetric Runoff Coefficient
Building Roofs	29,800m^2	0.95
Paved Areas	101,200m^2	0.85
Stockpiles/Quarry	106,000m^2	0.64

The volumetric runoff coefficient given in the table makes allowance for water loss through evaporation and infiltration from the respective surfaces.

9.3.3 Potential Runoff

Potential runoff generated is therefore summarised in the following table:

	Potential Runoff (ML/year)		
	Dry	Medium	Wet
Building Roofs	11.2	24.7	53.8
Paved Areas	33.9	75.1	163.4
Stockpiles/Quarry	26.8	59.2	128.9
Total	**71.9**	**159.0**	**346.1**

9.4 Water Demands

The various water uses in the proposed development are summarised below:

Demand Use	Source	Demand
Dust Suppression	OSD Basin (6700kL storage)	40kL/day (no application if rainfall >2mm)
Toilets - Offices	Raintank	5 staff x 6 flushes/day x 5L = 150L/day
Toilets - Kilns	Raintank	24 staff x 6 flushes/day x 5L = 720L/day
Industrial Process	Town Supply/Tank	120kL/day
Total		**48.2 ML/year**

By far the most significant water demand is in the forming process for the aggregate facility which will require 5,000L per hour, 24 hours per day. Security of constant, consistent supply is also vital for this process and therefore the primary water source will be the existing public water supply network. However, in the interests of minimising water use it is sensible that storage tanks be installed next to the existing brick factory to store roofwater from that building. This water would serve as a backup/auxiliary supply for use in the adjacent kiln process.

9.5 Water Saving Measures

Potential water saving measures that could be utilised on the site are:

- Re-use of stormwater runoff from the OSD basin for dust suppression across the site. Water would be pumped into water carts for wetting of haul roads, stockpiles and other exposed areas. This is similar to the existing scenario where water is extracted from the existing dam for the same purpose.

- Harvesting of roofwater from the existing factory buildings for use in the manufacturing process and toilet-flushing at the kiln office. This water would be stored in above-ground tanks to be installed alongside the existing buildings and pumped from there to the kiln plant. It is recommended that a minimum storage volume of 100,000L be provided in multiple 20-30kL tanks. Potentially this volume could be a lot higher to reduce reliance on the piped supply i.e. allowing the plant to operate for several days without mains top-up. The existing buildings would require new guttering to direct flows to the storage tanks.

- Harvesting of roofwater from the proposed office building for toilet-flushing and any other non-potable uses. Rainwater collected by the gutters on the building is to be stored in an above-ground tank (approx. size 20,000L) fitted with a pump for non-potable reuse within building. Overflows would be directed to the piped stormwater system.

9.6 Groundwater

Douglas Partners recently undertook a geotechnical investigation of the subject site, the results of which are included in Report No.84821.00 dated June 2015.

The investigation included installation of groundwater monitoring wells in three boreholes (BH7, 9 and 10) to allow for measurement of groundwater levels and permeability testing. Water levels were also recorded during drilling of the other deep auger boreholes.

Measured groundwater depths in the three monitoring wells ranged from 6.5-12.0m below the existing surface. Fluctuations measured over several days were less than 300mm in each well. The level of the groundwater surface at these locations ranges between RL59.3-60.6. As the lowest proposed surface levels of the new kiln pad in this area are RL61.0 (i.e. the deepest zone of excavation on site), groundwater is not expected to be encountered during construction or operation.

In two other boreholes (No.1 and 4) groundwater was encountered at 3.8 and 3.9m depth respectively during drilling. The geotechnical report states that this is probably caused by seepage from a perched water table located within the fill layer. In any case, the proposed surface levels in both of these locations require filling rather than any excavation. Therefore groundwater should not be encountered during construction or operation.

It should also be noted that due to the largely impervious coverage of the site to infiltration (mostly buildings, pavements and low-permeability clays) there is expected to be minimal interaction between surface water and groundwater on the site.

Appendix A

AT&L Civil Drawings

CONCRETE AGGREGATE FACILITY

780 WALLGROVE ROAD

HORSLEY PARK

CIVIL WORKS

DRAWING INDEX

LOCALITY PLAN

N.T.S

Issue	Description	Date
B	RE-ISSUED FOR SSD APPROVAL	2-06-15
A	ISSUED FOR SSD APPROVAL	27-05-15

Bar Scales

100mm on Original

Client: BRICKWORKS LIMITED

Scales	N.T.S	Drawn	LVD
		Designed	MM
Grid	MGA	Checked	
Height Datum	AHD	Approved	

Project: CONCRETE AGGREGATE FACILITY 780 WALLGROVE ROAD HORSLEY PARK

Title: COVER SHEET, LOCALITY PLAN AND DRAWING INDEX

Civil Engineers and Project Managers
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Status: FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION

A1

Drawing No.	Project No.	Issue
C00	15-261	B

F:\15-261 Brickworks Horsley Park\Drgs\Civil\Final\C00.dwg

STORMWATER DRAINAGE NOTES

1. STORMWATER DESIGN CRITERIA:
   (A) AVERAGE RECURRENCE INTERVAL:
   1:5 YEARS EXTERNAL PAVEMENTS & OTHER AREAS
   1:20 YEARS ROOFED AREAS
   1:100 YEARS OVERLAND FLOW PATHS
   (B) RAINFALL INTENSITIES:
   TIME OF CONCENTRATION: 5 MINUTES
   1:5 YEARS= 134 mm/hr
   1:20 YEARS= 171 mm/hr
   1:100 YEARS= 219 mm/hr
   (C) RUNOFF COEFFICIENTS:
   ROOF AREAS: C100 =1.0
   EXTERNAL PAVEMENTS: C100 =0.9
   EXPOSED SOILS: C100 =0.64
2. PIPES 300 DIA. AND LARGER TO BE REINFORCED CONCRETE CLASS '2' APPROVED SPIGOT AND SOCKET WITH RUBBER RING JOINTS. U.N.O.
3. PIPES UP TO 300 DIA SHALL BE SEWER GRADE uPVC WITH SOLVENT WELDED JOINTS.
4. EQUIVALENT STRENGTH VCP OR FRC PIPES MAY BE USED.
5. ALL STORMWATER DRAINAGE LINES UNDER PROPOSED BUILDING SLABS TO BE uPVC PRESSURE PIPE GRADE 6. ENSURE ALL VERTICALS AND DOWNPIPES ARE uPVC PRESSURE PIPE, GRADE 6 FOR A MIN OF 3.0m IN HEIGHT.
6. PIPES TO BE INSTALLED TO TYPE HS3 (ROAD) HS2 (LOTS) SUPPORT IN ACCORDANCE WITH AS 3725 (2007) IN ALL CASES BACKFILL TRENCH WITH SAND TO 300mm ABOVE PIPE. WHERE PIPE IS UNDER PAVEMENTS BACKFILL REMAINDER OF TRENCH TO UNDERSIDE OF PAVEMENT WITH SAND OR APPROVED GRANULAR MATERIAL COMPACTED IN 150mm LAYERS TO MINIMUM 98% STANDARD MAXIMUM DRY DENSITY IN ACCORDANCE WITH AS 1289 5.2.1. (OR A DENSITY INDEX OF NOT LESS THAN 75)
7. ~~2010~~ INTERNAL WORKS WITHIN PROPERTY BOUNDARIES ARE TO COMPLY WITH THE REQUIREMENTS OF AS 3500 3.1 (2006) AND AS/NZS 3500 3.2
8. PRECAST PITS MAY BE USED EXTERNAL TO THE BUILDING SUBJECT TO APPROVAL BY AT & L.
9. ENLARGERS, CONNECTIONS AND JUNCTIONS TO BE PREFABRICATED FITTINGS WHERE PIPES ARE LESS THAN 300 DIA.
10. WHERE SUBSOIL DRAINS PASS UNDER FLOOR SLABS AND VEHICULAR PAVEMENTS, UNSLOTTED uPVC SEWER GRADE PIPE IS TO BE USED.
11. CARE IS TO BE TAKEN WITH LEVELS OF STORMWATER LINES. GRADES SHOWN ARE NOT TO BE REDUCED WITHOUT APPROVAL.
12. GRATES AND COVERS SHALL CONFORM TO AS 3996.
13. ALL INTERNAL PIT DIMENSIONS TO CONFORM TO AS3500.3 TABLE 7.5.2.1
14. AT ALL TIMES DURING CONSTRUCTION OF STORMWATER PITS, ADEQUATE SAFETY PROCEDURES SHALL BE TAKEN TO ENSURE AGAINST THE POSSIBILITY OF PERSONNEL FALLING DOWN PITS.
15. ALL EXISTING STORMWATER DRAINAGE LINES AND PITS THAT ARE TO REMAIN ARE TO BE INSPECTED AND CLEANED. DURING THIS PROCESS ANY PART OF THE STORMWATER DRAINAGE SYSTEM THAT WARRANTS REPAIR SHALL BE REPORTED TO THE SUPERINTENDENT/ENGINEER FOR FURTHER DIRECTIONS.

SITEWORKS LEGEND

- EXISTING BOUNDARY
- 28.0 PROPOSED CONTOUR
- 4.0 EXISTING CONTOUR
- KERB AND GUTTER.
- KERB ONLY
- PROPOSED STORMWATER PIPE
- PROPOSED STORMWATER SURFACE INLET PIT
- PROPOSED STORMWATER KERB INLET PIT
- INLET CHUTE DUMPED ROCK D_{50}= 150mm MIN. OVER GEOTEXTILE LINER
- X X EXISTING SERVICE/STORMWATER TO BE REMOVED
- RIRPARIAN CREEK BANK
- 20m RIRPARIAN CORRIDOR SETBACK
- 40m RIRPARIAN CORRIDOR SETBACK

SITEWORKS NOTES

1. ORIGIN OF LEVELS:- REFER SURVEY NOTES.
2. CONTRACTOR MUST VERIFY ALL DIMENSIONS AND EXISTING LEVELS ON SITE PRIOR TO COMMENCEMENT OF WORK. ANY DISCREPANCIES TO BE REPORTED TO AT & L.
3. MAKE SMOOTH CONNECTION WITH EXISTING WORKS.
4. SHOULD THE CONTRACTOR WISH TO USE A RECYCLED PRODUCT THE CONTRACTOR IS TO SEEK ACCEPTANCE OF THE PRODUCT FROM AT&L. THE PRICE DIFFERENCE BETWEEN AN IGNEOUS PRODUCT AND A RECYCLED PRODUCT SHALL BE CLEARLY INDICATED.
5. WHERE NOTED ON THE DRAWINGS THAT WORKS ARE TO BE CARRIED BY OTHERS, (eg. ADJUSTMENT OF SERVICES), THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE CO-ORDINATION OF THESE WORKS.

SURVEY NOTES

THE EXISTING SITE CONDITIONS SHOWN ON THE FOLLOWING DRAWINGS HAVE BEEN INVESTIGATED BY CARDNO HARD & FORESTER PTY LTD, BEING REGISTERED SURVEYORS. THE INFORMATION IS SHOWN TO PROVIDE A BASIS FOR DESIGN. AT & L DOES NOT GUARANTEE THE ACCURACY OR COMPLETENESS OF THE SURVEY BASE OR ITS SUITABILITY AS A BASIS FOR CONSTRUCTION DRAWINGS.

SHOULD DISCREPANCIES BE ENCOUNTERED DURING CONSTRUCTION BETWEEN THE SURVEY DATA AND ACTUAL FIELD DATA, CONTACT AT & L.

THE FOLLOWING NOTES HAVE BEEN TAKEN DIRECTLY FROM THE ORIGINAL SURVEY DOCUMENTS.

IMPORTANT NOTE:
THIS PLAN IS PREPARED FROM A COMBINATION OF FIELD SURVEY AND EXISTING RECORDS FOR THE PURPOSE OF DESIGNING NEW CONSTRUCTIONS ON THE LAND AND SHOULD NOT BE USED FOR ANY OTHER PURPOSE. THE TITLE BOUNDARIES SHOWN HEREON WERE NOT MARKED BY THE AUTHOR AT THE TIME OF SURVEY AND HAVE BEEN DETERMINED BY PLAN DIMENSIONS ONLY AND NOT BY FIELD MEASUREMENT.

A SERVICES SEARCH OF THE AREA SURVEYED ABOVE HAS NOT BEEN UNDERTAKEN. VISIBLE SERVICES SHOWN HEREON HAVE BEEN LOCATED WHERE POSSIBLE BY FIELD SURVEY. PRIOR TO ANY DEMOLITION, EXCAVATION OR CONSTRUCTION ON THE SITE, THE RELEVANT AUTHORITY SHOULD BE CONTACTED FOR POSSIBLE LOCATION OF FURTHER UNDERGROUND SERVICES AND DETAILED LOCATIONS OF ALL SERVICES. THIS NOTE IS AN INTEGRAL PART OF THIS PLAN.

EMBANKMENT CONSTRUCTION

1. STRIP VEGETATION AND TOPSOIL FROM EMBANKMENT AREA AND STOCKPILE TOPSOIL FOR LATER USE. CUT BACK AREA TO FIRM GROUND.
2. CONSTRUCT EMBANKMENT IN PRESENCE OF QUALIFIED AND EXPERIENCED GEOTECHNICAL ENGINEER IF NOT ROCK.
3. CONSTRUCT BODY OF EMBANKMENT WITH CLAYEY MATERIAL WON FROM SITE. COMPACT THE CLAYEY MATERIAL APPROVED BY A QUALIFIED AND EXPERIENCED GEOTECHNICAL ENGINEER IN LAYERS NOT EXCEEDING 300-350mm (AS AGREED BY GITA / TGE) THICKNESS TO A DRY DENSITY EQUIVALENT TO 98% OF THAT DETERMINED BY STANDARD COMPACTION (AS 1289.5.1.1) AND AT A MOISTURE CONTENT OF -2% TO +2% OF OPTIMUM MOISTURE CONTENT. MOST IMPORTANTLY, IF SHRINKAGE CRACKS OCCUR, DIRECTION TO BE GIVEN BY THE TGE.
4. OVERFILL THE EMBANKMENT AND TRIM OFF, SO THAT THE ENTIRE BODY OF THE EMBANKMENT IS COMPACTED.
5. PLACE ROCK RIP-RAP AS SHOWN.
6. RECOVER TOPSOIL FROM STOCKPILE AND SPREAD OVER EMBANKMENT AND CUT BATTERS (A THIN COVER OF TOPSOIL ONLY HAS BEEN NOMINATED). ONLY LIGHTLY TRACK-ROLL THE TOPSOIL AND THEN LANDSCAPE IN ACCORDANCE WITH THE LANDSCAPE AREA DRAWINGS.
8. WATER AND FERTILIZE LANDSCAPE AS REQUIRED BY CLIMACTIC CONDITIONS TO ENSURE THE LANDSCAPE IS SUCCESSFUL.
9. AT THE COMPLETION OF WORK WRITTEN CONFIRMATION & CERTIFICATION IS TO BE PROVIDED FROM A QUALIFIED & EXPERIENCED GEOTECHNICAL ENGINEER THAT THE EMBANKMENTS HAVE BEEN CONSTRUCTED IN ACCORDANCE WITH THESE DRAWINGS.

BULK EARTHWORKS NOTES

1. ORIGIN OF LEVELS: REFER SURVEY NOTES
2. STRIP ALL TOPSOIL/ORGANIC MATERIAL FROM CONSTRUCTION AREA AND REMOVE FROM SITE OR STOCK PILE AS DIRECTED BY SUPERINTENDENT.
3. EXCAVATED MATERIAL TO BE USED AS STRUCTURAL FILL PROVIDED THE PLACEMENT MOISTURE CONTENT OF THE MATERIAL IS +/- 2% OF THE OPTIMUM MOISTURE CONTENT.
4. COMPACT FILL AREAS AND SUBGRADE TO NOT LESS THAN:

LOCATION	STANDARD DRY DENSITY (AS 1289 E 5.1.1.)
UNDER BUILDING SLABS ON GROUND	98%
UNDER ROADS AND CARPARKS	98%
LANDSCAPED AREAS UNLESS NOTED OTHERWISE	98%

5. FOR NON COHESIVE MATERIAL, COMPACT TO 75% DENSITY INDEX.
6. BEFORE PLACING FILL, PROOF ROLL EXPOSED SUBGRADE WITH AN 8 TONNE (MIN) DEADWEIGHT SMOOTH DRUM VIBRATORY ROLLER TO DETECT THEN REMOVE SOFT SPOTS (AREAS WITH MORE THAN 2mm MOVEMENT UNDER ROLLER).
7. FREQUENCY OF COMPACTION TESTING SHALL BE NOT LESS THAN :-
   (A) 1 TEST PER 200m^2 OF FILL PLACED PER 300 LAYER OF FILL.
   (B) 3 TESTS PER VISIT
   (C) 1 TEST PER 1000m^2 OF EXPOSED SUBGRADE
   TESTING SHALL BE "LEVEL 1" TESTING IN ACCORDANCE WITH AS 3798 (1996).
8. FILLING TO BE PLACED AND COMPACTED IN MAXIMUM 150mm LAYERS
9. NO FILLING SHALL TAKE PLACE TO EXPOSE SUBGRADE UNTIL THE AREA HAS BEEN PROOF ROLLED IN THE PRESENCE OF AT & L AND APPROVAL GIVEN IN WRITING THAT FILLING CAN PROCEED.

EROSION AND SEDIMENT CONTROL NOTES

GENERAL INSTRUCTIONS

1. THE SITE SUPERINTENDENT/ENGINEER WILL ENSURE THAT ALL SOIL AND WATER MANAGEMENT WORKS ARE LOCATED AS DOCUMENTED.
2. ALL WORK SHALL BE GENERALLY CARRIED OUT IN ACCORDANCE WITH
   a. LOCAL AUTHORITY REQUIREMENTS
   b. EPA REQUIREMENTS
   c. NSW DEPARTMENT OF HOUSING MANUAL "MANAGING URBAN STORMWATER, SOILS AND CONSTRUCTION", 4th EDITION, MARCH 2004.
3. MAINTAIN THE EROSION CONTROL DEVICES TO THE SATISFACTION OF THE SUPERINTENDENT AND THE LOCAL AUTHORITY.
4. WHEN STORMWATER PITS ARE CONSTRUCTED, PREVENT SITE RUNOFF ENTERING UNLESS SEDIMENT FENCES ARE ERECTED AROUND PITS.
5. CONTRACTOR IS TO ENSURE ALL EROSION & SEDIMENT CONTROL DEVICES ARE MAINTAINED IN GOOD WORKING ORDER AND OPERATE EFFECTIVELY. REPAIRS AND OR MAINTENANCE SHALL BE UNDERTAKEN AS REQUIRED, PARTICULARLY FOLLOWING STORM EVENTS.

RECOMMENDED IMPLEMENTATION SEQUENCE:

1. ALL EROSION AND SEDIMENT CONTROL MEASURES SHALL BE INSTALLED AND FUNCTIONAL PRIOR TO WORKS COMMENCING AND IN THE FOLLOWING SEQUENCE.
   a. CONSTRUCT TEMPORARY STABILISED SITE ACCESS, ENSURING ADJACENT STORMWATER RUN OFF IS DIVERTED AWAY FROM ACCESS
   b. INSTALL SEDIMENT FENCING AND/OR BARRIER FENCING TO CONFINE INGRESS TO AND EGRESS FROM THE SITE TO STABILISED ACCESS POINT(S) ONLY.
   c. PROVIDE INLET PROTECTION TO STORMWATER INLETS AND GULLIES ON ALL ROADS ADJOINING THE SITE.
   d. CONSTRUCT BARRIER FENCING AROUND RESTRICTED 'NO-GO' ZONES OF RETAINED VEGETATION, AREAS NOT TO BE DISTURBED AND AREAS WHICH WILL REMAIN UN-WORKED.
   e. CONSTRUCT UPSTREAM DIVERSION CHANNELS TO DIVERT CLEAN WATER AROUND WORKSITE, AND INSTALL APPROPRIATE CHANNEL STABILISATION.
   f. CONSTRUCT LOW FLOW EARTH BANKS AS CATCH DRAINS PARALLEL TO CONTOURS TO LIMIT LARGE SLOPE LENGTHS (SLOPES SHOULD BE LESS THEN 80M IN LENGTH).
   g. INSTALL ALL TEMPORARY SEDIMENT FENCES.
   h. CONSTRUCT ANY NOMINATED SEDIMENT BASINS AND SEDIMENT TRAPS.
   i. STABILISE ALL DISTURBED AREAS ASAP AND PROGRESSIVELY AS WORKS ARE COMPLETED. TEMPORARY STABILISATION TO BE DONE USING MULCHING, HYDROMULCHING, HYDROSEEDEDING OR DIRECT SEEDING TO GIVE A 70% COVERAGE OF GROUND SURFACE WITHIN 14 DAYS OF WORKS COMPLETING (EVEN IF WORKS MAY CONTINUE LATER).
2. UNDERTAKE SITE DEVELOPMENT WORKS SO THAT LAND DISTURBANCE IS CONFINED TO MINIMUM WORKABLE AREAS.
3. DISTURBED AREAS TO EXTEND NO MORE THAN 5 METRES (PREFERABLY 2 METRES) FROM ESSENTIAL WORKS AREAS.
4. WORK AREAS TO BE DELINEATED BY BARRIER FENCING AND DIVERSION CHANNEL UPSLOPE AND SEDIMENT FENCING DOWNSLOPE.
5. THE CONTRACTOR SHALL ENSURE THAT THE EXISTING VEGETATION AND GROUNDCOVER IS RETAINED AS MUCH AS POSSIBLE.
6. TOPSOIL SHALL BE STRIPPED AND STOCKPILED FOR LATER USE ONSITE.
7. SITE VEGETATION APPROVED FOR CLEARING SHOULD BE MULCHED AND STOCKPILED FOR LATER USE IN LANDSCAPING, STABILISATION AND/OR SITE REHABILITATION WORKS.
8. AT ALL TIMES THE CONTRACTOR SHALL MONITOR THE PREVAILING WEATHER CONDITIONS AND PROTECT ANY DOWNSTREAM CONSTRUCTION AND RECEIVING ENVIRONMENTS.
9. EROSION AND SEDIMENT CONTROL PROTECTION MEASURES SHALL BE MAINTAINED BY THE CONTRACTOR THROUGHOUT CONTRACT.
10. PLANS AND CONTROL MEASURES FOR LARGE SITES WILL NEED TO BE REVISED AND UPDATED TO REFLECT THE SITE STAGES AND PROGRESSION OF WORKS.
11. MEASURES INCLUDING SEDIMENT FENCES SHOULD BE MOVED AND REINSTATED AS WORKS PROGRESS.
12. FOOT AND VEHICULAR TRAFFIC TO BE RESTRICTED IN RECENTLY STABILISED AREAS INCLUDING THOSE HYDROSEEDED, TURFED OR SEEDED.

DUST CONTROL

1. DURING WINDY AND DRY WEATHER ANY UNPROTECTED AREAS SHALL BE KEPT MOIST (NOT WET) BY SPRINKLING WITH WATER TO KEEP DUST UNDER CONTROL. WHERE WATER IS NOT AVAILABLE IN SUFFICIENT QUANTITIES, SOIL BINDERS OR DUST RETARDANTS TO BE USED FOR DUST SUPPRESSION.
2. EXPOSED SURFACES INCLUDING BATTERS SHOULD BE LEFT ROUGH TO REDUCE WIND SPEEDS AND POTENTIAL FOR WIND EROSION.
3. USE OPEN WEAVE BARRIER FENCING ON WINDWARD SIDE OF SITE IF REQUIRED. FENCING IS GENERALLY REQUIRED WHERE AREA OF DISTURBANCE IS >5000m^2.

LAND DISTURBANCE

1. WHERE PRACTICAL, THE SOIL EROSION HAZARD ON THE SITE WILL BE KEPT AS LOW AS POSSIBLE. TO THIS END, WORKS SHOULD BE UNDERTAKEN IN THE FOLLOWING SEQUENCE:
   (A) INSTALL A WIND FENCE ALONG THE BOUNDARIES AS SHOWN ON PLAN. REFER DETAIL.
   (B) INSTALL A SEDIMENT FENCE ALONG THE BOUNDARIES AS SHOWN ON PLAN. REFER DETAIL.
   (C) CONSTRUCT STABILISED CONSTRUCTION ENTRANCE TO LOCATION AS DETERMINED BY SUPERINTENDENT/ENGINEER. REFER DETAIL.
   (D) INSTALL SEDIMENT BASIN AS SHOWN ON PLAN
   (E) INSTALL SEDIMENT TRAPS AS SHOWN ON PLAN.
   (F) UNDERTAKE SITE DEVELOPMENT WORKS IN ACCORDANCE WITH THE ENGINEERING PLANS. WHERE POSSIBLE, PHASE DEVELOPMENT SO THAT LAND DISTURBANCE IS CONFINED TO AREAS OF WORKABLE SIZE.

CONTROL MEASURES

1. FINAL SITE LANDSCAPING SHALL BE UNDERTAKEN AS SOON AS POSSIBLE AND WITHIN 10 WORKING DAYS OF CONSTRUCTION COMPLETION
2. SEDIMENT LADEN WATER SHALL BE PREVENTED FROM ENTERING THE PERMANENT DRAINAGE SYSTEM BY USING INLET PROTECTION.
3. ALL PERIMETER BANKS AND CHANNEL DRAINS SHALL HAVE UNINTERRUPTED POSITIVE GRADE TO AN OUTLET.
4. ALL TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES SHALL ONLY BE REMOVED ONCE SITE IS STABILISED AND UPSTREAM WORKS HAVE BEEN COMPLETED.
5. AT CONSTRUCTION COMPLETION ALL TEMPORARY EARTH STRUCTURES, INCLUDING SOIL STOCKPILES ARE TO BE TRACK ROLLED AND SEEDED. THE CONTRACTOR IS TO ENSURE A 70% COVERAGE WITHIN 14 DAYS.

OTHER MATTERS

1. ACCEPTABLE RECEPTORS AND DISPOSAL PRACTICES WILL BE USED FOR CONCRETE AND MORTAR SLURRIES, PAINTS, ACID WASHERS, LITTER AND GENERAL WASTE MATERIALS.
2. ANY EXISTING TREES WHICH ARE NOT REQUIRED OR APPROVED TO BE CLEARED FOR THE WORKS AND/OR FORM PART OF THE FINAL LANDSCAPING PLAN SHOULD BE PROTECTED FROM CONSTRUCTION ACTIVITIES BY:
   a. PROTECTING THEM WITH BARRIER FENCING OR MARKERS.
   b. ENSURING NOTHING IS NAILED TO THEM
   c. PROHIBITING PAVING, GRADING OR PLACING OF STOCKPILES WITHIN DRIP LINE.
3. ALL VEHICLE AND EQUIPMENT WASHING SHOULD BE CONTAINED IN SPECIFIC BUNDED AREAS, DISCONNECTED FROM CONCENTRATED FLOW PATHS AND THE STORMWATER SYSTEM.
4. ANY NECESSARY VEHICLE OR EQUIPMENT REFUELING SHOULD BE UNDERTAKEN AWAY FROM CONCENTRATED FLOW PATHS AND PREFERABLY WITHIN A BUNDED AREA.
5. ANY ONSITE FUEL STORAGE AREAS SHOULD BE COVERED AND BUNDED.

MAINTENANCE OF PUBLIC ROADS

1. ALL CONSTRUCTION VEHICLES DEPARTING FROM THE SITE SHALL HAVE THEIR TYRES WASHED DOWN OR SEDIMENT REMOVED BY A STABILISED SITE ACCESS DEVICE.
2. THE STABILISED SITE ACCESS AREAS SHALL BE LOCATED SUCH THAT SILTED WATER IS FILTERED THROUGH A SUITABLE SEDIMENT TRAP (SUCH AS A SEDIMENT FENCE) INSTALLED DOWNSTREAM OF ACCESS.
3. THE CONTRACTOR SHALL INSPECT THE PUBLIC ROADS ADJACENT TO THE SITE DAILY AND MANUALLY REMOVE ANY SEDIMENT DEPOSITS (BY SWEEPING NOT WASH DOWN).

SITE INSPECTION AND MAINTENANCE

1. ALL EROSION AND SEDIMENT CONTROL MEASURES SHALL BE INSPECTED REGULARLY, IMMEDIATELY BEFORE SITE CLOSURE, PRIOR TO PREDICTED LARGE STORM EVENTS AND AFTER EVERY SIGNIFICANT (> 5MM) RAINFALL EVENT OR AT LEAST ON A WEEKLY BASIS.
2. THE CONTRACTOR WILL AS A MINIMUM CONDUCT EACH INSPECTION IN LINE WITH THE FOLLOWING
   a. RECORD TYPE OF DEVICE/CONTROL MEASURE BEING INSPECTED AND ITS LOCATION;
   b. RECORD THE CONDITION OF EVERY CONTROL MEASURE;
   c. RECORD MAINTENANCE REQUIREMENTS FOR EVERY CONTROL DEVICE;
   d. RECORD SEDIMENT VOLUMES REMOVED FROM SEDIMENT TRAPPING DEVICES;
   e. RECORD DETAILS OF SEDIMENT BASIN TREATMENT, FLOCCULANT DOSAGE AND CLEANOUT;
   f. RECORD SEDIMENT DISPOSAL PROCEDURES AND LOCATION.
3. REPAIRS AND MAINTENANCE OF ALL DEVICES AND MEASURES INCLUDING DIVERSION CHANNELS SHALL BE UNDERTAKEN AS REQUIRED, ENSURING ALL MEASURES ARE FULLY FUNCTIONAL AT ALL TIMES.
4. ENSURE SEDIMENT LADEN WATER HAS NOT BEEN DIVERTED AROUND DEVICES.
5. REPAIR SCOUR DAMAGE TO SEDIMENT CONTROL MEASURES AFTER RAINFALL EVENTS AND REINSTATE DEVICES AS NECESSARY.
6. SEDIMENT FENCES WILL REQUIRE CLEANING WHEN SEDIMENT REACHES 300MM DEPTH OR ONE-HALF THE HEIGHT OF THE FILTER FABRIC AND ALL OTHER SEDIMENT TRAPS WILL REQUIRE CLEANING OUT WHEN 30% OF DESIGN CAPACITY IS REACHED.
7. ALL INLET AND GULLY TRAPS TO BE CLEANED NOT HOSED AFTER EVERY RAINFALL EVENT, (1>5mm) OR AT LEAST ON A WEEKLY BASIS.
8. SEDIMENT REMOVED FROM ANY TRAPPING DEVICE TO BE RELOCATED, ENSURING FURTHER POLLUTION TO DOWNSTREAM ENVIRONMENTS WILL NOT OCCUR.
9. ALL SEEDING, HYDROSEEDING AND TURFING REQUIRES REGULAR WATERING, UNTIL EFFECTIVE COVER ESTABLISHED AND PLANTS ARE GROWING VIGOROUSLY. WATERING SHOULD VARY DEPENDING ON WEATHER AND SOIL CONDITIONS.
10. WATERING SHOULD START IMMEDIATELY AFTER PLANTING AND SHOULD COMPLY WITH THE FOLLOWING AS A MINIMUM:
    WEEK 1 3 WATERINGS/WEEK
    WEEK 2-6 2 WATERINGS/WEEK
    WEEK 7-12 1 WATERING/WEEK
11. EXCESSIVE VEGETATION GROWTH WILL BE CONTROLLED THROUGH MOWING OR SLASHING.
12. IT IS THE CONTRACTORS RESPONSIBILITY TO ENSURE INSPECTION, MAINTENANCE AND TESTING OF DEVICES IS UNDERTAKEN ON SITE.
13. THE CONTRACTOR TO KEEP DETAILED AND LEGIBLE RECORDS OF ALL INSPECTION AND MAINTENANCE UNDERTAKEN ON THE EROSION AND SEDIMENT CONTROL DEVICES.
14. ALL SITE WASTE INCLUDING GENERAL RUBBISH TO BE DISPOSED OF IN AN ENVIRONMENTALLY RESPONSIBLE MANNER IN ACCORDANCE WITH THE ENVIRONMENTAL PROTECTION (WASTE MANAGEMENT) POLICY 2000 AND ENVIRONMENTAL PROTECTION (WASTE MANAGEMENT) REGULATION 2000.
15. THE CONTRACTOR SHALL CONSTRUCT AND IMPLEMENT ADDITIONAL MEASURES AS NECESSARY TO ENSURE PROTECTION OF DOWNSTREAM ENVIRONMENTS.

SEDIMENT BASIN MAINTENANCE

1. ALL SEDIMENT BASIN TO BE DESIGNED, CONSTRUCTED AND MAINTAINED IN ACCORDANCE WITH NSW DEPARTMENT OF HOUSING MANUAL "MANAGING URBAN STORMWATER, SOILS AND CONSTRUCTION", 4th EDITION, MARCH 2004.
2. THE CONTRACTOR SHALL KEEP DETAILED AND ACCURATE RECORDS OF THE MONITORING, TREATMENT, TESTING AND MAINTENANCE OF THE SEDIMENT BASIN INCLUDING RECORDED RAINFALL VOLUME, FLOCCULATING AGENTS USED AND TEST RESULTS PRIOR TO DEWATERING.
3. THE STORMWATER RUNOFF COLLECTED IN THE SEDIMENT BASIN SHALL BE MONITORED, TREATED AND TESTED PRIOR TO DISCHARGE, INCLUDING WATER TO BE REUSED ON SITE.
4. WATER TESTING TO BE UNDERTAKEN BY A SUITABLY QUALIFIED PERSON.
5. ALL LABORATORY TESTING TO BE UNDERTAKEN BY A NATA ACCREDITED LABORATORY.
6. ALL WATER PUMPED FROM THE SEDIMENT BASIN SHALL BE TESTED FOR ENVIRONMENTAL COMPLIANCE AGAINST THE RELEASE CRITERIA IN THE TABLE BELOW (AS A MINIMUM), UNLESS ALTERNATIVE (MORE STRINGENT) STANDARDS ARE SPECIFIED BY THE LOCAL AUTHORITY PRIOR TO RELEASE.

PARAMETER	RELEASE CRITERIA
SUSPENDED SOLIDS	50mg/l MAX
pH	WITHIN RANGE 6.5-8.5
VISUAL AMENITY	NO VISUAL PLUME

7. WATER TESTING TO BE UNDERTAKEN USING EITHER A HANDHELD PH/TURBIDITY METER OR SAMPLES COLLECTED FOR LABORATORY TESTING PRIOR TO BASIN DEWATERING.
8. THE SEDIMENT BASIN SHALL BE TREATED BY FLOCCULATION AFTER ALL RAINFALL EVENTS (> 5MM) USING GYPSUM OR ALUM. MANUAL DOSAGE OF BASIN SHALL BE UNDERTAKEN USING A MINIMUM RATE OF 32kg/100m3 FOR GYPSUM AND 1.5-8kg/100m3 FOR ALUM. HIGHER DOSAGE MAY BE REQUIRED DEPENDING ON SOIL TYPE AND APPLICATION TECHNIQUE.
9. THE CHOSEN FLOCCULENT SHALL BE SPREAD EVENLY OVER THE BASIN SURFACE AREA. THE BASIN WILL REQUIRE A PUMP SYSTEM TO SPRAY SLURRY OF FLOCCULANTS OVER SURFACE AT AN ANGLE OF 10 - 20 DEGREES.
10. THE TREATED BASIN SHALL BE DEWATERED WITH A PUMP SYSTEM WITH A FLOATING INLET TO ENSURE SETTLED SEDIMENT IS NOT ENTRAINED AND DISCHARGED.
11. BASIN DEWATERING SHALL OCCUR WITHIN 5 DAYS FROM CONCLUSION OF RAINFALL EVENT.
12. SEDIMENT BASINS WILL REQUIRE DEWATERING AND SEDIMENT CLEANOUT ONCE STORAGE CAPACITY REACHES 70%.
13. CAPTURED SEDIMENT WILL BE DISPOSED OF IN AN ENVIRONMENTALLY RESPONSIBLE MANNER AS TO NOT CAUSE FURTHER CONTAMINATION OR DOWNSTREAM POLLUTION SEDIMENT SHOULD NOT BE DISPOSED OF IN CONCENTRATED FLOWS, WHERE IT CAN BE RE-ENTRAINED OR WHERE THE RECEIVING WATER HAS A PH OF < 5.5.
14. THE BASIN AND ALL OTHER CONTROL DEVICES WILL BE MAINTAINED IN AN OPERATIONAL STATE UNTIL SITE STABILISED.
15. REPAIR ANY SCOUR DAMAGE TO THE SEDIMENT BASIN BATTERS AND EMERGENCY SPILLWAY FOLLOWING RAINFALL EVENTS.
16. SEDIMENT BASIN SHOULD NOT BE CONSTRUCTED WITH SMOOTH INTERNAL SLOPES AND BASIN BATTERS SHOULD NOT BE STEEPER THEN 3(H):1(V).
17. BASINS SHOULD BE APPROPRIATELY FENCED AND MARKED BY WARNING SIGNS IF UNSUPERVISED PUBLIC ACCESS IS LIKELY AND PUBLIC SAFETY IS AT RISK.
18. ALL INLET CHUTE TO BE FORMED FROM DUMPED ROCK PLACED OVER GEOTEXTILE LINER. ROCK USED TO BE CRUSHED, CLEAN, HARD DURABLE AND MINIMUM AVERAGE SIZE (d_{50})=150mm

KERBING NOTES

1. ALL CONCRETE TO HAVE A MINIMUM COMPRESSIVE STRENGTH OF 25 MPa U.N.O IN REINFORCED CONCRETE NOTES.
2. ALL KERBS, GUTTERS, DISH DRAINS AND CROSSINGS TO BE CONSTRUCTED ON 100mm GRANULAR BASECOURSE COMPACTED TO MINIMUM 95% MODIFIED DRY DENSITY (AS 1289 5.2.1).
3. EXPANSION JOINTS (E.J) TO BE FORMED FROM 10mm COMPRESSIBLE CORK FILLER BOARD FOR THE FULL DEPTH OF THE SECTION AND CUT TO PROFILE. EXPANSION JOINTS TO BE LOCATED AT DRAINAGE PITS, ON TANGENT POINTS OF CURVES AND ELSEWHERE AT MAX 12m CENTRES EXCEPT FOR INTEGRAL KERBS WHERE THE EXPANSION JOINTS ARE TO MATCH THE JOINT LOCATIONS IN THE SLABS.
4. WEAKENED PLANE JOINTS TO BE MIN 3mm WIDE AND LOCATED AT 3m CENTRES EXCEPT FOR INTEGRAL KERBS WHERE THE WEAKENED PLANE JOINTS ARE TO MATCH THE JOINT LOCATIONS IN THE SLABS.
5. BROOMED FINISH TO ALL RAMPED AND VEHICULAR CROSSINGS. ALL OTHER KERBING OR DISH DRAINS TO BE STEEL FLOAT FINISHED.
6. IN THE REPLACEMENT OF KERB AND GUTTER :-
   EXISTING ROAD PAVEMENT IS TO BE SAWCUT 900mm U.N.O FROM THE LIP OF GUTTER. UPON COMPLETION OF THE NEW KERB AND GUTTER NEW BASECOURSE AND SURFACE TO BE LAID 600mm WIDE U.N.O.

   EXISTING ALLOTMENT DRAINAGE PIPES ARE TO BE BUILT INTO THE NEW KERB AND GUTTER WITH 100mm DIA HOLE.

   EXISTING KERB AND GUTTER IS TO BE COMPLETELY REMOVED WHERE NEW KERB AND GUTTER IS SHOWN.

Issue	Description	Date
B	RE-ISSUED FOR SSD APPROVAL	2-06-15
A	ISSUED FOR SSD APPROVAL	27-05-15

Bar Scales

100mm on Original

Client: BRICKWORKS LIMITED

Scales

Grid MGA

Height Datum AHD

Drawn	LVD
Designed	MM
Checked	
Approved	

Project: CONCRETE AGGREGATE FACILITY
780 WALLGROVE ROAD
HORSLEY PARK

Title: GENERAL NOTES AND LEGEND

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A1

Drawing No.	Project No.	Issue
C01	15-261	B

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Issue	Description	Date
B	RE-ISSUED FOR SSD APPROVAL	2-06-15
A	ISSUED FOR SSD APPROVAL	27-05-15

100mm on Original

Bar Scales

0 30 60 90 120 150m

1 : 1500 @ A1 1 : 3000 @ A3

Client

BRICKWORKS LIMITED

Scales	1 :1500	Drawn	LVD
		Designed	MM
Grid	MGA	Checked	
Height Datum	AHD	Approved	

Project

CONCRETE AGGREGATE FACILITY
780 WALLGROVE ROAD
HORSLEY PARK

Title

OVERALL EXISTING SITEPLAN

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Drawing No.	Project No.	Issue
C02	15-261	B

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LEGEND

20m RIPARIAN SETBACK

40m RIPARIAN SETBACK

TOP OF CREEK BANK

C05

C06

C07

C08

C09

EXISTING INTERNAL ROAD

SCA WARRAGAMBA - PROSPECT WATER PIPELINE

PROPOSED VEGETATION REHABILITATION AREA /RIPARIAN OFFSET AREA=4685m²

LANDSCAPING/FUTURE EXPANSION AREA

PROPOSED ACCESS

PROPOSED TRUCK PARKING/QUEUE

PROPOSED OFFICE

EXISTING BRICK STORAGE YARD

1 C11

PROPOSED CARPARK

PROPOSED TRUCK WEIGHBRIDGE

PROPOSED ENCROACHMENT INTO 40m RIPARIAN CORRIDOR BY BASIN BATTERS AREA = 550m²

PROPOSED CRUSHING AND SCREENING PLANT

4 C13

EXISTING VEGETATED BUND

EXISTING BRICK FACTORY

2 C11

PROPOSED OSD/SEDIMENT BASIN No.2

PROPOSED VEGETATION REHABILITATION AREA/ RIPARIAN OFFSET AREA = 4000m²

CREEK

PROPOSED OSD/SEDIMENT BASIN No.1

PROPOSED MAIN STOCKPILE AREA

EXISTING MILL BUILDING

EXISTING HAUL ROAD

FERRERS ROAD

OPEN SWALE ROAD

PROPOSED LOADING AREA

3 C12

PROPOSED EXTRUDER BUILDING

6 C13

EXISTING CRUSHER

EASTERN DRAIN No.1

5 C13

EXISTING HAUL ROAD

OPEN SWALE DRAIN

PROPOSED HAUL ROAD RE-ALIGNMENT No.2

PROPOSED KILN PAD

Issue	Description	Date
C	RIPARIAN RE-VEGETATION AREAS AMENDED. AERIAL OVERLAY ADDED.	08-09-15
B	RE-ISSUED FOR SSD APPROVAL	2-06-15
A	ISSUED FOR SSD APPROVAL	27-05-15

100mm on Original

Bar Scales

0 30 60 90 120 150m

1 : 1500 @ A1 1 : 3000 @ A3

Client: BRICKWORKS LIMITED

Scales	1 :1500	Drawn	LVD
		Designed	MM
Grid	MGA	Checked	
Height Datum	AHD	Approved	

Project: CONCRETE AGGREGATE FACILITY 780 WALLGROVE ROAD HORSLEY PARK

Title: GENERAL ARRANGEMENT PLAN

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Drawing No.	Project No.	Issue
C03	15-261	C

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SCA WARRAGAMBA – PROSPECT WATER PIPELINE

EXISTING INTERNAL ROAD

CREEK

EASTERN

EXISTING STOCKPILE No.2
CUT VOLUME=27,000m³

EXISTING BRICK STORAGE YARD

EXISTING BRICK FACTORY

EXISTING STOCKPILE No.1
CUT VOLUME=4,500m³

EXISTING MILL BUILDING

FERRERS ROAD

EXISTING STOCKPILE No.3

EXISTING STOCKPILE No.4
CUT VOLUME=111,00m³

EXISTING STOCKPILE No.5

EARTHWORKS VOLUMES

NET CUT (m³)	NET FILL (m³)	BALANCE (m³)
124426	48445	75981

NOTES

1. EARTHWORKS VOLUMES DENOTED ARE APPROXIMATE ONLY AND HAVE BEEN CALCULATED BETWEEN THE FINISHED SURFACE LEVEL AND THE EXISTING SURFACE LEVEL. THE VOLUMES DO NOT TAKE INTO ACCOUNT THE FOLLOWING :-
   - PROPOSED PAVEMENT DESIGN THICKNESSES
   - STRIPPING AND STOCKPILING OF EXISTING TOP SOIL
   - BULKING OR SHRINKAGE FACTORS OF REMOVED CUT
   - REMOVAL OF EXISTING BUILDING SLABS AND PAVEMENTS
   - REMOVAL AND\OR REMEDIATION OF ANY EXISTING UNCONTROLLED FILL
   - PROPOSED LANDSCAPING
   - STORMWATER AND UTILITIES TRENCHING

LEGEND

EXTENT OF EXISTING STOCKPILE

CUT\FILL DEPTH RANGE LEGEND

-99999	m	to	-3.5	m
-3.5	m	to	-3.0	m
-3.0	m	to	-2.5	m
-2.5	m	to	-2.0	m
-2.0	m	to	-1.5	m
-1.5	m	to	-1.0	m
-1.0	m	to	-0.5	m
-0.5	m	to	0.00	m
0.000	m	to	0.5	m
0.5	m	to	1.0	m
1.0	m	to	1.5	m
1.5	m	to	2.0	m
2.0	m	to	2.5	m
2.5	m	to	3.0	m
3.0	m	to	3.5	m
3.5	to		9999	m

Issue	Description	Date
B	RE-ISSUED FOR SSD APPROVAL	2-06-15
A	ISSUED FOR SSD APPROVAL	27-05-15

Bar Scales

0 30 60 90 120 150m

1 : 1500 @ A1 1 : 3000 @ A3

Client: BRICKWORKS LIMITED

Scales 1 :1500

Grid MGA

Height Datum AHD

Drawn LVD

Designed MM

Checked

Approved

Project: CONCRETE AGGREGATE FACILITY
780 WALLGROVE ROAD
HORSLEY PARK

Title: BULK EARTHWORKS CUT/FILL PLAN

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Status: FOR APPROVAL
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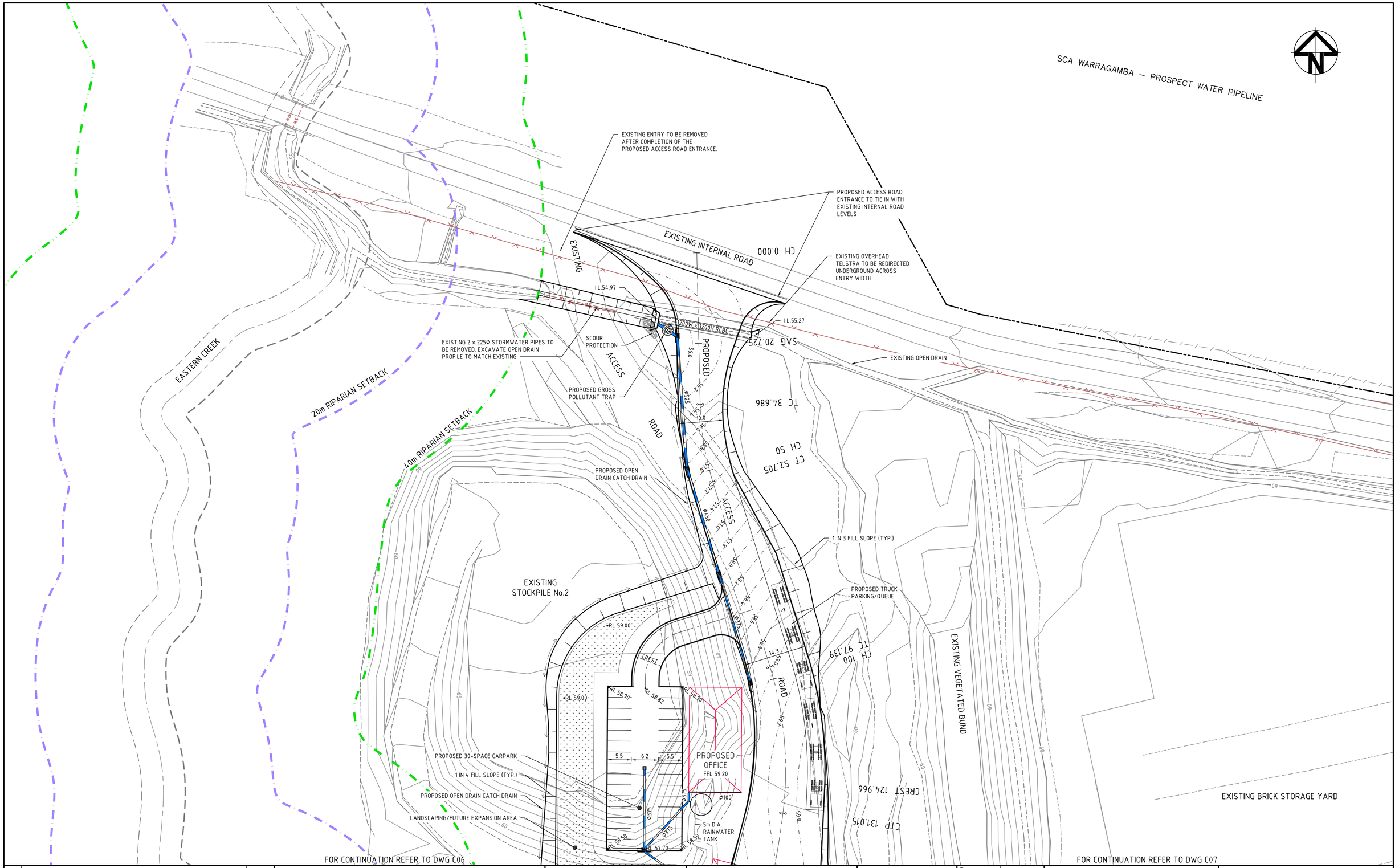
A1

Drawing No.	Project No.	Issue
C04	15-261	B

100mm on Original

F:\15-261 Brickworks Horsley Park\Drgs\Civil\Final\C04.dwg



Issue	Description	Date
B	RE-ISSUED FOR SSD APPROVAL	2-06-15
A	ISSUED FOR SSD APPROVAL	27-05-15

Bar Scales

0 10 20 30 40

1 : 400 @ A1 1 : 800 @ A3

Client

BRICKWORKS LIMITED

Scales	1 :400	Drawn	LVD
		Designed	MM
Grid	MGA	Checked	
Height Datum	AHD	Approved	

Project

CONCRETE AGGREGATE FACILITY
780 WALLGROVE ROAD
HORSLEY PARK

Title

SITEWORKS AND STORMWATER DRAINAGE PLAN SHEET 1

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Drawing No.	Project No.	Issue
C05	15-261	B

100mm on Original

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FOR CONTINUATION REFER TO DWG C05

PROPOSED 30-SPACE CARPARK
1 IN 4 FILL SLOPE (TYP.)
PROPOSED OPEN DRAIN CATCH DRAIN
LANDSCAPING/FUTURE EXPANSION AREA
PROPOSED OFFICE FFL 59.20
5m DIA. RAINWATER TANK
RL 58.50
RL 57.70
RL 59.00
BERM RL 58.50
PROPOSED TRUCK WEIGHBRIDGE
PROPOSED OSD/SEDIMENT BASIN No.2
BASIN No.2 OUTLET SPILLWAY
BASIN No.2 OUTLET WEIR
PROPOSED OSD/SEDIMENT BASIN No.1
BASE RL 54.50
PROPOSED GROSS POLLUTANT TRAP
PROPOSED GRADED STOCKPILE /LOADING AREA
ACCESS
SCOUR PROTECTION
OPEN SWALE DRAIN
ROAD No.1
1 IN 4 FILL SLOPE (TYP.)
EASTERN CREEK
20m RIPARIAN SETBACK
40m RIPARIAN SETBACK
CREST 124.966
CTP 131.015
CT 156.858
CH 150
CH 200
SAG 214.505
CT 212.258
CTP 238.934
CH 250
CTP 253.293
CH 300
1% FALL

FOR CONTINUATION REFER TO DWG C08

FOR CONTINUATION REFER TO DWG C07

Issue	Description	Date
B	RE-ISSUED FOR SSD APPROVAL	2-06-15
A	ISSUED FOR SSD APPROVAL	27-05-15

100mm on Original

Bar Scales

0 10 20 30 40

1 : 400 @ A1 1 : 800 @ A3

Client: BRICKWORKS LIMITED

Scales	1 :400	Drawn	LVD
		Designed	MM
Grid	MGA	Checked	
Height Datum	AHD	Approved	

Project: CONCRETE AGGREGATE FACILITY 780 WALLGROVE ROAD HORSLEY PARK

Title: SITEWORKS AND STORMWATER DRAINAGE PLAN SHEET 2

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Drawing No.	Project No.	Issue
C06	15-261	B

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FOR CONTINUATION REFER TO DWG C05

FOR CONTINUATION REFER TO DWG C06

EXISTING BRICK STORAGE YARD

EXISTING BRICK FACTORY

EXISTING MILL BUILDING

PROPOSED CRUSHING AND SCREENING PLANT
FFL 60.7

30m

43m

10m

ø315

ø450

EXISTING PIPE OUTLET SECTION TO BE REMOVED

CONSTRUCT NEW ACCESS CHAMBER OVER EXISTING PIPE

1% FALL

1% FALL

80m

EXISTING VEGETATED BUND

1 IN 3 FILL SLOPE (TYP.)

APPROXIMATE LOCATION OF EXISTING 1200ø STORMWATER OUTLET PIPE.
LOCATION TO BE CONFIRMED AND PIPE TO BE PROTECTED DURING CONSTRUCTION

MAIN STOCKPILE AREA, WITH UNDERGROUND RECLAIM FACILITY

RAINWATER TANK

RAILS

FOR CONTINUATION REFER TO DWG C08

FOR CONTINUATION REFER TO DWG C09

Issue	Description	Date
B	RE-ISSUED FOR SSD APPROVAL	2-06-15
A	ISSUED FOR SSD APPROVAL	27-05-15

Bar Scales

0 10 20 30 40

1 : 400 @ A1 1 : 800 @ A3

100mm on Original

Client

BRICKWORKS LIMITED

Scales	1 :400	Drawn	LVD
		Designed	MM
Grid	MGA	Checked	
Height Datum	AHD	Approved	

Project

CONCRETE AGGREGATE FACILITY
780 WALLGROVE ROAD
HORSLEY PARK

Title

SITEWORKS AND STORMWATER DRAINAGE PLAN SHEET 3

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NOT TO BE USED FOR CONSTRUCTION

A1

Drawing No.	Project No.	Issue
C07	15-261	B

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FOR CONTINUATION REFER TO DWG C06

FOR CONTINUATION REFER TO DWG C07

EXISTING
STOCKPILE No.3

EXISTING
STOCKPILE No.4

EXISTING
STOCKPILE No.5

MAIN STOCKPILE AREA,
WITH UNDERGROUND
RECLAIM FACILITY

PROPOSED ELEVATED
BIN STORAGE

1 IN 4 FILL SLOPE (TYP.)

PROPOSED HAUL ROAD
RE-ALIGNMENT TO TIE IN
WITH EXISTING HAUL ROAD

PROPOSED CULVERT
UNDER HAUL ROAD

PROPOSED

OPEN DRAIN

SWALE

ACCESS ROAD

HAUL ROAD

RE-ALIGNMENT

No.1 DRAIN

No.2 DRAIN

CT 351.354

CT 381.336

CH 400

CH 429.704

CT 388.136

CH 471.721

CTP 352.768

TC 324.356

R 400.0

R 20.0

1V:4H FALL

1800W x 1000H x 450L

100m

FOR CONTINUATION REFER TO DWG C09

Issue	Description	Date
B	RE-ISSUED FOR SSD APPROVAL	2-06-15
A	ISSUED FOR SSD APPROVAL	27-05-15

Bar Scales

0 10 20 30 40

1 : 400 @ A1 1 : 800 @ A3

Client: BRICKWORKS LIMITED

Scales	1 :400	Drawn	LVD
		Designed	MM
Grid	MGA	Checked	
Height Datum	AHD	Approved	

Project
CONCRETE
AGGREGATE FACILITY
780 WALLGROVE ROAD
HORSLEY PARK

Title
SITEWORKS
AND STORMWATER
DRAINAGE
PLAN SHEET 4

Civil Engineers and Project Managers
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Suite 702, 154 Pacific Hwy
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Status: FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION

A1

Drawing No.	Project No.	Issue
C08	15-261	B

100mm on Original

F:\15-261 Brickworks Horsley Park\Drgs\Civil\Final\C08.dwg

FOR CONTINUATION REFER TO DWG C07

FOR CONTINUATION REFER TO DWG C08

RAINWATER TANK

SMOOTHLY TIE INTO SURROUNDING SURFACE LEVEL

EXISTING FIELD INLET PITS AND STORMWATER PIPE TO BE PROTECTED DURING CONSTRUCTION (TYP)

1% FALL

EXTRUDER BUILDING

PROPOSED CULVERT UNDER HAUL ROAD

Ø750

KILNS PAD

MINIMUM 7.0m-WIDE ACCESS CLEARANCE AROUND PROPOSED KILNS

EXISTING CRUSHER

EXISTING HAUL ROAD

PROPOSED HAUL ROAD RE-ALIGNMENT TO TIE IN WITH EXISTING HAUL ROAD

1 IN 2 CUT SLOPE TYPICAL.

FERRERS ROAD

CH 0.000

CTP 14.995

CREST 31.235

RE-ALIGNMENT

ROAD

HAUL ROAD No.2

DRAIN

SWALE

PROPOSED OPEN

CT 266.941

CTP 248.416

TC 230.000

CT 71.073

EXISTING HAUL ROAD TO BE RELOCATED AROUND SOUTHERN EDGE OF PROPOSED KILNS PAD BATTER

Issue	Description	Date
B	RE-ISSUED FOR SSD APPROVAL	2-06-15
A	ISSUED FOR SSD APPROVAL	27-05-15

100mm on Original

Bar Scales

0 10 20 30 40

1 : 400 @ A1 1 : 800 @ A3

Client: BRICKWORKS LIMITED

Scales	1 :400
Grid	MGA
Height Datum	AHD

Drawn	LVD
Designed	MM
Checked	
Approved	

Project: CONCRETE AGGREGATE FACILITY 780 WALLGROVE ROAD HORSLEY PARK

Title: SITEWORKS AND STORMWATER DRAINAGE PLAN SHEET 5

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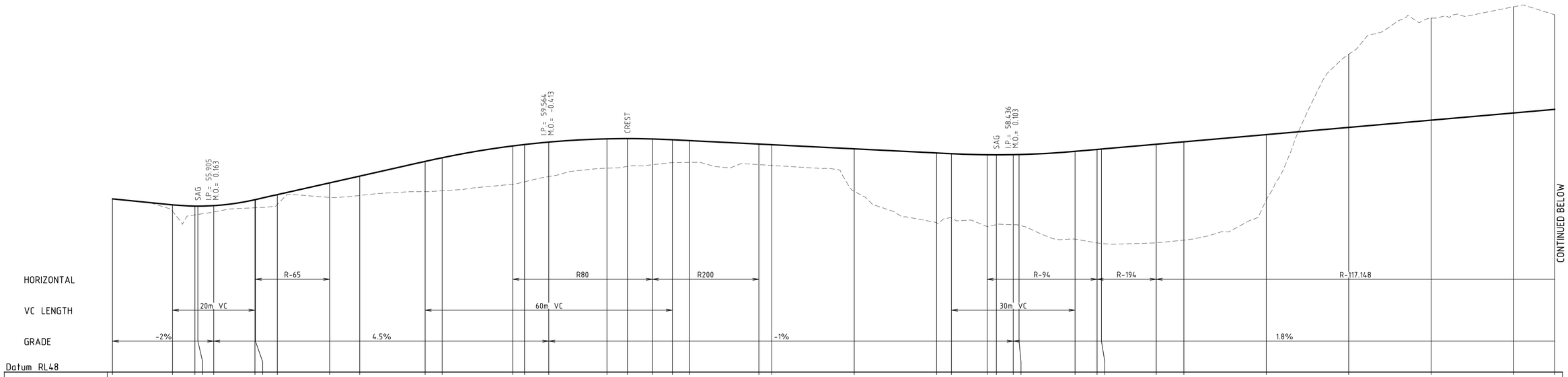
Status: FOR APPROVAL NOT TO BE USED FOR CONSTRUCTION

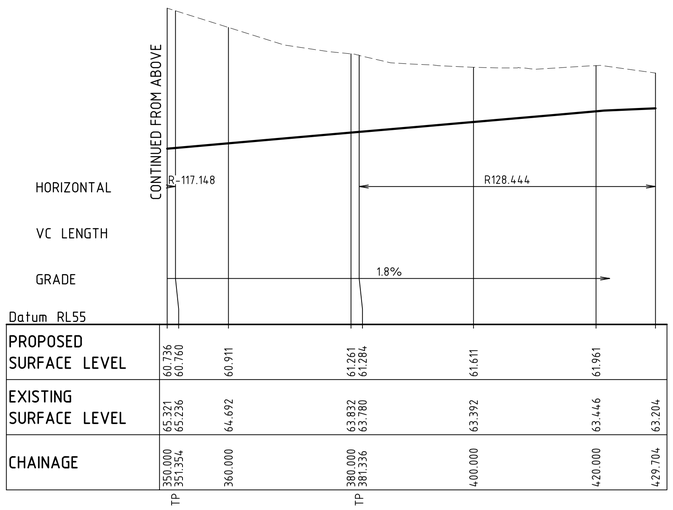
A1

Drawing No.	Project No.	Issue
C09	15-261	B

F:\15-261 Brickworks Horsley Park\Drgs\Civil\Final\C09.dwg



	TP 0.000	14.571	20.000	20.725	24.571	TP 34.571	34.686	40.000	TP 52.705	60.000	TP 75.875	80.000	TP 97.139	100.000	105.875	120.000	124.966	TP 131.015	135.875	140.000	TP 156.858	160.000	180.000	200.000	203.596	TP 212.258	214.505	218.596	220.000	233.596	TP 238.934	240.000	TP 253.293	260.000	280.000	300.000	320.000	340.000	350.000
PROPOSED SURFACE LEVEL	56.396	56.105	56.044	56.043	56.067	56.355	56.360	56.599	57.171	57.499	58.214	58.391	58.963	59.032	59.151	59.307	59.318	59.301	59.264	59.222	59.054	59.022	58.822	58.622	58.586	58.534	58.532	58.540	58.546	58.699	58.792	58.811	59.044	59.161	59.511	59.861	60.211	60.561	60.736
EXISTING SURFACE LEVEL	56.396	55.799	55.619	55.641	55.764	55.965	55.986	56.128	56.468	56.561	56.746	56.789	57.104	57.224	57.477	57.883	57.968	58.051	58.156	58.164	58.056	58.017	56.762	55.233	55.476	55.054	55.150	55.145	55.122	54.441	54.263	54.235	54.266	54.395	56.340	63.411	65.163	65.708	65.321



	TP 350.000	351.354	360.000	TP 380.000	381.336	400.000	420.000	429.704
PROPOSED SURFACE LEVEL	60.736	60.760	60.911	61.261	61.284	61.611	61.961	
EXISTING SURFACE LEVEL	65.321	65.236	64.692	63.932	63.780	63.392	63.446	63.204

PROPOSED ACCESS ROAD LONGITUDINAL SECTION

SCALE 1:500 HORI.
1:100 VERT.

Issue	Description	Date
B	RE-ISSUED FOR SSD APPROVAL	2-06-15
A	ISSUED FOR SSD APPROVAL	27-05-15

Bar Scales

0 2 4 6 8 10m
1 : 100 @ A1 1 : 200 @ A3

0 10 20 30 40 50m
1 : 500 @ A1 1 : 1000 @ A3

Client: BRICKWORKS LIMITED

Scales	1 :100 1 :500	Drawn	LVD
		Designed	MM
Grid	MGA	Checked	
Height Datum	AHD	Approved	

Project: CONCRETE AGGREGATE FACILITY
780 WALLGROVE ROAD
HORSLEY PARK

Title: ACCESS ROAD LONGITUDINAL SECTION

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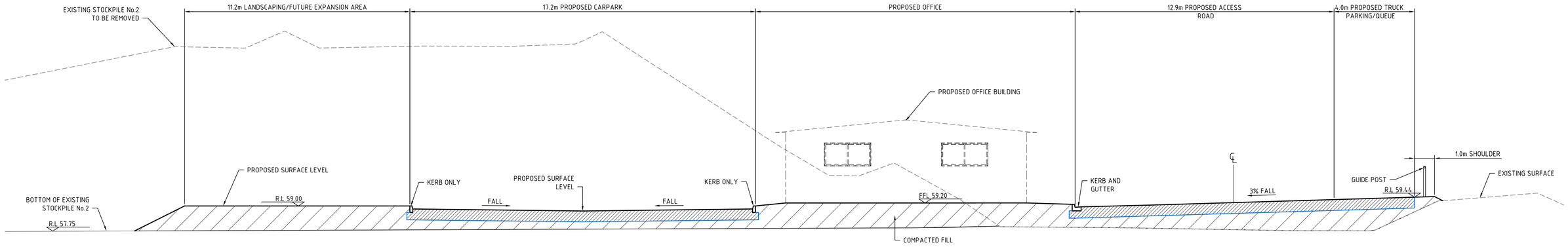
Status: FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION

A1

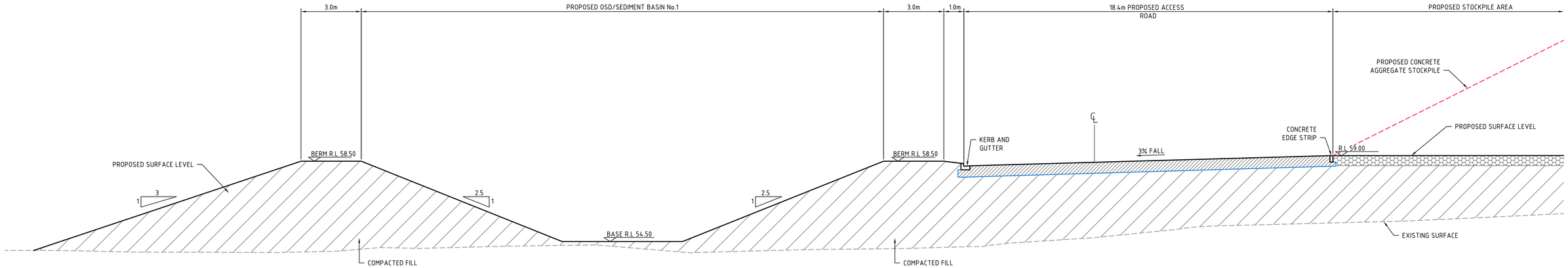
Drawing No.	Project No.	Issue
C10	15-261	B

100mm on Original

F:\15-261 Brickworks Horsley Park\Drgs\Civil\Final\C10.dwg



SECTION 1
1 : 100 C03



SECTION 2
1 : 100 C03

Issue	Description	Date
B	RE-ISSUED FOR SSD APPROVAL	2-06-15
A	ISSUED FOR SSD APPROVAL	27-05-15

100mm on Original

Bar Scales

0 2 4 6 8 10m

1 : 100 @ A1 1 : 200 @ A3

Client: BRICKWORKS LIMITED

Scales	1:100	Drawn	LVD
		Designed	MM
Grid	MGA	Checked	
Height Datum	AHD	Approved	

Project: CONCRETE AGGREGATE FACILITY
780 WALLGROVE ROAD
HORSLEY PARK

Title: TYPICAL SITE SECTIONS SHEET 1

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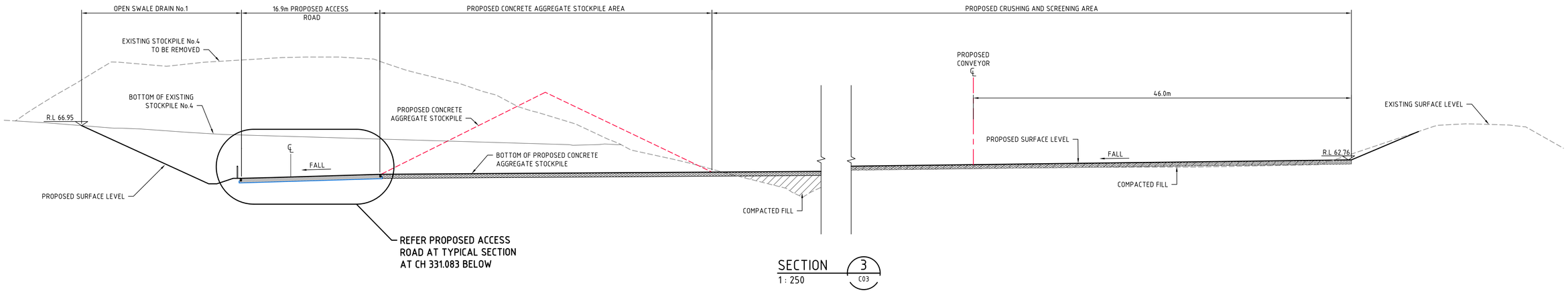
Status: FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION

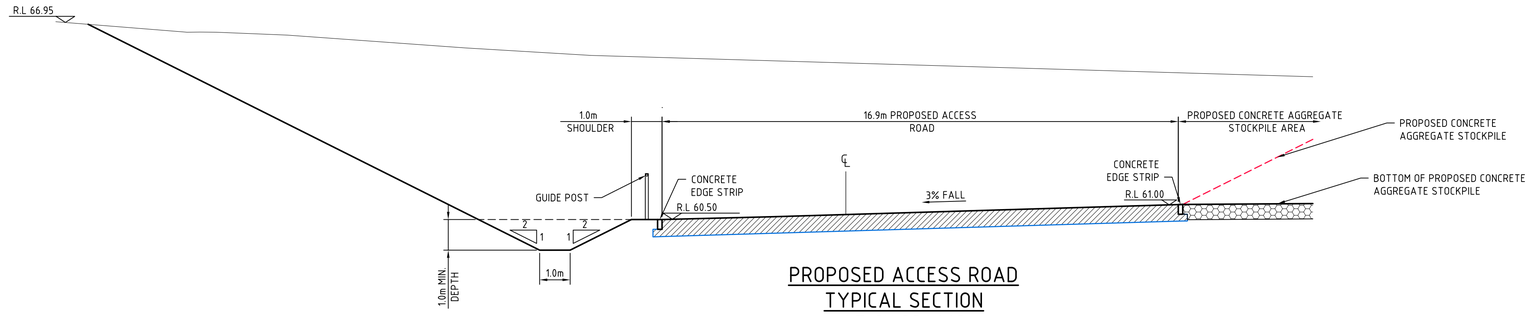
A1

Drawing No.	Project No.	Issue
C11	15-261	B

F:\15-261 Brickworks Horsley Park\Drgs\Civil\Final\C11.dwg



SECTION 3 / C03
1 : 250



PROPOSED ACCESS ROAD
TYPICAL SECTION
AT CH 331.083
SCALE 1:100

Issue	Description	Date
B	RE-ISSUED FOR SSD APPROVAL	2-06-15
A	ISSUED FOR SSD APPROVAL	27-05-15

Bar Scales

0 5 10 15 20 25m
1 : 250 @ A1 1 : 500 @ A3

0 2 4 6 8 10m
1 : 100 @ A1 1 : 200 @ A3

Client: BRICKWORKS LIMITED

Scales	1:250	Drawn	LVD
		Designed	MM
Grid	MGA	Checked	
Height Datum	AHD	Approved	

Project
CONCRETE AGGREGATE FACILITY
780 WALLGROVE ROAD
HORSLEY PARK

Title
TYPICAL SITE SECTIONS SHEET 2

Civil Engineers and Project Managers
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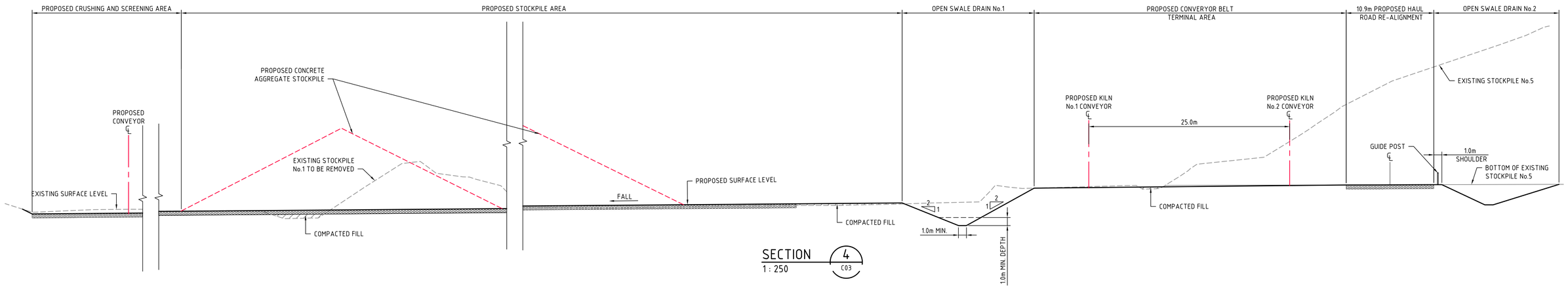
Status: FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION

A1

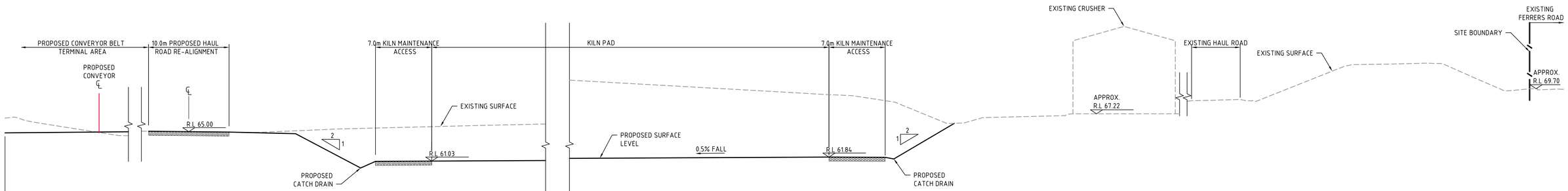
Drawing No.	Project No.	Issue
C12	15-261	B

100mm on Original

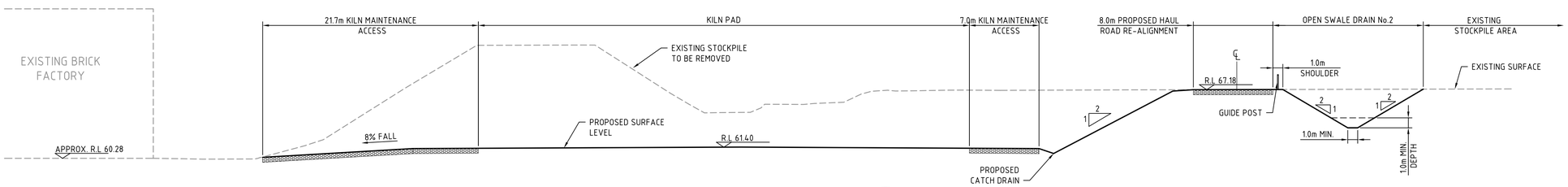
F:\15-261 Brickworks Horsley Park\Drgs\Civil\Final\C12.dwg



SECTION 4 (C03)
1 : 250



SECTION 5 (C03)
1 : 250



SECTION 6 (C03)
1 : 250

Issue	Description	Date
B	RE-ISSUED FOR SSD APPROVAL	2-06-15
A	ISSUED FOR SSD APPROVAL	27-05-15

100mm on Original

Bar Scales

0 5 10 15 20 25m

1 : 250 @ A1 1 : 500 @ A3

Client: BRICKWORKS LIMITED

Scales	1:250
Grid	MGA
Height Datum	AHD
Drawn	LVD
Designed	MM
Checked	
Approved	

Project: CONCRETE AGGREGATE FACILITY 780 WALLGROVE ROAD HORSLEY PARK

Title: TYPICAL SITE SECTIONS SHEET 3

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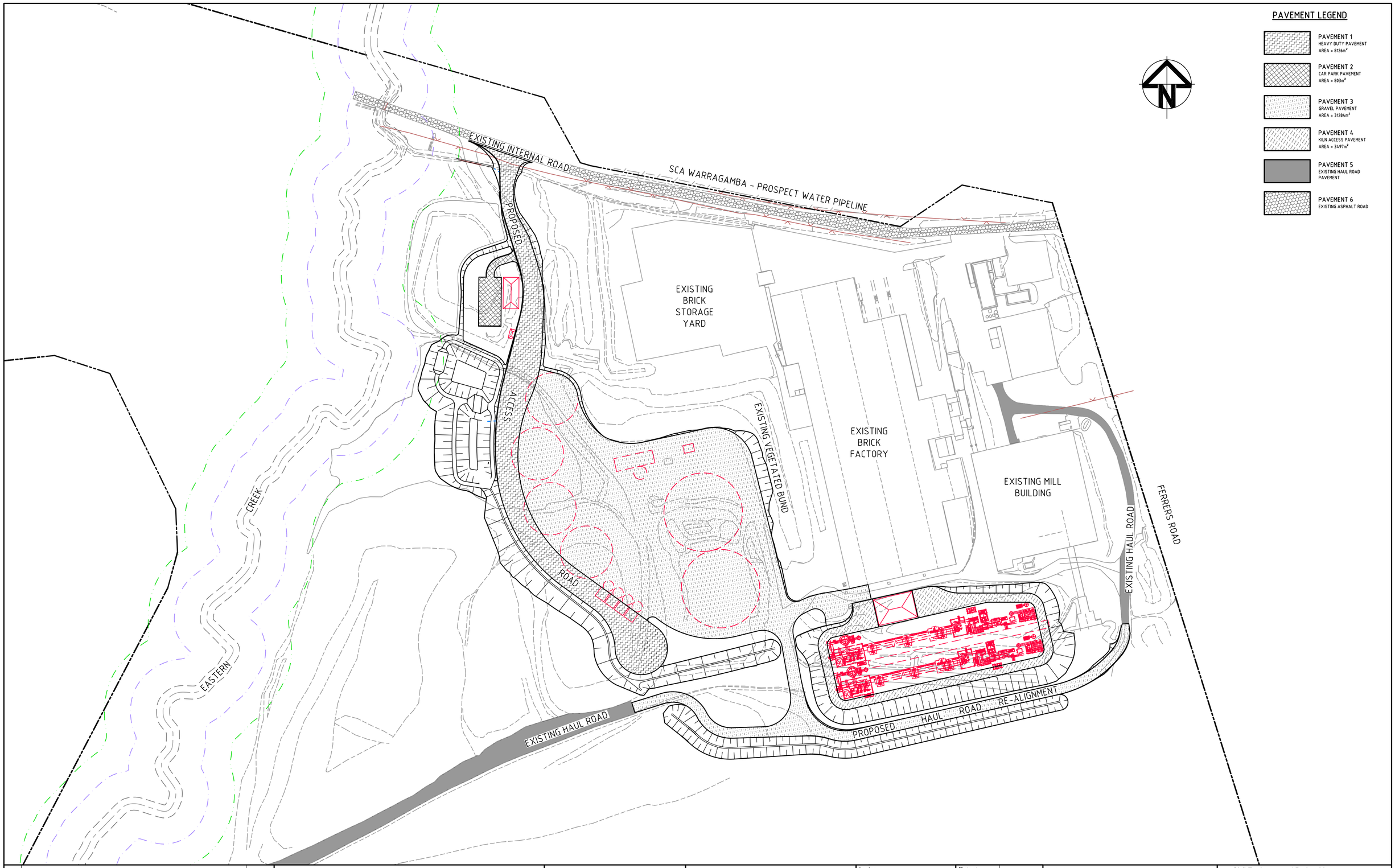
Status: FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION

A1

Drawing No.	Project No.	Issue
C13	15-261	B

F:\15-261 Brickworks Horsley Park\Drgs\Civil\Final\C13.dwg



Issue	Description	Date
B	RE-ISSUED FOR SSD APPROVAL	2-06-15
A	ISSUED FOR SSD APPROVAL	27-05-15

100mm on Original

Bar Scales

0 30 60 90 120 150m

1 : 1500 @ A1 1 : 3000 @ A3

Client: BRICKWORKS LIMITED

Scales	1:1000	Drawn	LVD
		Designed	MM
Grid	MGA	Checked	
Height Datum	AHD	Approved	

Project: CONCRETE AGGREGATE FACILITY 780 WALLGROVE ROAD HORSLEY PARK

Title: PAVEMENT PLAN

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Fax: 02 9460 8413
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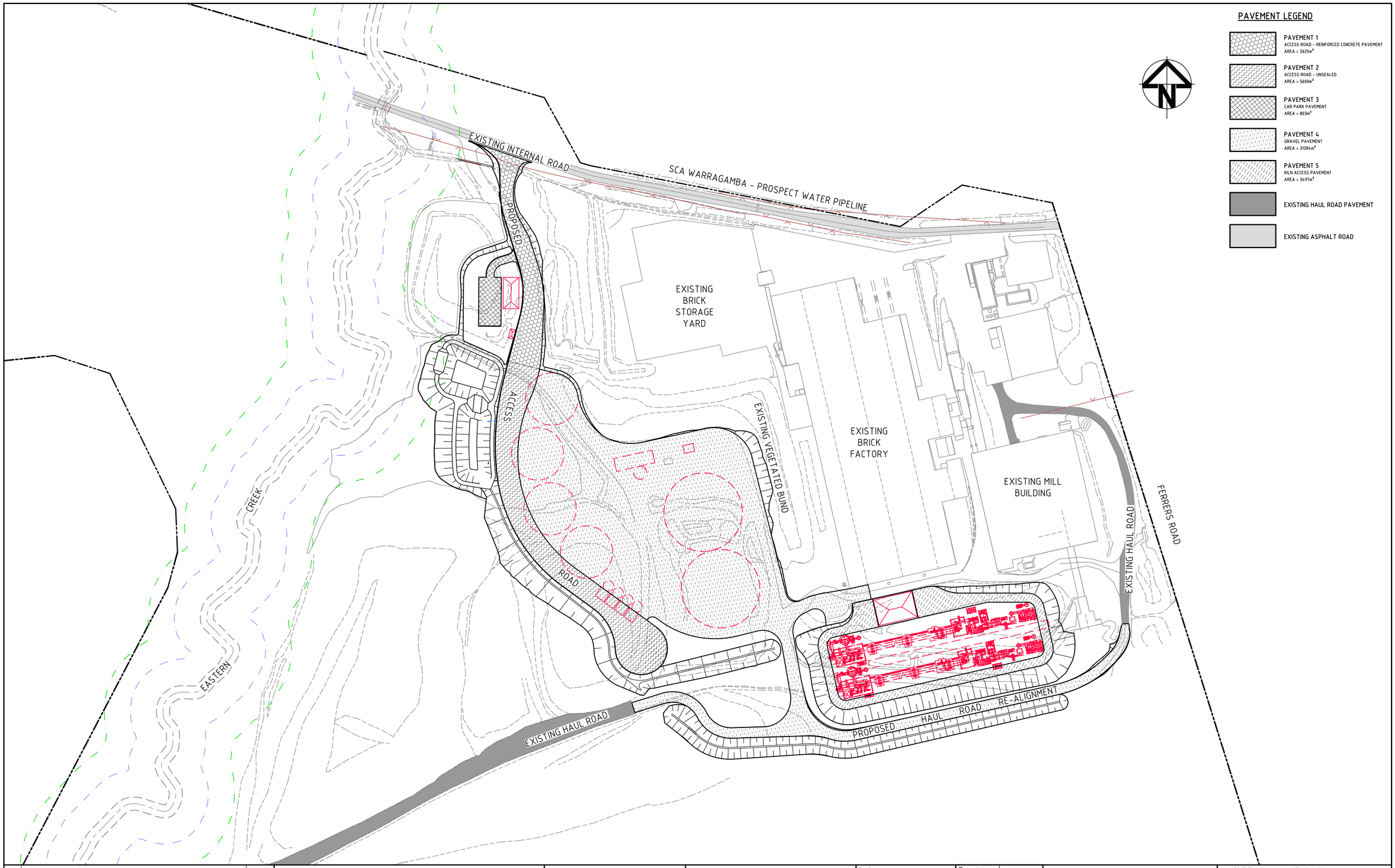
Status: FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION

A1

Drawing No.	Project No.	Issue
C14	15-261	B

F:\15-261 Brickworks Horsley Park\Drgs\Civil\Final\C14.dwg



Issue	Description	Date
C	PAVEMENT TYPES AMENDED	15-06-15
B	RE-ISSUED FOR SSD APPROVAL	2-06-15
A	ISSUED FOR SSD APPROVAL	27-05-15

100mm on Original

Bar Scales

0 30 60 90 120 150m

1 : 1500 @ A1 1 : 3000 @ A3

Client: BRICKWORKS LIMITED

Scales	1:1000	Drawn	LVD
		Designed	MM
Grid	MGA	Checked	
Height Datum	AHD	Approved	

Project: CONCRETE AGGREGATE FACILITY 780 WALLGROVE ROAD HORSLEY PARK

Title: PAVEMENT PLAN

Civil Engineers and Project Managers
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Status: FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION

A1

Drawing No.	Project No.	Issue
C14	15-261	C

F:\15-261 Brickworks Horsley Park\Drgs\Civil\Final\C14.dwg

Issue	Description	Date
B	RE-ISSUED FOR SSD APPROVAL	2-06-15
A	ISSUED FOR SSD APPROVAL	27-05-15

100mm on Original

Bar Scales

0 50 100 150 200m

1 : 2000 @ A1

Client

BRICKWORKS LIMITED

Scales	1:2000	Drawn	LVD
		Designed	MM
Grid	MGA	Checked	
Height Datum	AHD	Approved	

Project

CONCRETE AGGREGATE FACILITY
780 WALLGROVE ROAD
HORSLEY PARK

Title

EXISTING STORMWATER CATCHMENT PLAN

Civil Engineers and Project Managers
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Suite 702, 154 Pacific Hwy
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Fax: 02 9460 8413
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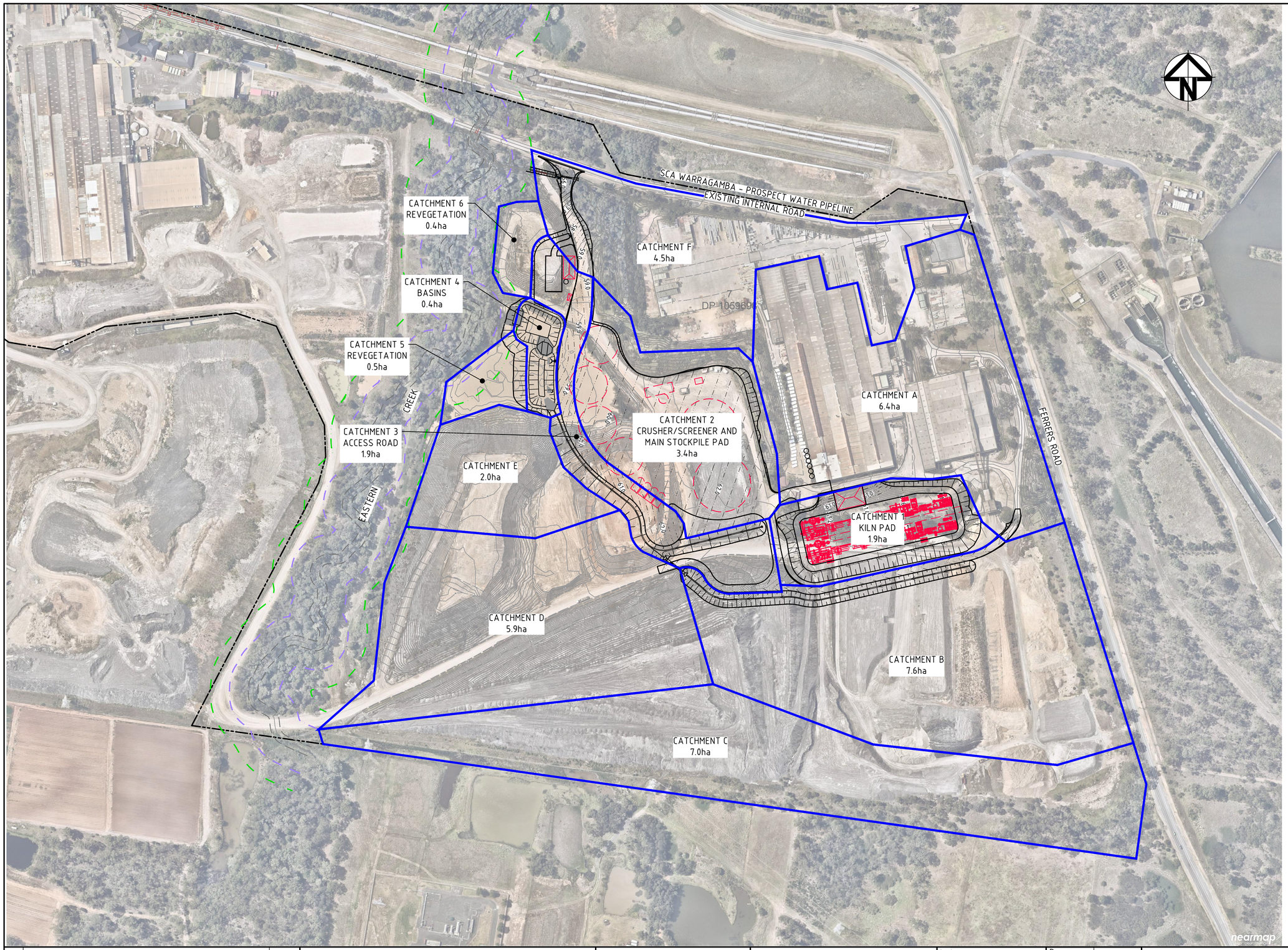
info@atl.net.au

Status: FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION

A1

Drawing No.	Project No.	Issue
C15	15-261	B

F:\15-261 Brickworks Horsley Park\Drgs\Civil\Final\C15.dwg



Issue	Description	Date
C	REVEGETATION CATCHMENTS ADDED	08-09-15
B	RE-ISSUED FOR SSD APPROVAL	2-06-15
A	ISSUED FOR SSD APPROVAL	27-05-15

Bar Scales

0 50 100 150 200m

1 : 2000 @ A1

Client: BRICKWORKS LIMITED

Scales	1:2000	Drawn	LVD
		Designed	MM
Grid	MGA	Checked	
Height Datum	AHD	Approved	

Project: CONCRETE AGGREGATE FACILITY 780 WALLGROVE ROAD HORSLEY PARK

Title: PROPOSED STORMWATER CATCHMENTS PLAN

Civil Engineers and Project Managers
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Suite 702, 154 Pacific Hwy
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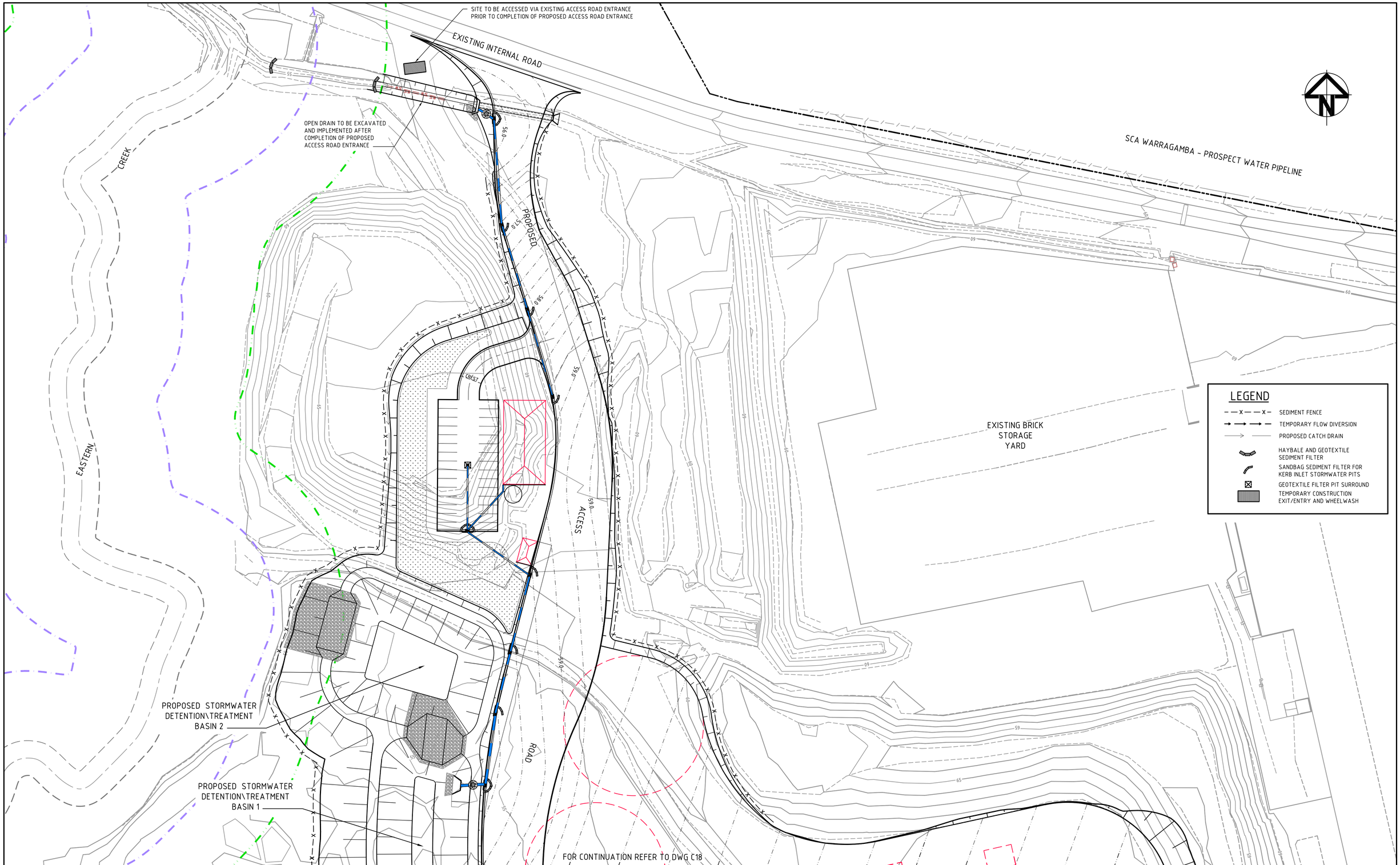
Status: FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION

A1

Drawing No.	Project No.	Issue
C16	15-261	C

100mm on Original

F:\15-261 Brickworks Horsley Park\Drgs\Civil\Final\C16.dwg



Issue	Description	Date
B	RE-ISSUED FOR SSD APPROVAL	2-06-15
A	ISSUED FOR SSD APPROVAL	27-05-15

Bar Scales

0 10 20 30 40 50m

1 : 500 @ A1 1 : 1000 @ A3

Client: BRICKWORKS LIMITED

Scales	1:500	Drawn	LVD
		Designed	MM
Grid	MGA	Checked	
Height Datum	AHD	Approved	

Project: CONCRETE AGGREGATE FACILITY 780 WALLGROVE ROAD HORSLEY PARK

Title: SEDIMENT AND EROSION PLAN SHEET 1

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Status: FOR APPROVAL NOT TO BE USED FOR CONSTRUCTION

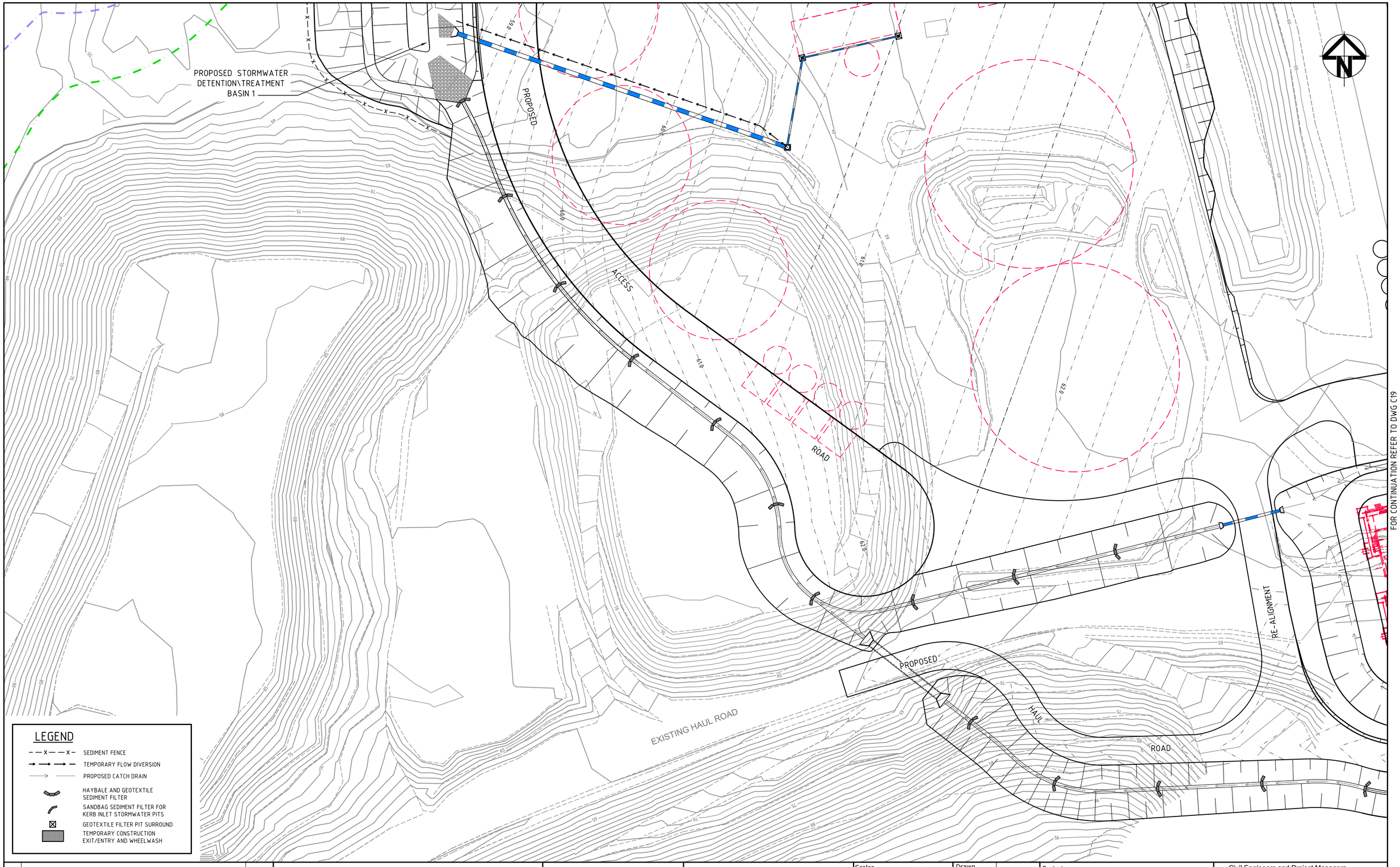
A1

Drawing No.	Project No.	Issue
C17	15-261	B

100mm on Original

F:\15-261 Brickworks Horsley Park\Drgs\Civil\Final\C17.dwg

FOR CONTINUATION REFER TO DWG C17



FOR CONTINUATION REFER TO DWG C19

Issue	Description	Date
B	RE-ISSUED FOR SSD APPROVAL	2-06-15
A	ISSUED FOR SSD APPROVAL	27-05-15

Bar Scales

0 10 20 30 40 50m

1 : 500 @ A1 1 : 1000 @ A3

Client

BRICKWORKS LIMITED

Scales	1:500	Drawn	LVD
		Designed	MM
Grid	MGA	Checked	
Height Datum	AHD	Approved	

Project

CONCRETE AGGREGATE FACILITY
780 WALLGROVE ROAD
HORSLEY PARK

Title

SEDIMENT AND EROSION PLAN SHEET 2

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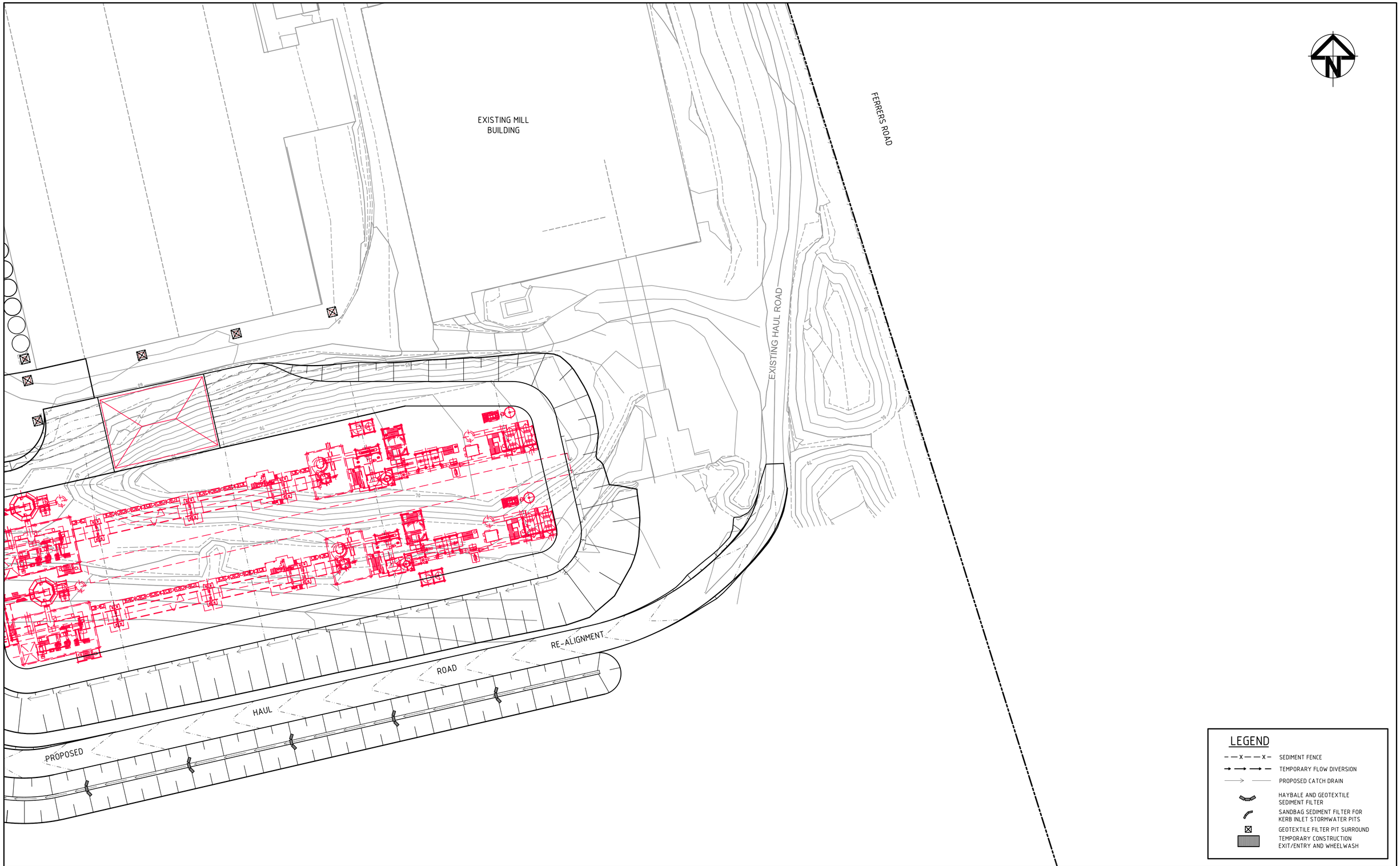
Status: FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION

A1

Drawing No.	Project No.	Issue
C18	15-261	B

100mm on Original

F:\15-261 Brickworks Horsley Park\Drgs\Civil\Final\C18.dwg



Issue	Description	Date
B	RE-ISSUED FOR SSD APPROVAL	2-06-15
A	ISSUED FOR SSD APPROVAL	27-05-15

100mm on Original

Bar Scales

0 10 20 30 40 50m

1 : 500 @ A1 1 : 1000 @ A3

Client

BRICKWORKS LIMITED

Scales	1:500	Drawn	LVD
		Designed	MM
Grid	MGA	Checked	
Height Datum	AHD	Approved	

Project

CONCRETE AGGREGATE FACILITY
780 WALLGROVE ROAD
HORSLEY PARK

Title

SEDIMENT AND EROSION PLAN SHEET 3

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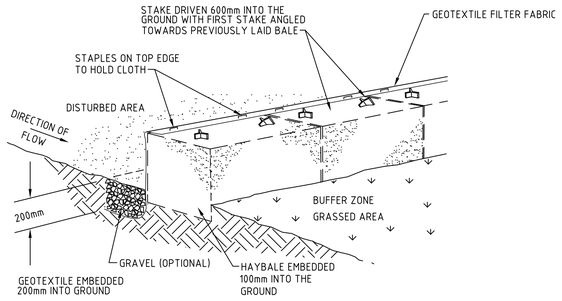
Status: FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION

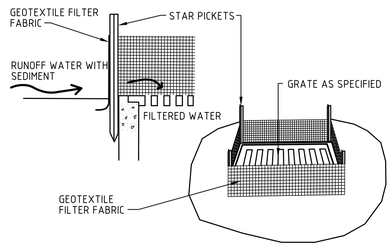
A1

Drawing No.	Project No.	Issue
C19	15-261	B

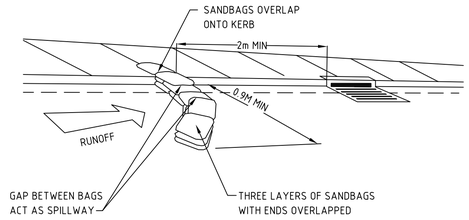
F:\15-261 Brickworks Horsley Park\Drgs\Civil\Final\C19.dwg



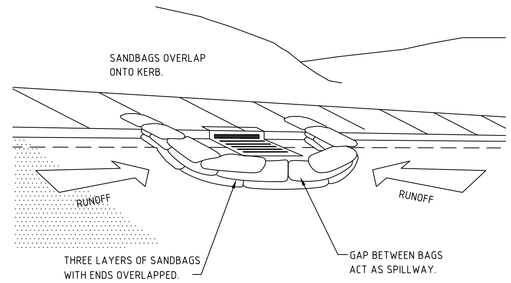
HAYBALE AND GEOTEXTILE SEDIMENT FILTER
NTS



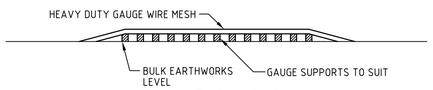
GEOTEXTILE FILTER PIT SURROUND
NTS



SANDBAG SEDIMENT TRAP FOR KERB INLET ON GRADE
NTS

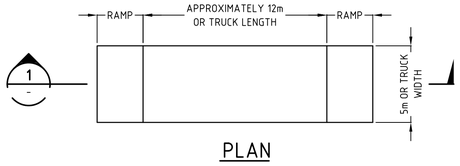


SANDBAG SEDIMENT TRAP FOR KERB INLET AT LOWPOINT
NTS



ELEVATION

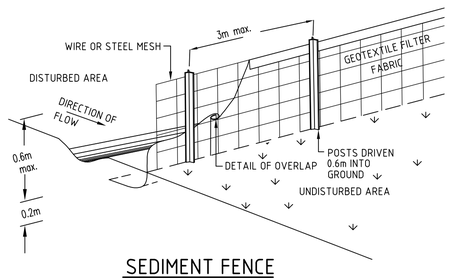
SECTION 1 / - 1 : 200



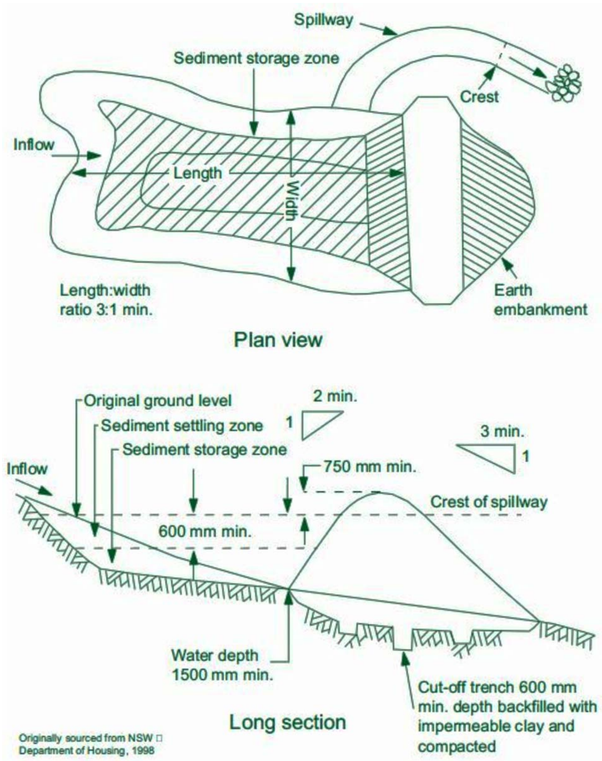
PLAN

TEMPORARY CONSTRUCTION EXIT
SCALE 1:200

THE EXIT SHALL BE MAINTAINED IN A CONDITION WHICH PREVENTS TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHTS OF WAY. THIS MAY REQUIRE REPAIR AND OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT. ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACKED ONTO PUBLIC RIGHTS OF WAY MUST BE REMOVED IMMEDIATELY.



SEDIMENT FENCE
NTS



TEMPORARY SEDIMENT BASIN (TYPE F AND D)
NTS

Issue	Description	Date
B	RE-ISSUED FOR SSD APPROVAL	2-06-15
A	ISSUED FOR SSD APPROVAL	27-05-15

Bar Scales

0 100 200 400 600 800 1000mm

1 : 10 @ A1 1 : 20 @ A3

0 5 10 15 20m

1 : 200 @ A1 1 : 400 @ A3

Client: BRICKWORKS LIMITED

Scales	AS SHOWN	Drawn	LVD
		Designed	MM
Grid	MGA	Checked	
Height Datum	AHD	Approved	

Project: CONCRETE AGGREGATE FACILITY 780 WALLGROVE ROAD HORSLEY PARK

Title: SEDIMENT AND EROSION DETAILS

Civil Engineers and Project Managers
at&l
Suite 702, 154 Pacific Hwy
St Leonards NSW 2065
ABN 96 130 882 405
Tel: 02 9439 1777
Fax: 02 9460 8413
www.atl.net.au
info@atl.net.au

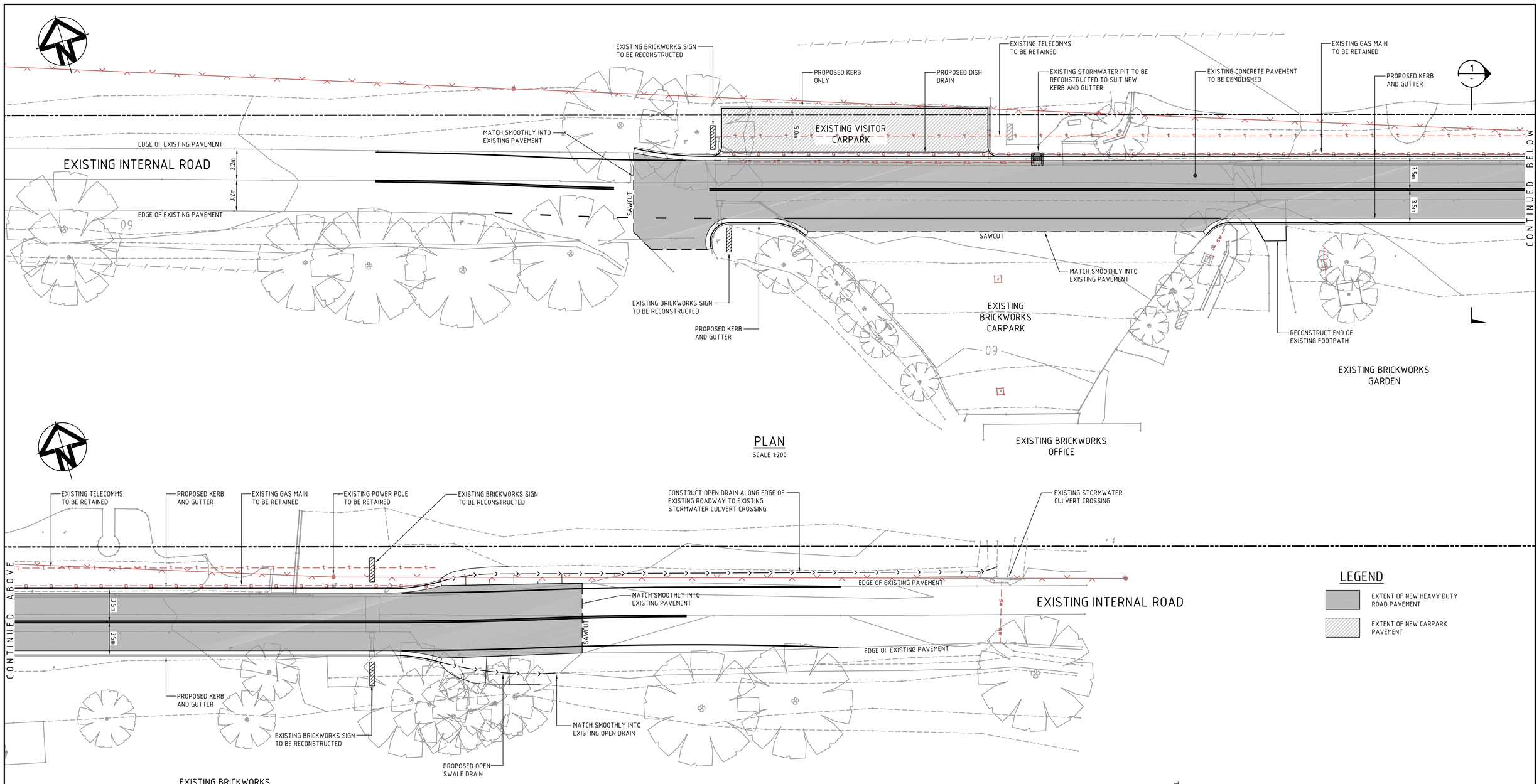
Status: FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION

A1

Drawing No.	Project No.	Issue
C20	15-261	B

100mm on Original

F:\15-261 Brickworks Horsley Park\Drgs\Civil\Final\C20.dwg

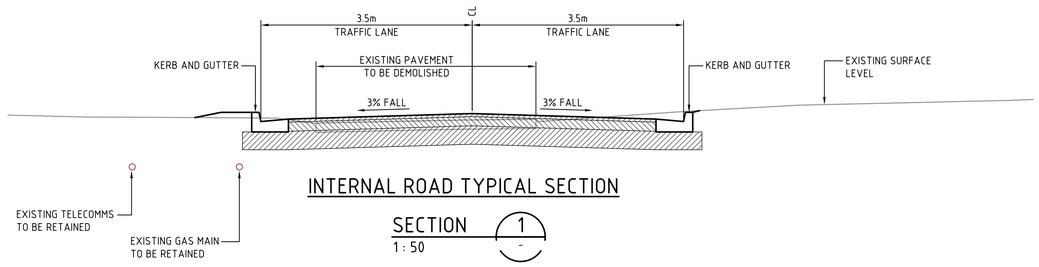


PLAN
SCALE 1:200

PLAN
SCALE 1:200

LEGEND

- EXTENT OF NEW HEAVY DUTY ROAD PAVEMENT
- EXTENT OF NEW CARPARK PAVEMENT



INTERNAL ROAD TYPICAL SECTION

SECTION 1 / - 1 : 50

Issue	Description	Date
B	RE-ISSUED FOR SSD APPROVAL	2-06-15
A	ISSUED FOR SSD APPROVAL	27-05-15

Bar Scales

0 1 2 3 4 5m
1 : 50 @ A1 1 : 100 @ A3
0 5 10 15 20m
1 : 200 @ A1 1 : 400 @ A3

Client: BRICKWORKS LIMITED

Scales	AS SHOWN	Drawn	LVD
		Designed	MM
Grid	MGA	Checked	
Height Datum	AHD	Approved	

Project: CONCRETE AGGREGATE FACILITY 780 WALLGROVE ROAD HORSLEY PARK

Title: EXISTING INTERNAL ROAD WIDENING PLAN AND TYPICAL SECTION

Civil Engineers and Project Managers
at&l
Suite 702, 154 Pacific Hwy
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ABN 96 130 882 405
Tel: 02 9439 1777
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www.atl.net.au
Info@atl.net.au

Status: FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION

A1

Drawing No.	Project No.	Issue
C30	15-261	B

100mm on Original

F:\15-261 Brickworks Horsley Park\Drgs\Civil\Final\C30.dwg

Appendix B

BMT WBM Flood Report

BMT WBM Pty Ltd
Suite G2, 13-15 Smail Street
Ultimo NSW 2007
Australia

Tel: +61 2 8960 7755
Fax: +61 2 8960 7745

ABN 54 010 830 421

www.bmtwbm.com.au

Our Ref: L.S20149.01_BrickworksQuarry_FIA.docx

26 May 2015

Suite 702, 154 Pacific Highway,
St Leonards NSW 2065

Attention: Simon Haycock

Dear Simon

RE: Brickworks Quarry Site at Horsley Park – Flood Impact Assessment

The following letter report outlines the flood impact assessment undertaken for the proposed development at the above address.

The flood impact assessment was undertaken using Fairfield Council's current hydraulic model of the Eastern Creek catchment developed as part of the Rural Area Flood Study, Ropes, Reedy and Eastern Creeks – Final Draft (2013).

Proposed Development and Description of Existing Flood Risk

The proposed works will involve bulk earthworks to form platform levels for a new manufacturing plant and associated amenities. This will include some filling of the existing dam. This assessment focuses on determining the risk of flooding and flooding impacts from Eastern Creek which is immediately west of the site (Figure 1).

Hydraulic Modelling Overview

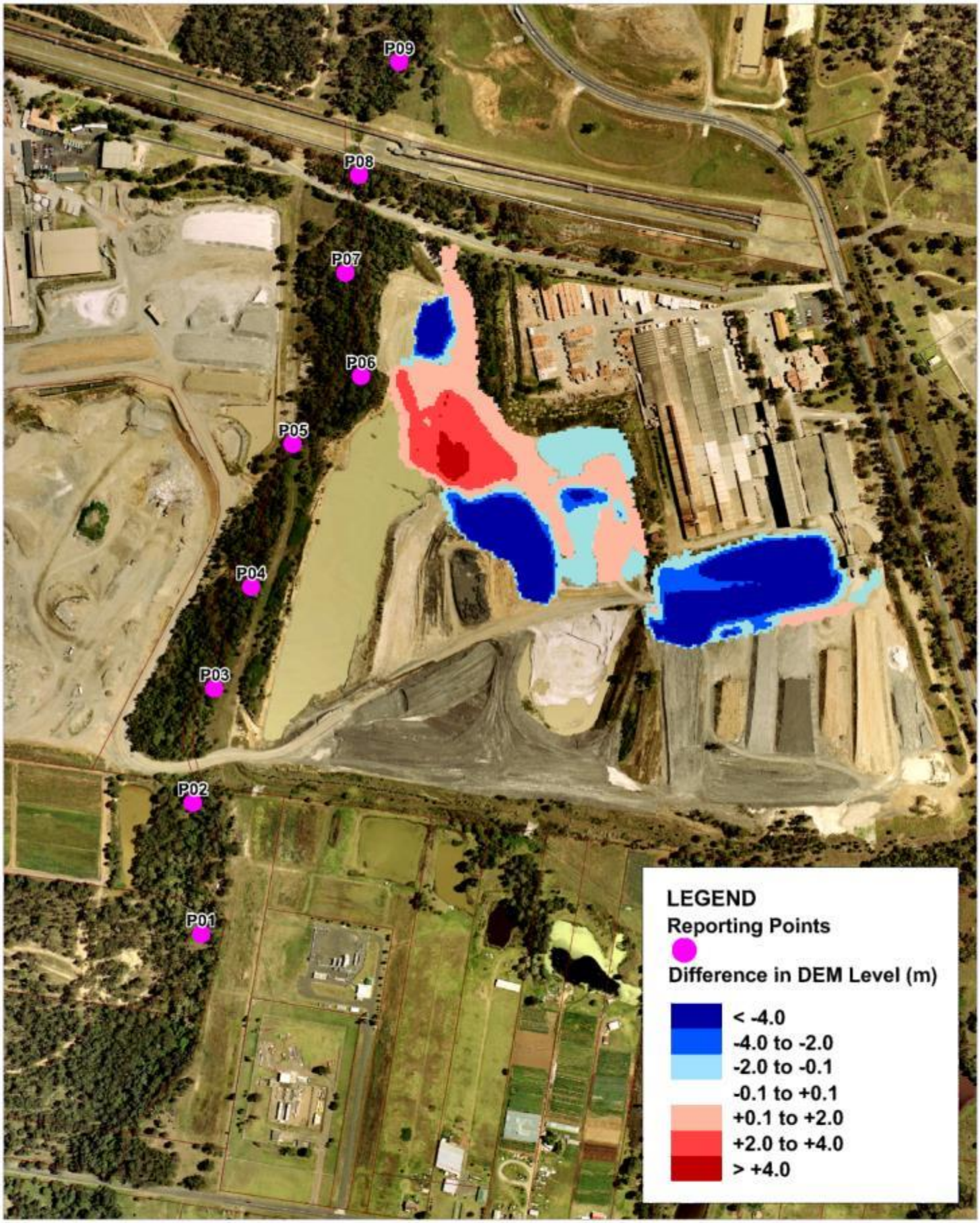
The Eastern Creek catchment hydraulic model is a two-dimensional (2D) TUFLOW model utilising a 5m grid resolution. Major stream paths such as Eastern Creek are modelled as nested 1D features. In order to assess the existing overland flood risk and flood impacts of the proposed development, refinement to the Draft model was required. The following modifications were made to the TUFLOW model.

- Existing Case Model (Pre-development conditions)

  Modelling undertaken for the flood study assumed that the quarries were filled (topographic changes). For the purposes of this flood impact assessment, the flood study model is therefore not a suitable base case model. Local site survey was provided as a 12da file for the Pre Developed conditions. This terrain was "patched" on the flood study model. The dam adjacent to the Creek was assumed full prior to the design storm. Aerial imagery supports this starting water level. Quarry land-use layers developed for the flood study were applied on the site for the assessment.

- Proposed Case Model

  Two proposed development models were developed when preparing the flood impact assessment in order to mitigate flood impacts in Eastern Creek from the development (only the final scenario is reported). Proposed development site topography was provided as 12da files. This terrain data was similarly patched over the pre-development model. Figure 1 shows the change in topography for the Proposed Case versus Existing Case model.



Title:

Study Area and Reporting Locations

Figure:	Rev:
1	-

N

0 125 250m

Approx. Scale

BMT WBM
www.bmtwbm.com.au

Filepath : S:\WATER\PROJECTS\S20149_BrickworksQuarry_FIA\MI\Workspaces\Figure01_StudyArea.wor

Flood Mapping and Peak Result Tables

The TUFLOW hydraulic model has been used to derive “Flood Study Condition”, “Pre Developed” and “Proposed Development” flood levels for the 5% AEP (20 year ARI), 1% AEP (100 year ARI) and the PMF (Probable Maximum Flood) design storms.

Flooding characteristics for all design events have been determined by assessing a range of design storm durations. The resulting peak water level is determined by considering all storm durations and extracting the highest water level in each model cell.

Figure 2 shows the Flood Study 1% AEP maximum water level surface while Figure 3 shows the difference in flood levels (1% AEP) from the Flood Study model versus the pre-developed model. The Flood Study adopted topographic changes to remove the quarry in conjunction with a revised land-use layer assuming the quarry site had been restored. This resulted in higher conveyance within Eastern Creek at the western site boundary for the Flood Study compared to that modelled for the pre-developed scenario. Note red sections in Figure 3 indicate areas where the pre-developed scenario produces higher flood levels than the flood study.

A range of flood mapping has been provided as follows:

Appendix A – Flood Level Impact Mapping

- A1 5% AEP (20 Year ARI) Maximum Water Level Differences
- A2 1% AEP (100 Year ARI) Maximum Water Level Differences
- A3 PMF Maximum Water Level Differences

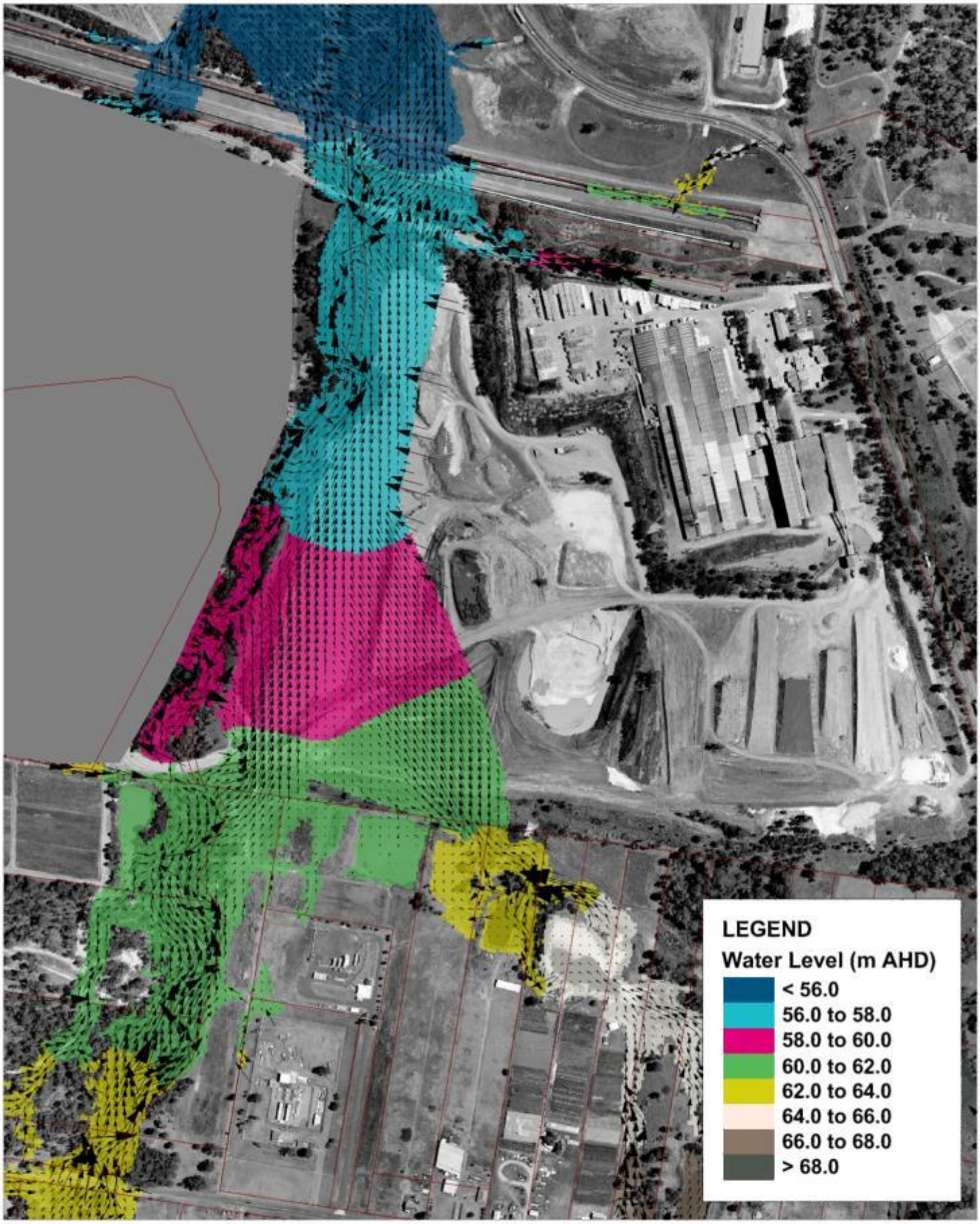
Appendix B – Velocity-Depth Product Mapping

- B1 5% AEP (20 Year ARI) Velocity-Depth Product - Pre Developed
- B2 1% AEP (100 Year ARI) Velocity-Depth Product - Pre Developed
- B3 PMF Velocity-Depth Product - Pre Developed
- B4 5% AEP (20 Year ARI) Velocity-Depth Product - Developed
- B5 1% AEP (100 Year ARI) Velocity-Depth Product - Developed
- B6 PMF Velocity-Depth Product - Developed

Appendix C – Peak Water Level Mapping (include velocity vectors)

- C1 5% AEP (20 Year ARI) Maximum Water Levels – Pre Developed
- C2 1% AEP (100 Year ARI) Maximum Water Levels – Pre Developed
- C3 PMF Maximum Water Levels - Pre Developed
- C4 5% AEP (20 Year ARI) Maximum Water Levels - Developed
- C5 1% AEP (100 Year ARI) Maximum Water Levels - Developed
- C6 PMF Maximum Water Levels - Developed

Impact mapping provided in Appendix-A contrasts the revised pre-developed scenario with the developed scenario. Flood levels determined in the Flood Study model are however different to the pre-developed scenario.



Title:

Flood Study -Peak Flood Level
1% AEP (100 yr ARI)

Figure: 02

Rev: -

N

0 125 250m

Approx. Scale

BMT WBM
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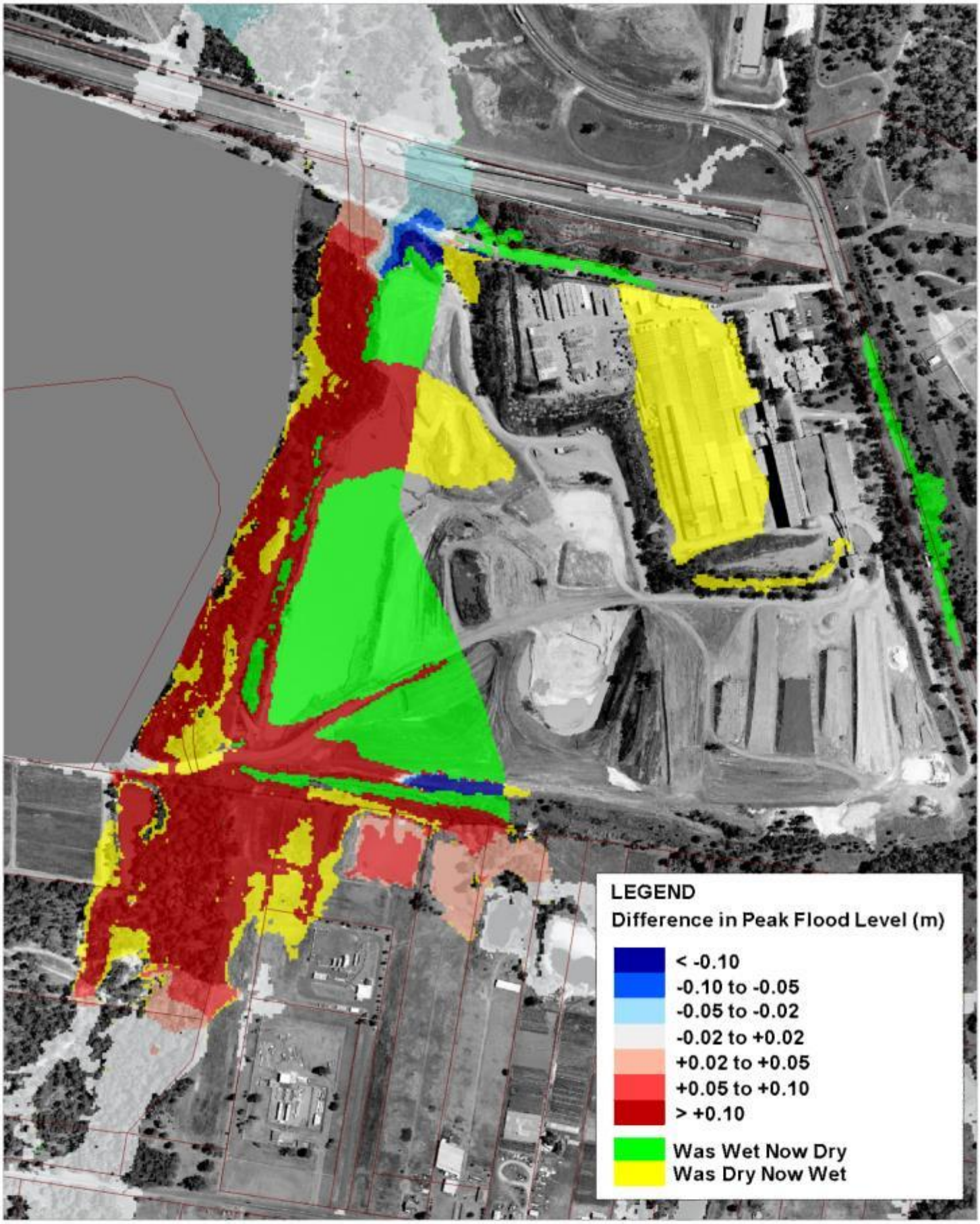
Filepath : S20149\MI\Workspaces\Figure02_100YR_Level.wor



Title:

Flood Level Impacts - Flood Study versus Pre Developed 1% AEP (100 yr ARI)

Figure: 03

Rev: -

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0 125 250m

Approx. Scale

BMT WBM
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Peak water levels have been extracted along the site for the “pre-developed case” and “developed case” (Table 1). Figure 1 shows the locations reported.

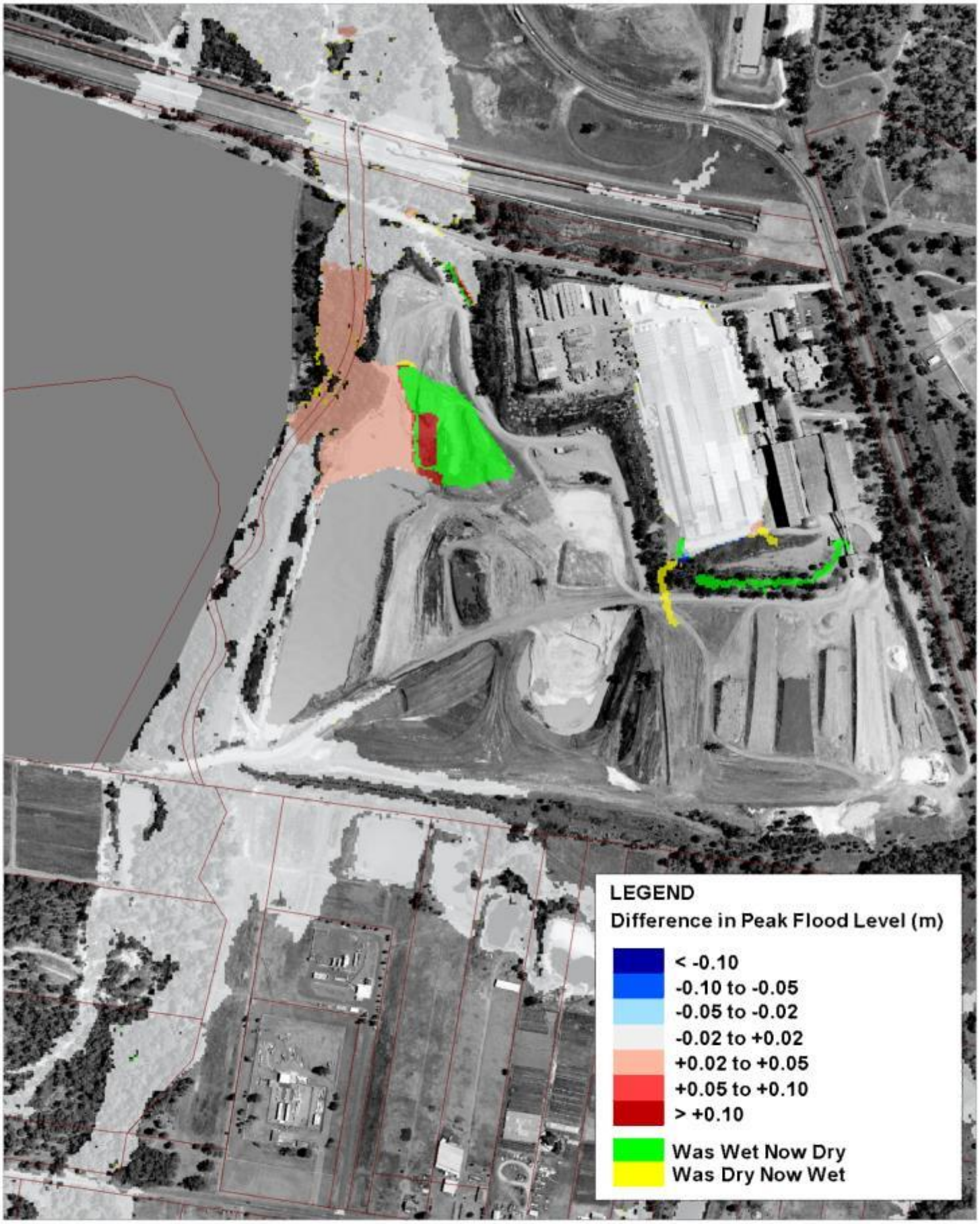
Table 1 Peak Water Levels Results on site (mAHD)

Location	Pre Developed			Post Developed (It 2)			Impacts		
	5% AEP	1% AEP	PMF	5% AEP	1% AEP	PMF	5% AEP	1% AEP	PMF
P01	61.18	61.33	62.84	61.18	61.33	62.84	0.00	0.00	0.00
P02	61.10	61.24	62.75	61.10	61.24	62.75	0.00	0.00	0.00
P03	59.28	59.56	61.85	59.28	59.56	61.85	0.00	0.00	0.00
P04	58.84	59.09	61.27	58.84	59.09	61.27	0.00	0.00	0.01
P05	57.83	58.11	59.95	57.84	58.11	59.99	0.02	0.01	0.04
P06	57.31	57.63	59.66	57.33	57.64	59.72	0.03	0.01	0.05
P07	56.86	57.11	58.75	56.88	57.12	58.79	0.02	0.01	0.04
P08	56.17	56.29	57.43	56.18	56.30	57.44	0.01	0.00	0.01
P09	55.42	55.57	56.95	55.43	55.58	56.95	0.01	0.00	0.00

Yours Faithfully
BMT WBM

Bowen Hicks

Appendix A Flood Level Impact Mapping



Title:

Flood Level Impacts - Development versus Pre Developed 5% AEP (20 yr ARI)

Figure: A-1

Rev: -

N

0 125 250m

Approx. Scale

BMT WBM

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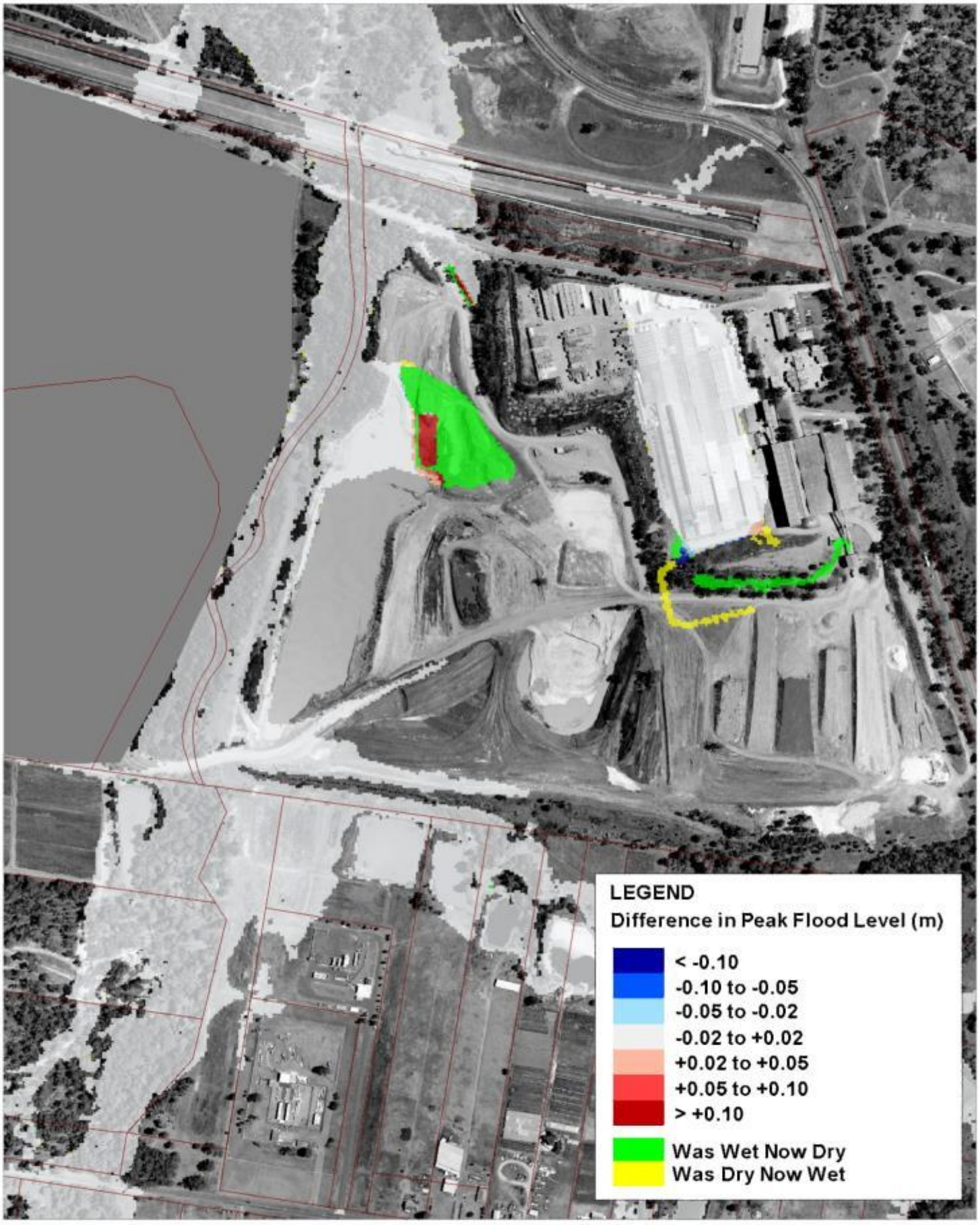

Title:

Flood Level Impacts - Development versus Pre Developed 1% AEP (100 yr ARI)

Figure: A-2

Rev: -

N

0 125 250m

Approx. Scale

BMT WBM

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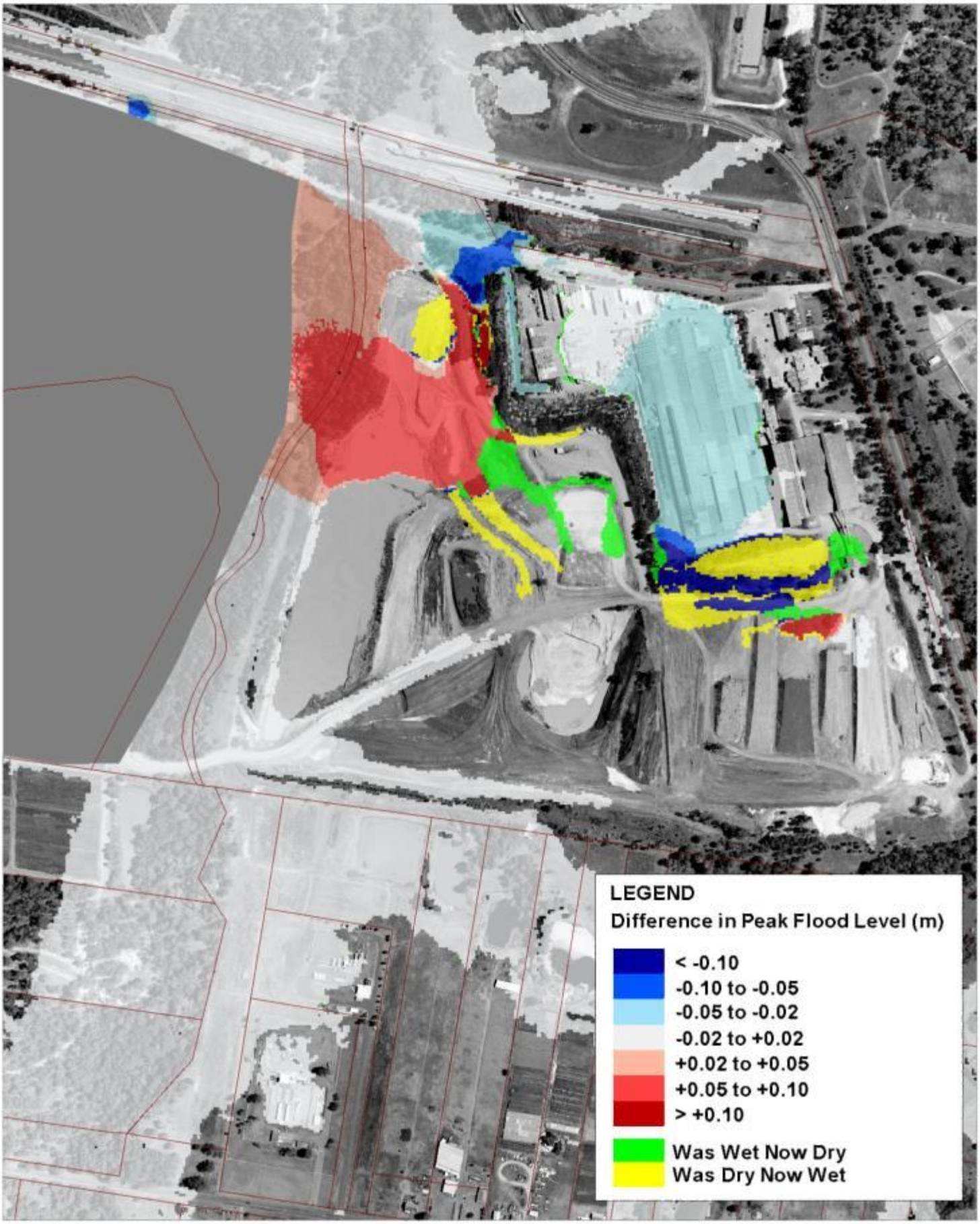
Filepath : S20149\MI\Workspaces\FigureA02_100_Imp_PostDv2_PreDv.wor



Title:

Flood Level Impacts - Development versus Pre Developed Probable Maximum Flood (PMF)

Figure:	Rev:
A-3	-

N

0 125 250m

Approx. Scale

BMT WBM
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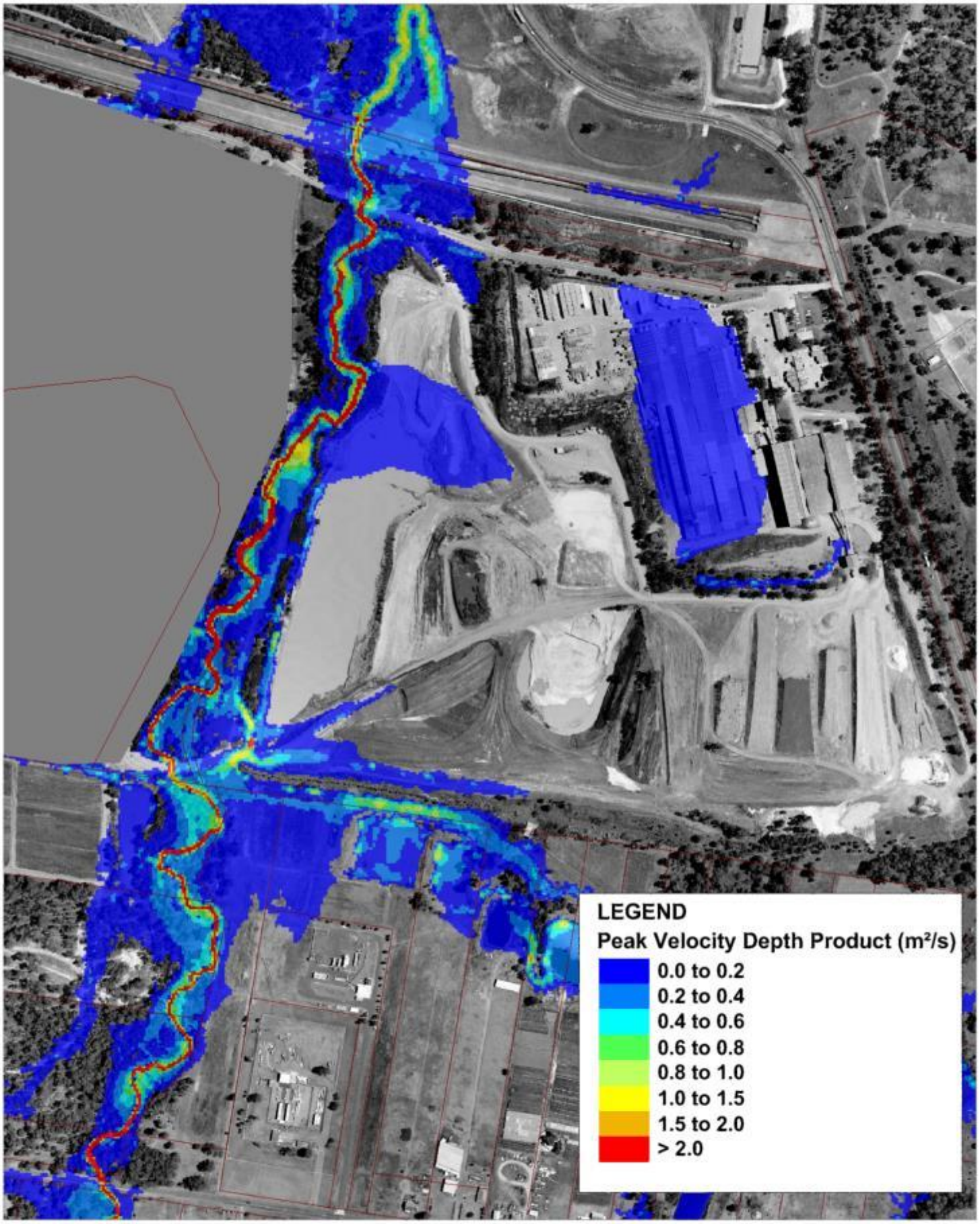
Filepath : S20149\M1\Workspaces\FigureA03_PMF_Imp_PostDv2_PreDv.wor

Appendix B Velocity-Depth Product Mapping



Title:

Pre Development -Velocity Depth Product 5% AEP (20 yr ARI)

Figure: B-1

Rev: -

N

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Approx. Scale

BMT WBM
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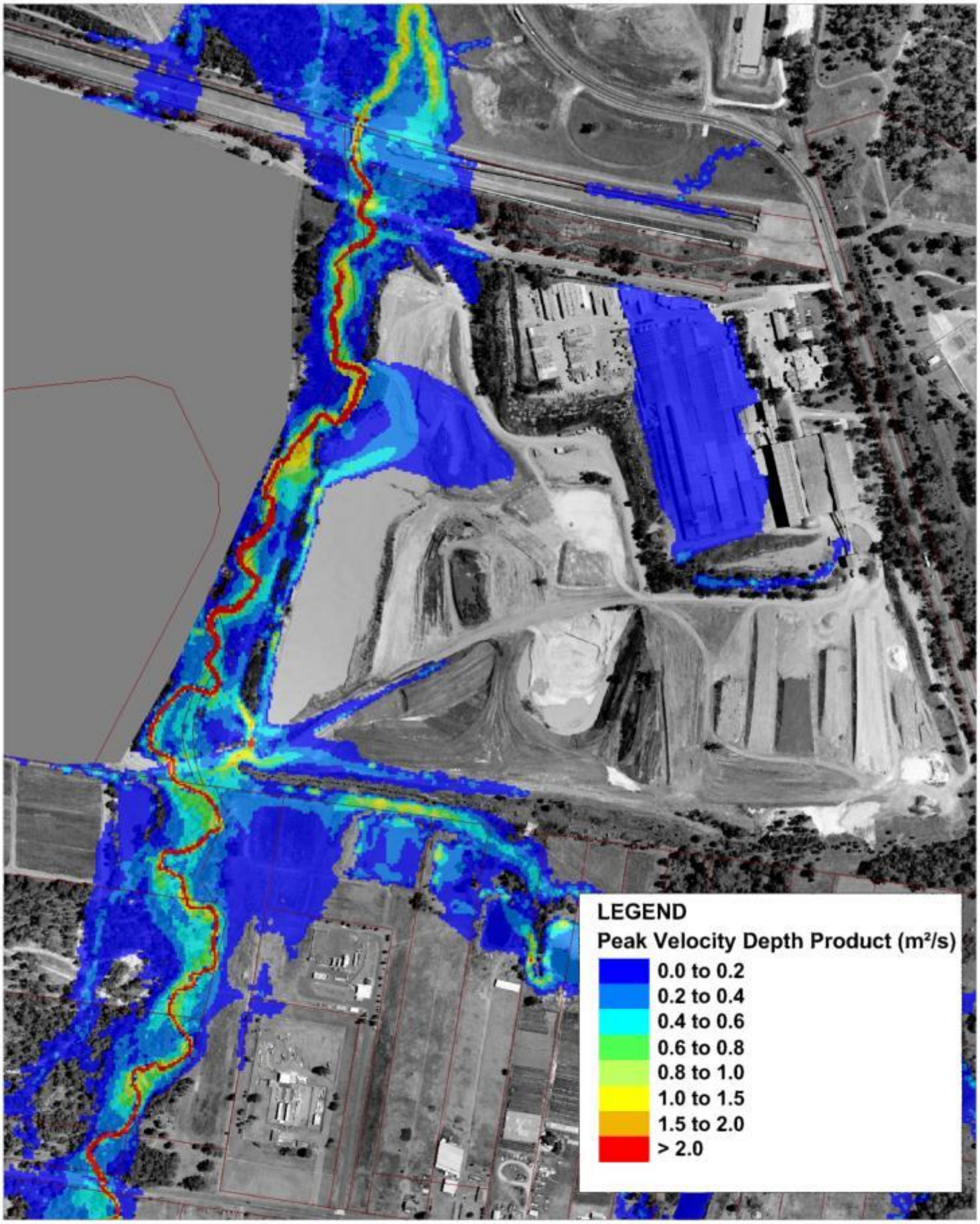
Filepath : S20149\MI\Workspaces\FigureB01_020YR_VD.wor



Title:

Pre Development -Velocity Depth Product 1% AEP (100 yr ARI)

Figure: B-2

Rev: -

N

0 125 250m

Approx. Scale

BMT WBM
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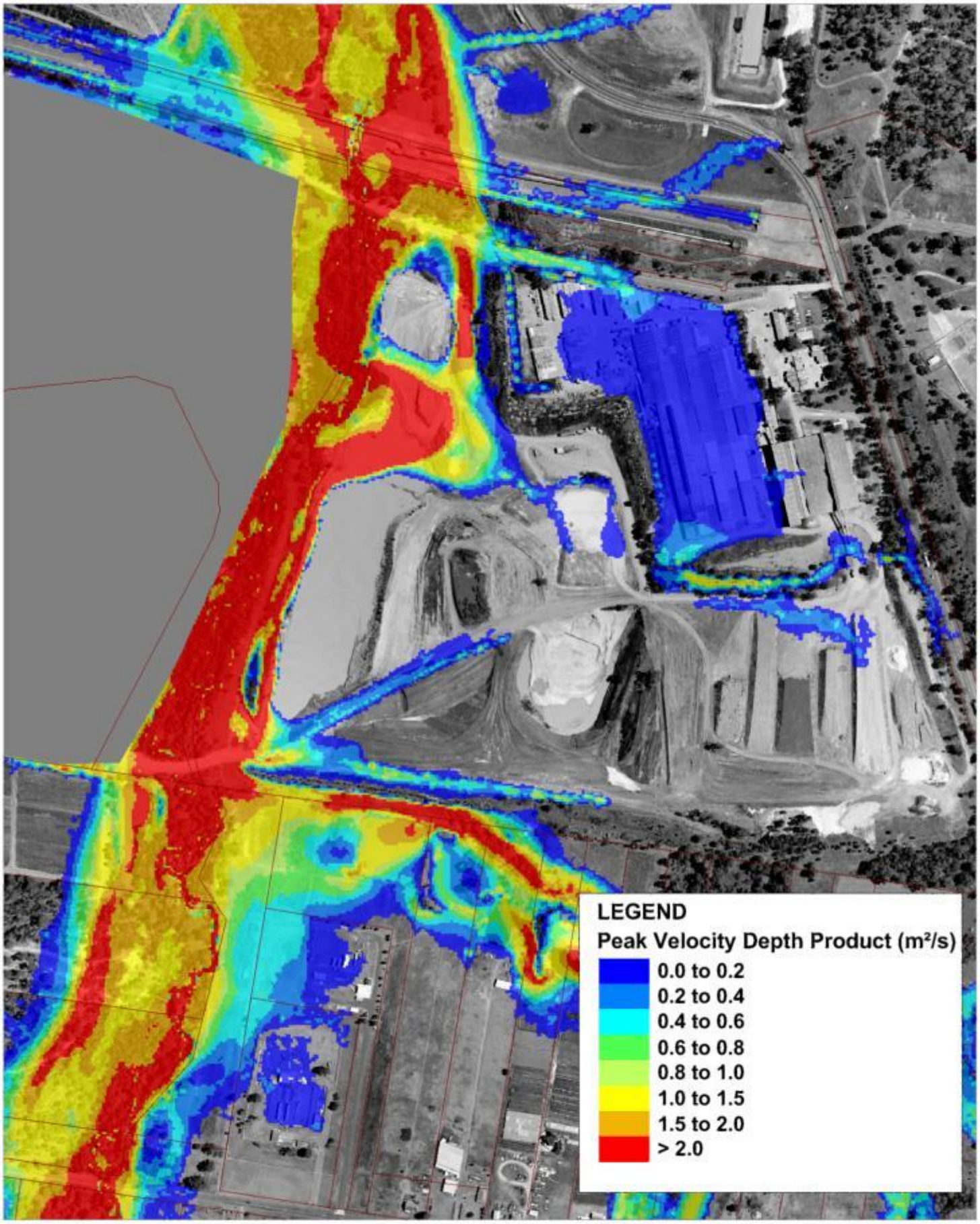


Title:

Pre Development -Velocity Depth Product Probable Maximum Flood (PMF)

Figure: B-3

Rev: -

N

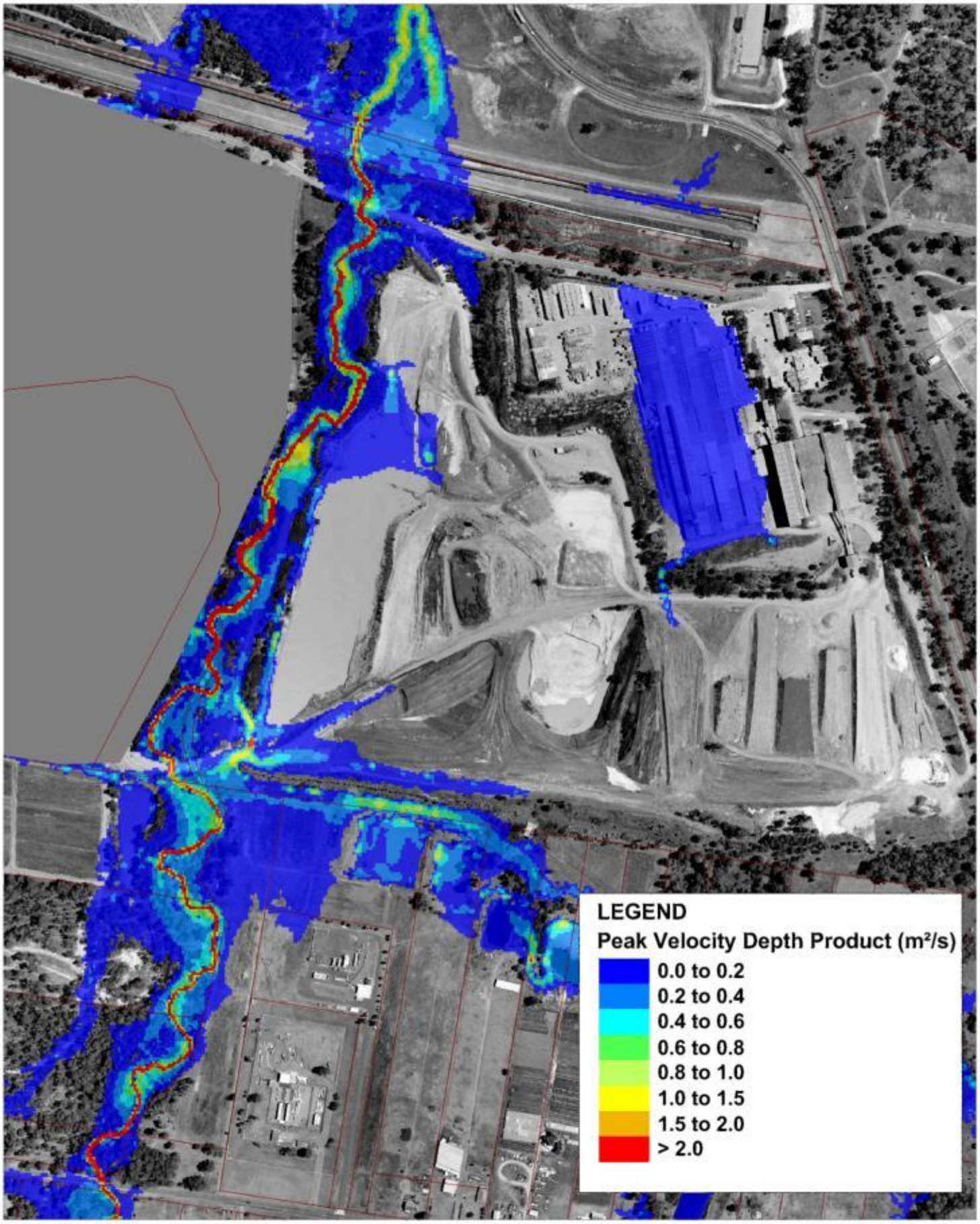
0 125 250m

Approx. Scale

BMT WBM

www.bmtwbm.com.au

Filepath : S20149\M1\Workspaces\FigureB03_PMF_VD.wor



Title:

Post Development It2 -Velocity Depth Product 5% AEP (20 yr ARI)

Figure: B-4

Rev: -

N

0 125 250m

Approx. Scale

BMT WBM
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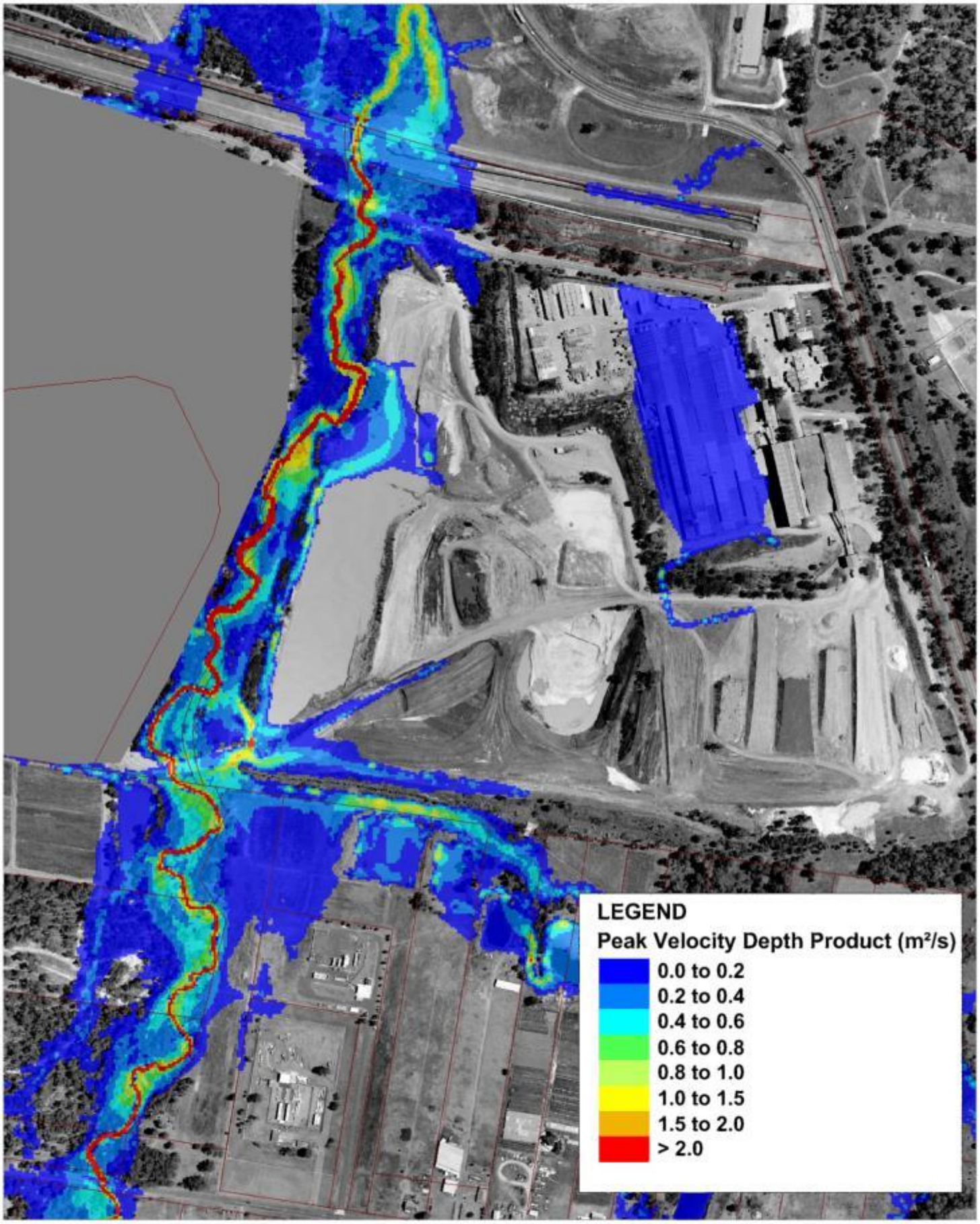

Title:

Post Development It2 -Velocity Depth Product 1% AEP (100 yr ARI)

Figure: B-5

Rev: -

N

0 125 250m

Approx. Scale

BMT WBM
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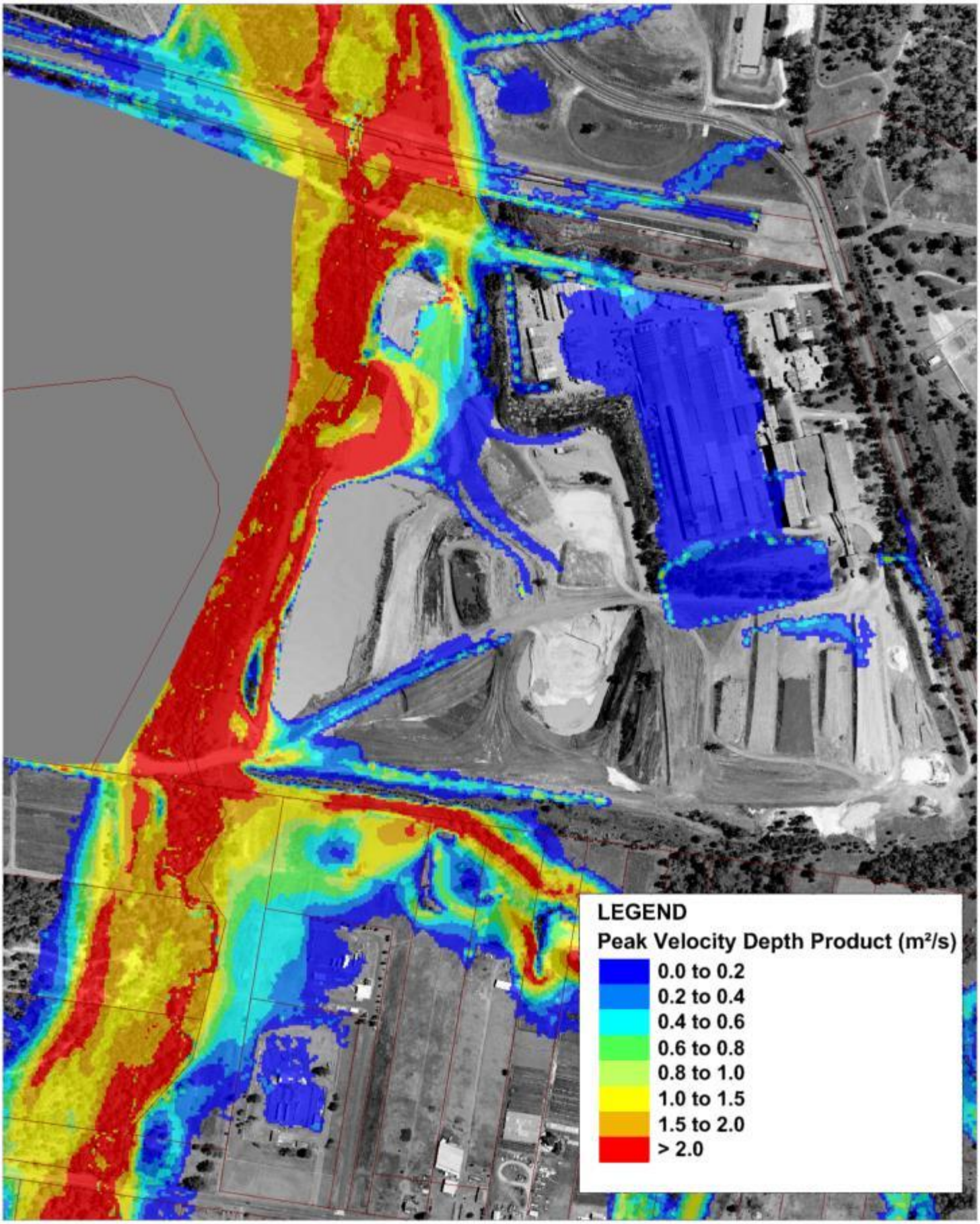
Filepath : S20149\MI\Workspaces\FigureB05_100YR_VD.wor



Title:

Post Development It2 -Velocity Depth Product Probable Maximum Flood (PMF)

Figure: B-6

Rev: -

N

0 125 250m

Approx. Scale

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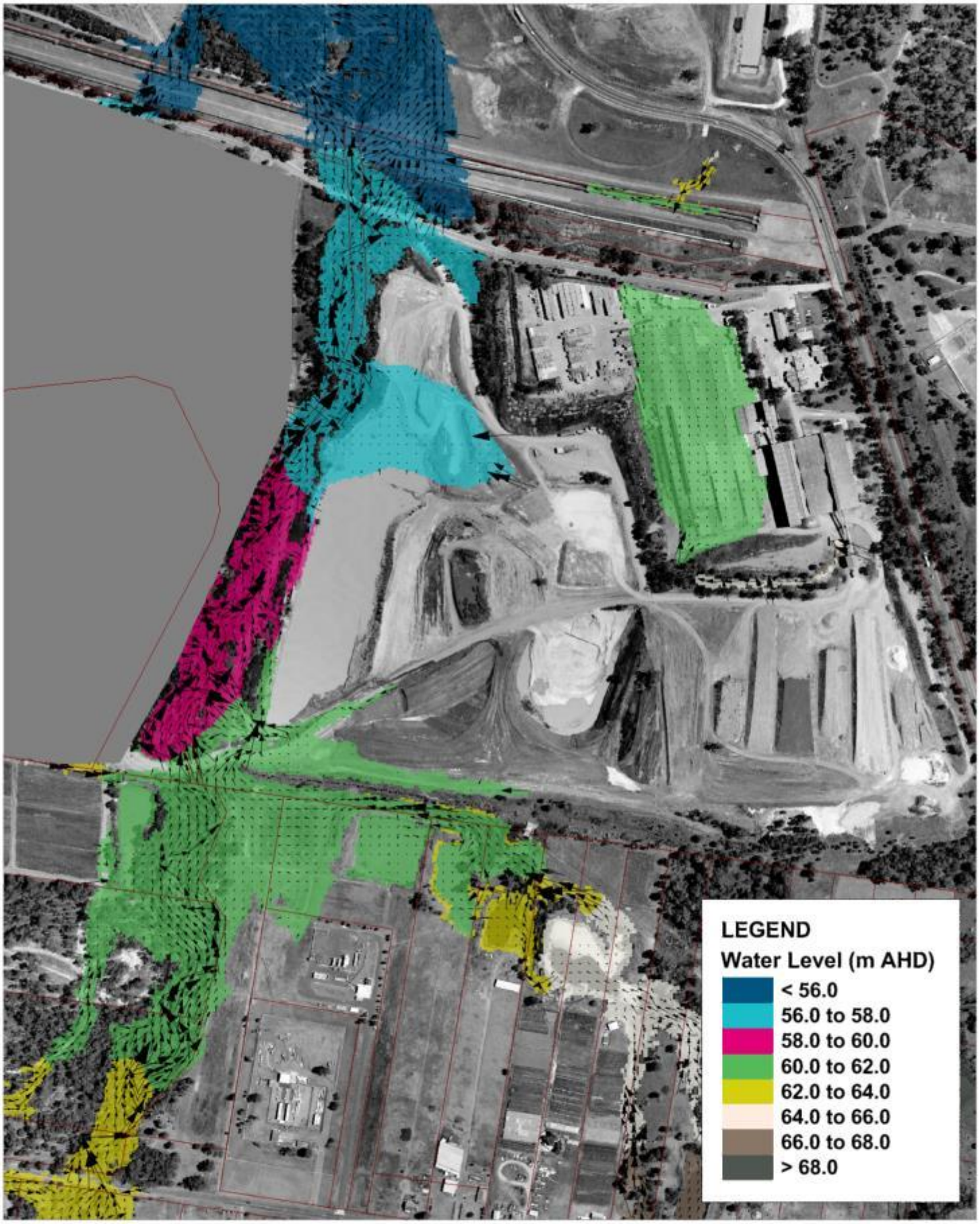
Filepath : S20149\M1\Workspaces\FigureB06_PMF_VD.wor

Appendix C Peak Water Level Mapping



Title:

Pre Development -Peak Flood Level
5% AEP (20 yr ARI)

Figure: C-1

Rev: -

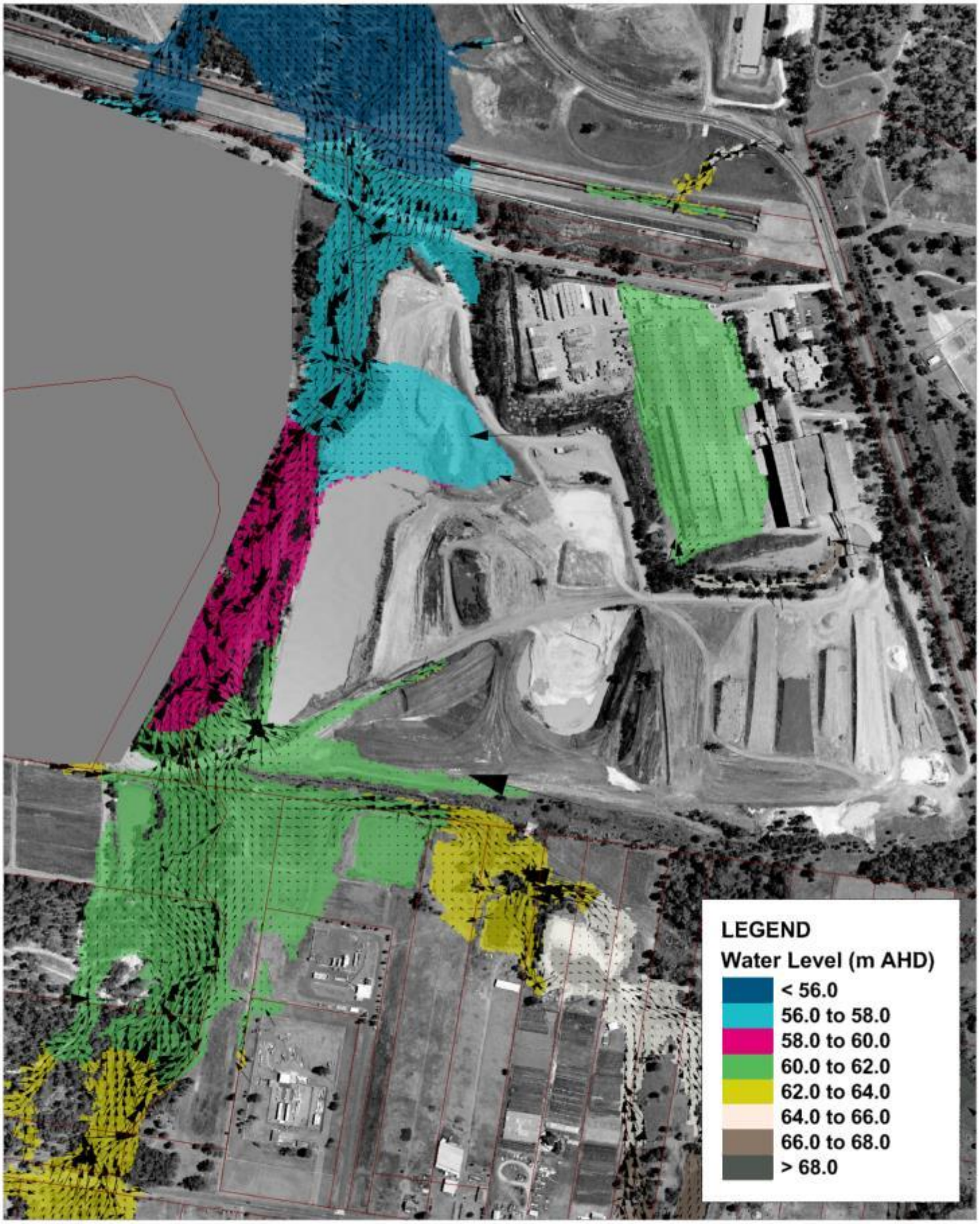
N

0 125 250m

Approx. Scale

BMT WBM
www.bmtwbm.com.au

Filepath : S20149\MI\Workspaces\FigureC01_020YR_Level.wor



Title:

Pre Development -Peak Flood Level 1% AEP (100 yr ARI)

Figure: C-2

Rev: -

N

0 125 250m

Approx. Scale

BMT WBM
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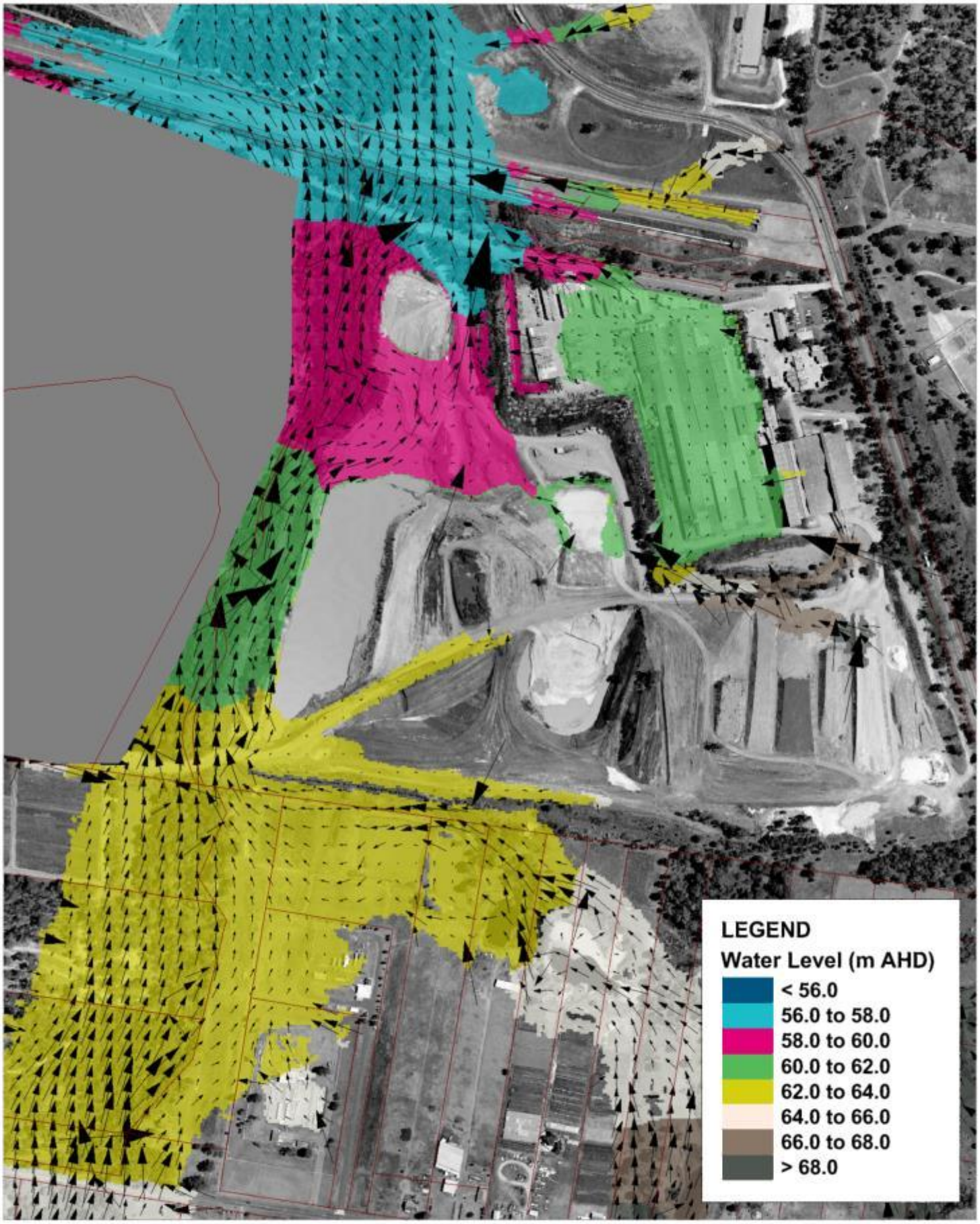
Filepath : S20149\MI\Workspaces\FigureC02_100YR_Level.wor



Title:

Pre Development -Peak Flood Level
Probable Maximum Flood (PMF)

Figure: C-3

Rev: -

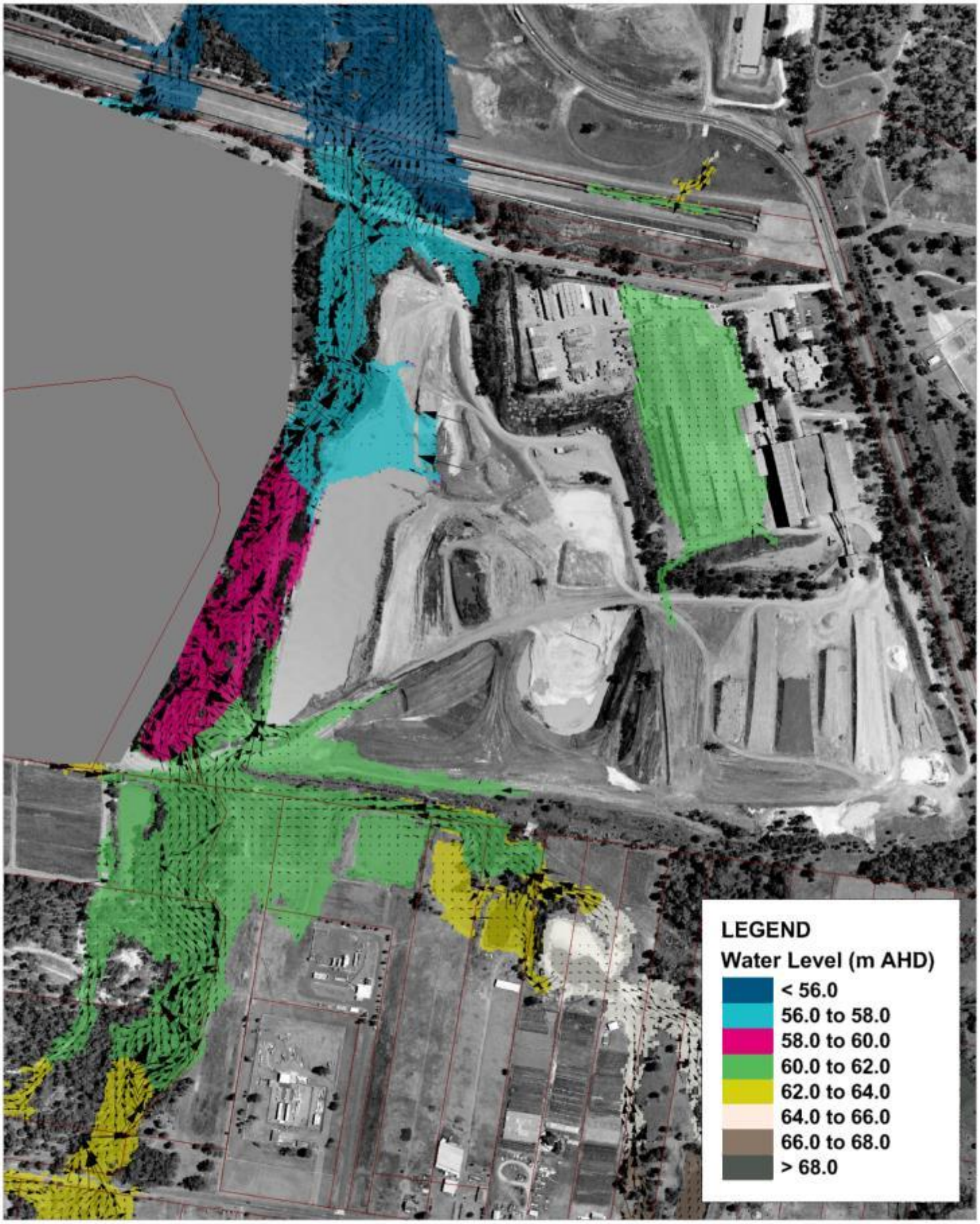
N

0 125 250m

Approx. Scale

BMT WBM
www.bmtwbm.com.au

Filepath : S20149\MI\Workspaces\FigureC03_PMF_Level.wor



Title:

Post Development It2 -Peak Flood Level 5% AEP (20 yr ARI)

Figure: C-4

Rev: -

N

0 125 250m

Approx. Scale

BMT WBM
www.bmtwbm.com.au

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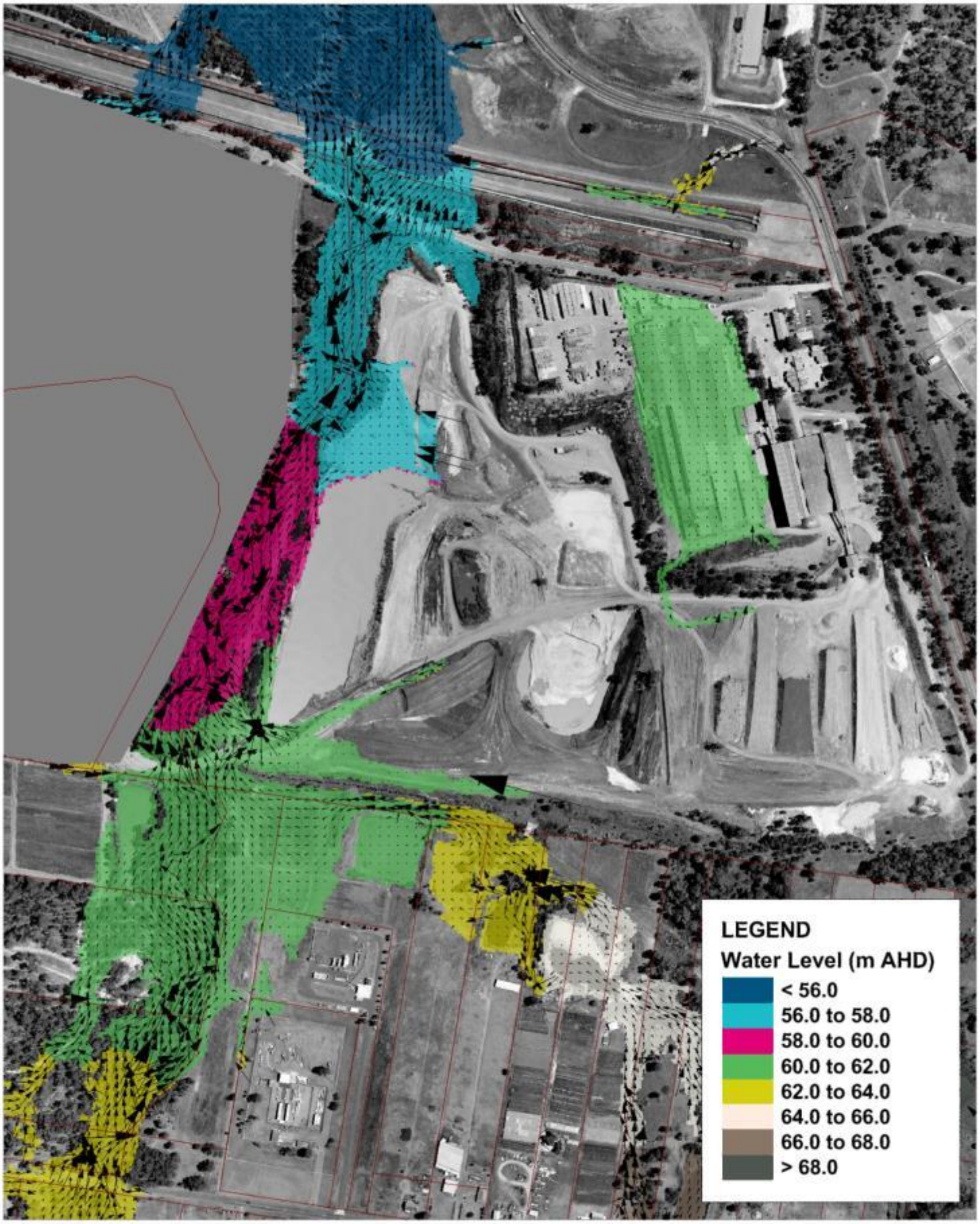

Title:

Post Development It2 -Peak Flood Level 1% AEP (100 yr ARI)

Figure: C-5

Rev: -

N

0 125 250m

Approx. Scale

BMT WBM
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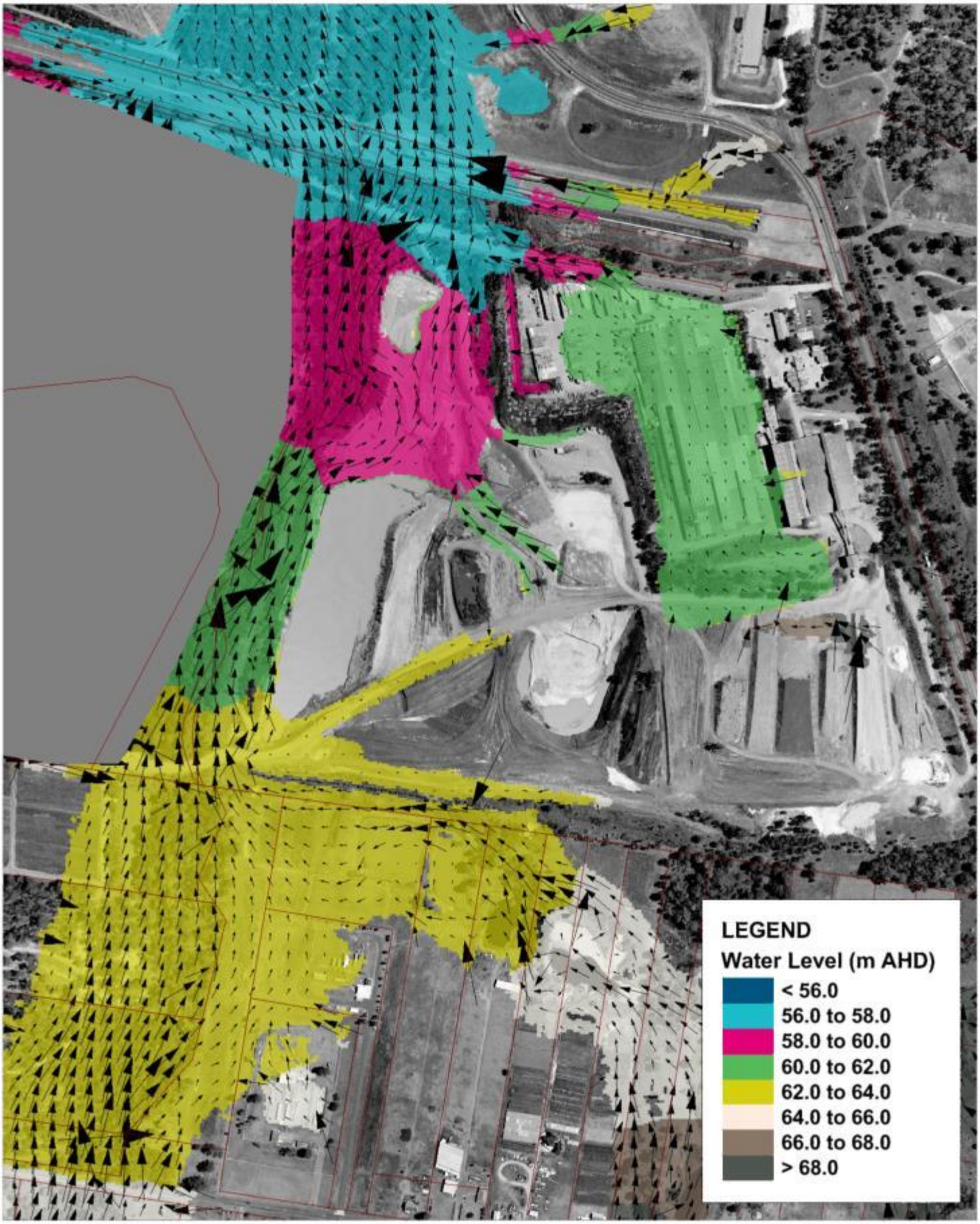
Filepath : S20149\MI\Workspaces\FigureC05_100YR_Level.wor



Title:

Post Development It2 -Peak Flood Level
Probable Maximum Flood (PMF)

Figure: C-6

Rev: -

N

0 125 250m

Approx. Scale

BMT WBM
www.bmtwbm.com.au

Filepath : S20149\M1\Workspaces\FigureC06_PMF_Level.wor