been assumed. A runoff coefficient of 0.4 has been retained for those sections of the catchment without vegetation coverage. Effected sub-catchments include D1, D2 and D3.

5. A run-off coefficient of 0.5 has been applied to sections of roads within each catchment. This predominantly affects sub-catchment M2, which includes a 0.6ha area of the Quarry Access Road (based on a length of 600m (from the top of the ridge at the boundary of sub-catchments M2 and D3) and a width of 10m) and sub-catchment D1, which includes a 0.3ha area of the Quarry Access Road (based on a length of 300m (from the boundary of sub-catchments M2 and D1 and a width of 10m).

Table 5.7 presents the calculated annual average surface water runoff within the sub-catchments contributing to the water balance. Runoff has been calculated by GSS Environmental based on the area contained within each catchment, annual rainfall to determine the volume of water falling within the catchment and runoff coefficient which determines the proportion of this water which is not captured by soil, vegetation etc. of the catchment, eg. Coefficient of 0.1 indicates only 10% of total water is not captures within the catchment. In cases where several runoff coefficients are identified within a catchment, the runoff for the proportional area of each is used.

Table 5.7
Annual Average Runoff

Catchment	Area (ha)	Runoff Coefficient	Storage / Settlement Structure	Runoff* (ML) Dry Year	Average Year	Wet Year
Primary Water Storage (Dirty Water)						
D1/D2	12.4	0.2/0.4/0.5	SeD1 / SeD2	17.8	24.9	32.4
D3	8.9	0.4	SD3 / SD4	21.8	30.6	39.8
D4	4.6	0.4	SeD3	11.3	15.8	20.6
M2 (including 0.6ha of Quarry Access Road)	3.5	0.2 / 0.5	SD2	5.4	7.6	9.8
M5	13.1	0.2	SD3 / SD4	4.9	6.9	8.9
Total		-		**61.2**	**85.8**	**111.5**
Additional Water Storage (Clean Water)						
C2	17.2	0.1	SD1	10.5	14.8	19.2
M6 (including 0.35ha of Site Access Road)	56.0	0.2/0.5	SD6 / SD7	56.2	78.8	102.6
Total				**66.7**	**93.6**	**121.8**
			TOTAL WATER STORAGE	***127.9***	***179.4***	***233.3***
*Source: GSS Environmental						

5.4.5 Water Balance

Based on the estimated site water requirements presented in Section 5.4.2, and the calculated volume of water available in dry, average and wet years, a preliminary water balance suggests the quarry site will operate with a significant water surplus. **Table 5.8** presents the calculated annual average surface water runoff, usage and storage of water on the Site to provide a preliminary water balance.

Table 5.8
Water Balance for Dry, Average and Wet Years

	Preliminary Water Balance (Runoff – Usage – Primary Storage Capacity) (ML)		
	Dry Year	Average Year	Wet Year
Runoff (ML)	61.2	85.8	111.5
Usage (ML)	34.6	34.6	34.6
Primary Storage Capacity (ML)	7.9	7.9	7.9
Preliminary Water Balance	**+18.7**	**+43.4**	**+69.1**

The water balance of **Table 5.8** assumes that rainfall and runoff over the course of the year will be consistent leading to water being constantly available for operational use. In reality, and despite the fact that local rainfall is relatively evenly distributed through the year, the Austen Quarry will experience periods of heavier rainfall resulting in the need to discharge treated water from the quarry site, and dry periods when water may need to be drawn from the additional, clean water storage. During periods of extended drought, up to 20ML of water will be pumped from the Coxs River to meet the operational requirements of the quarry.

Based on the water balance presented within **Table 5.8**, it is expected that during wet years, or following particularly heavy rainfall, water discharge to the Coxs River is likely.

5.4.6 Water Balance Review

Given the lack of data on the response of storage structures to rainfall events, as well as the relatively small capacity of water storage structures, the preliminary water balance presented in **Table 5.8** is a relatively simplistic input/output water balance. Anecdotal evidence supplied by Austen Quarry site personnel suggests that this water balance may overestimate the quantity of water available from surface water run-off, ie. the run-off coefficients are generally too high, and/or underestimate the volume of water used for operational and dust suppression purposes.

As such, it is therefore imperative that the water balance is reviewed each year based on site specific values for rainfall, run-off and water use. To obtain these site specific values, detailed records are kept of:

- daily rainfall and rainfall intensity;
- the volume of water maintained within the water storage and settlement structures, especially following rainfall events;
- water usage on the quarry site; and
- volumes of water transferred between the various water storages and/or discharged to the Coxs River.

The water balance will therefore be reviewed and refined annually based on the site specific data collected. This annual review, and the necessary data collection, will continue until such time as variation in the water balance is reduced to a satisfactory level.

5.4.7 Water Storage, Transfer and Discharge

Figure 5 presents, in flow chart form, the inter-relationship between the various water storages of the quarry site. As far as practicable, the clean and dirty water systems will remain segregated from each other, although in order to retain sufficient capacity with the settlement structures of the quarry site, it may be necessary for dirty water retain within SeD1 and SeD2 to be transferred to SD6 and SD7.

The transfer of water between the various storages will be via four main pipelines, as follows.

(i) Southern Main Line – which allows for water captured within SeD3 and the Quarry Sump to be pumped and/or gravity fed to SD3. The Southern Main Line also incorporates the linking of a water storage tank above the pit (see **Figure 2a**) and the water usage points within the extraction area. Head pressure created by gravity from the water storage tank to the water usage points within the extraction area will initiate a pump to draw water from SeD3, the Quarry Sump of SD4 for operational use.

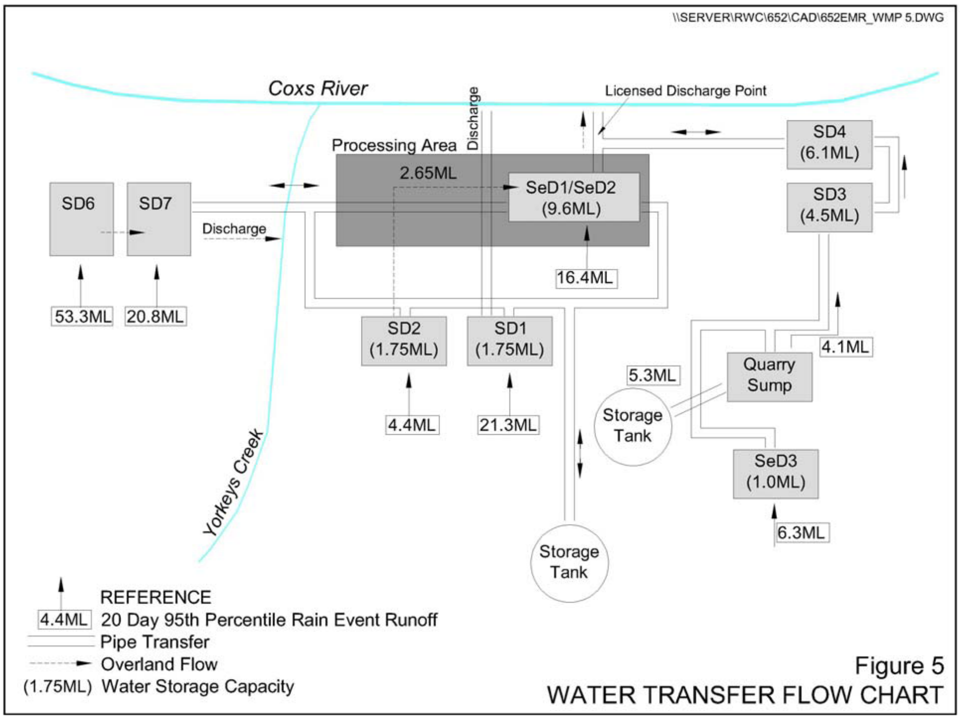

Figure 5
WATER TRANSFER FLOW CHART

(ii) Eastern Main Line – which allows for the transfer of water between SD3 / SD4 and the processing area (including water storages of SeD1, SeD2, SD1 and SD2, water usage points and the Ring Main Line).

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(iii) Ring Main Line – links the Eastern Main Line and the Western Main Line with the various water storages of the processing area and a water storage tank located above the processing area (see **Figure 2a**). Head pressure created by gravity from the water storage tank to the water usage points of the processing area will initiate a pump to draw water from the primary or additional water storages for operational use.

(iv) Western Main Line – links SD6 and SD 7 with the Ring Main Line and the various water storages and usage points of the processing area. The draw of water through this line may either be gravity or pumping on the processing area.

Water will be transferred between water storages to ensure that sufficient storage capacity is retained in the settlement structures to prevent the discharge of dirty water from the quarry site[3].

Table 5.9 presents the required capacity of the primary settlement storages of the dirty water sub-catchments to retain runoff from the 20 day 90th percentile rain event.

Table 5.9
Settlement Storage Capacity, 20 Day 95th Percentile Event

Storage Dam	Current Capacity (ML)	Required Capacity (ML)	Differential
SD2	1.75#	1.3	+0.45
SD3	4.5	12.6	-8.1
SeD1	9.6	4.9	+2.7
SeD2		2	
SeD3*	<1	3.7	>-2.7

Note #: Estimated size based on dam design of EIS (SKM, 1994).
Note *: Water captured within this structure has also been incorporated into that of SD3, as this includes water from the sub-catchments of D3 and D4. .

Source: GSS Environmental

Based on the runoff expected during and following a 20 day 95th percentile rainfall event, SD3 is the critical structure as this is predicted to overflow during and following such an event. It is noted however, that additional storage capacity would be retained within SeD1 / SeD2 (2.7ML) and potentially within SD4 (6.1ML), which would be sufficient to hold the 8.1ML exceedance predicted by the calculations of GSS Environmental. Under conditions of, or similar to, the 20 day 95th percentile rainfall event, water within the dirty water storages will be managed as follows.

(i) Treated (flocculated) water within SD4 will pumped to the licensed discharge point and discharged to the Coxs River.

(ii) At this time a water sample will be taken from SD 4, immediately downstream of the discharge point and at the Coxs River top and bottom crossing monitoring sites.

(iii) SD4 will be emptied until such time as capacity is reduced to approximately 20% of the total capacity of SD4.

(iv) Once emptied, water will be allowed to overflow from SD3 via a grass lined spillway into SD4.

[3] As clean water will not result in the discharge of sediment laden water to the Coxs River, there is no requirement to retain capacity within the water storages of the clean water catchments.

(v) In the event the volume of water held within of SD4 approaches capacity again, the Eastern Main Line will be transferred from SD 4 to SD3 to allow overflowing water to be pumped to SeD1 and SeD2 where additional capacity is available. In this event, the water with SD4 will be treated again such that an additional discharge may be undertaken to further alleviate pressure on the storage capacity of the quarry site.

(vi) Following the cessation of the 20 day 95th percentile rainfall event or similar, water from SD3 and SeD1 / SeD2 will be pumped to SD4 for treatment and discharge to maximise the storage capacity of the quarry site.

Information provided by Austen Quarry personnel has indicated that high intensity, high rainfall events do occur at the quarry site, as evidenced by the 1 in 150 ARI event (Parsons Brinkerhoff, 2005). Under these events, the most vulnerable point of the quarry site is the processing area, given the relatively high degree of disturbance, its location at the bottom of several sub-catchments and the proximity of the Coxs River. The processing area bund wall was therefore designed and constructed to ensure that such a high intensity rain event does not result in the overflow of SeD1 / SeD2 and therefore uncontrolled discharge of dirty water to the Coxs River. Based on a 1 in 100 72 hour ARI rain event, GSS Environmental determined that up to 42.1ML of water would report to the processing area. Of this, 21.3ML would be supplied by sub-catchment C2, which as a clean water catchment and can be discharged directly to the Coxs River. 4.4ML would be supplied by sub-catchment M2, of which approximately 1.75ML would be held within SD2. The remaining 16.4ML would be supplied by sub-catchments D1 and D2 and report directly to the processing area. Under a 1 in 100 72 hour ARI event, and assuming SeD1 / SeD2 were effectively empty, water would cover the processing area to a height of 300mm, well below the 1m bund height created by the processing area bund wall.

Following such an event, water would need to be pumped to, treated and discharged from SD4 twice to remove the water from the operational area of the processing pad, and a further time to empty SeD1 / SeD2 in preparedness for the design rainfall event (20 day 95th percentile rainfall event) or another 1 in 100 72 hour ARI event.

6 EROSION AND SEDIMENT CONTROL PLAN

6.1 Sources of Erosion and Sedimentation

During to the operation of the Austen Quarry, erosion and sedimentation could potentially result directly or indirectly from:

(i) surface water runoff from areas cleared and/or stripped of overburden in advance of extraction;

(ii) surface water runoff from disturbed areas below the downhill conveyor;

(iii) surface water runoff from topsoil, subsoil and overburden stockpiles and emplacements prior to rehabilitation;

(iv) surface water runoff from the processing area;

(v) surface water runoff from rehabilitated areas prior to full stabilisation;

(vi) discharges of water at erosive velocities; and

(vii) runoff from roads at erosive velocities.

Elevated winds may also result in erosion from exposed surfaces.

6.2 Erosion and Sediment Control Management

6.2.1 Introduction

The control of erosion will be primarily achieved by managing runoff at non-erosive velocities, through minimising the area of cleared or disturbed land and by providing adequate protection to exposed soil surfaces, eg. soil stockpiles, newly constructed bunds. Ultimately however, it will not be possible to prevent some soil particles, especially over the more disturbed areas of the site, from being captured either by wind or surface water flows and management will then focus on ensuring the majority of this captured sediment is trapped and contained prior to discharge from the quarry site.

The following sub-sections summarise the general principles of erosion and sediment control management of the Austen Quarry. Where management principles and practices have been previously described in Section 5.3, these are noted but not described in detail.

6.2.2 Minimising and Managing Site Disturbance

As far as practicable, areas ahead of quarry site or construction related disturbances are to be minimised at any one time. Additionally, cut and fill associated with road construction activities is to be minimised. Cut and fill activities, for road construction, will be managed as follows.

Cut Batters

All cut batters are to be constructed with a slope not exceeding 1:2 (V:H) as the application and binding of topsoil to slopes of a steeper slope is difficult. By leaving the cut batter with a rough scarified or track-walked surface (along the contour), a 'key' for the topsoil to be applied is created which will minimise the potential for the soil to be mobilised by wind or water flows. On all cut slopes, a topsoil layer of approximately100mm is to be applied with either seed of a stabilising cover crop sown or mulch treatment provided as soon as practicable after soil respreading.

Fill Batters

Fill batters, including the overburden emplacement surface, should not exceed 1:2.5 (V:H) in slope and should be thoroughly compacted before the topsoil is applied.

One major potential problem is the scouring caused by water runoff flowing over the fill slopes. In areas of low fill (less than 600mm) it is best to accept the risk and repair the rills as necessary. If the batters are higher than this, however, the batter should be protected with a diversion bank along the top edge of the batter (see Section 5.3.3.2).

The use of subsoils obtained from the quarry site should be avoided as the higher clay percentage and dispersibility of these soils will increase the risk of erosion and sedimentation.

Where the predominant medium of the batter is competent rock, the topsoil layer is to be limited to that required to fill in the gaps between the rocks.

6.2.3 Soil Management

Minimising the area of soil exposed to surface water flows, either as cleared surfaces ahead of extraction, soil stockpiles or respread soils over rehabilitated surfaces, is the primary aim of soil management. The secondary aim is to provide exposed soils with adequate protection to minimise disturbance caused by surface water flows. These aims are achieved by implementing the BMPs of Section 5.2.

6.2.4 Clean Water Diversion

By diverting clean water, ie. water flowing over undisturbed areas of the quarry site, away from the active areas of disturbance and directing this water either to water storages or discharge points at non-erosive velocities, this risk is greatly reduced. Structures used at the Austen Quarry to divert and store clean water include Diversion Banks (Section 5.3.3.2), Level Spreaders (Section 5.3.3.3), Culverts (Section 5.3.3.4), Spoon Drains (Section 5.3.3.5) and Clean Water Storages (Section 5.3.3.6).

6.2.5 Dirty Water Capture and Settlement

Water flowing over disturbed / exposed surfaces is likely to pick up significant quantities of sediment and as a result cause gully or sheet erosion. By diverting these water flows via specifically constructed structures such as Catch Banks (Section 5.3.4.2), Waterways (Section 5.3.4.2), Drop-down batter drains (Section 5.3.4.3), to sediment dams and basins (Section 5.3.4.4) the flow of water will be controlled and provided time to settle out the suspended solids prior to discharge (if required).

6.2.6 Water Discharge Protection

To ensure any water exiting the quarry site meets the water quality objective for suspended sediment of 30mg/L, sediment fencing or straw bale protection is to be installed and regularly monitored and maintained downstream of natural discharge points of the quarry site with minimal upstream disturbance, or where minor construction works are being undertaken.

6.2.7 Progressive Rehabilitation and Re-establishing Vegetative Cover

As the quarry site, overburden emplacement and processing area bund wall develop, these will be progressively rehabilitated through the replacement of topsoil and revegetation with native tree, shrub and grass species. Soil replacement will be managed as the relevant BMPs presented in Section 5.2.

Disturbed areas such as road side verges, cut and fill batters constructed around quarry site roads and hard stand areas and other temporary areas of disturbance such as soil stockpiles will be stabilised in accordance with *Procedure No. 6 - Site Stabilisation and Short Term Rehabilitation.*

6.2.8 Environmental Training

Crucial to the management of erosion and sediment control is the provision of adequate training for on-site personnel responsible for constructing and installing erosion and sediment control structures and operating machinery within and around these structures. It will be the responsibility of the quarry manager to ensure that all personnel are aware of their responsibilities to reduce the risk of erosion and sedimentation on the quarry site. To assist in ensuring all relevant personnel have the appropriate knowledge and training, key procedures have been developed as follows.

1. Road Construction.
2. Land Preparation (Vegetation Clearing and Soil Stripping).
3. Soil Management.
4. Erosion and Sediment Control Structure Construction.
5. Erosion and Sediment Control Structure Maintenance.
6. Site Stabilisation and Short-Term Rehabilitation.
7. Dust Suppression.
8. Hydrocarbon Storage Management.
9. Hydrocarbon Spill Response Plan.

E1. Surface Water Monitoring

6.2.9 Monitoring and Maintenance

6.2.9.1 Water Management (Erosion and Sediment Control) Structures

One or more quarry site personnel are to hold the responsibility for regularly inspecting the water management (erosion and sediment control) structures of the site. On a fortnightly basis (minimum), or following a rainfall event of >25mm/24hr, the assigned personnel is to note the general condition and effectiveness of each of these structures. By numbering the different structures, the potential for confusion over referencing is avoided.

The erosion and sediment control structures will be cleaned of accumulated sediment material (or extended or replaced) as soon as 20% capacity is lost due to the accumulation of material such that the specified capacities are maintained.

The results of the fortnightly inspections are to be provided to the quarry manager who will then provide instruction as to any remedial works to be undertaken or construction / installation of additional structures or sediment protection.

Procedure No. 5 - Erosion and Sediment Control Maintenance provides greater details on the monitoring and maintenance to be undertaken.

6.2.9.2 Rehabilitation and Revegetation

Maintenance of at least 70% grass cover over quarry site surfaces will significantly reduce the potential for erosion and sedimentation from these. Quarry site management, or other nominated site personnel, will periodically inspect previously cleared surfaces for grass or other vegetation establishment. Where grass or other vegetation establishment does not attain the objective 70% cover, supplementary seeding or planting will be undertaken at the first practicable opportunity.

Procedure No. 6 - Site Stabilisation and Short-Term Rehabilitation provides further detail on maintenance and monitoring to be undertaken.

6.2.9.3 Water Quality Monitoring

As part of a surface water monitoring program, and prior to water discharge from the licensed discharge point, the water will be sampled and compared visually to a sample chart held by ABL's Environmental Officer. If the visual assessment determines the water is of suitable quality for discharge, the sample will be sent to a NATA accredited laboratory and analysed for pH, suspended sediment, electrical conductivity and hydrocarbon content.

7 SURFACE WATER MONITORING PROGRAM

7.1 Introduction

This **Surface Water Monitoring Program (SWMonP)** has been prepared in compliance with *Condition 18(b)* and includes:

(i) surface water impact assessment criteria; and

(ii) a program to monitor:

a. the quality of water contained in, or discharged from, water storages (including the mining void) associated with the mine;

b. surface water quality upstream and downstream of the mine site; and

c. the effectiveness of the ESCP.

This SWMonP has been prepared to complement *Procedure No. E1 – Surface Water Monitoring*.

7.2 Impact Assessment Criteria

Impact assessment criteria for surface water are only relevant to water discharged from the licenced discharge point.

Recorded values for pH, Total Suspended Solids (TSS), Electrical Conductivity (EC) and Biochemical Oxygen Demand from water discharged from the Austen Quarry will be compared against the criteria presented in **Table 7.1**.

Table 7.1
Assessment Criteria

Parameter	Unit of measure	100% concentration limit
Total Suspended Solids	mg/L	30
Electrical Conductivity	µS/cm	1 500
Biochemical Oxygen Demand		20
pH	pH	6.5 – 8.5

The recorded values for any other parameters measured will be plotted to identify any trends over time. The DEC will be notified in the event of increasing levels of any parameter.

7.3 Monitoring Locations

The location of all surface water monitoring points are presented on **Figure 7** and have been chosen for four purposes.

(i) To ensure discharged water meets the assessment criteria of **Table 7.1**.

(ii) To assess whether the quarry site may be having any impact on the water quality of the Cox's River.

(iii) To identify the quality of water held in various quarry site water storages.

(iv) To assess the effectiveness of erosion and sediment control measures.

Table 7.2 identifies the monitoring point locations, the type of monitoring point along with a brief description (where relevant) of the location and frequency.

Table 7.2
Monitoring Locations

Location	Type of Monitoring Point	Description of Location	Frequency
EP Licenced Discharge Point*	Water Quality	Sediment Dam licensed to discharge to Cox's River	Prior to any proposed discharge
Cox's River Top Crossing and Bottom Crossing*	Water Quality	Cox's River, upstream and downstream of the quarry site	Bi-monthly
Quarry site water storages*	Water Quality	All storage dams and the mining void on the mine site	Miscellaneous
Quarry site water management (erosion and sediment control) structures	Erosion and Sediment Control	All noted surface water management structures and areas of previously identified erosion or sedimentation.	Monthly
* see **Figure 6**			

7.4 Monitoring Parameters

Table 7.3 presents the parameters measured at each monitoring location.

Table 7.3
Monitoring Locations

Location	Parameters		Sampling Method
EP Licenced Discharge Point	Total Suspended Solids		Representative sample
	Biochemical Oxygen Demand		
	pH		
	Electrical Conductivity		
Quarry site water storages	Total Suspended Solids		
	Biochemical Oxygen Demand		
	pH		
	Electrical Conductivity		
Cox's River Top Crossing and Bottom Crossing	pH	Chloride mg/L	Representative sample
	Total Suspended Solids mg/L	Iron (filterable) mg/L	
	Total Dissolved Solids mg/L	Potassium mg/L	
	Specific Conductance µS/cm	Magnesium mg/L	
	CO3 (as CaCO3) mg/L	Manganese mg/L	
	HCO3 (as CaCO3) mg/L	Sodium mg/L	
	OH (as CaCO3) mg/L	Sulfur (as SO4) mg/L	
	Calcium mg/L	Total Hardness (as CaCO3) mg/L	

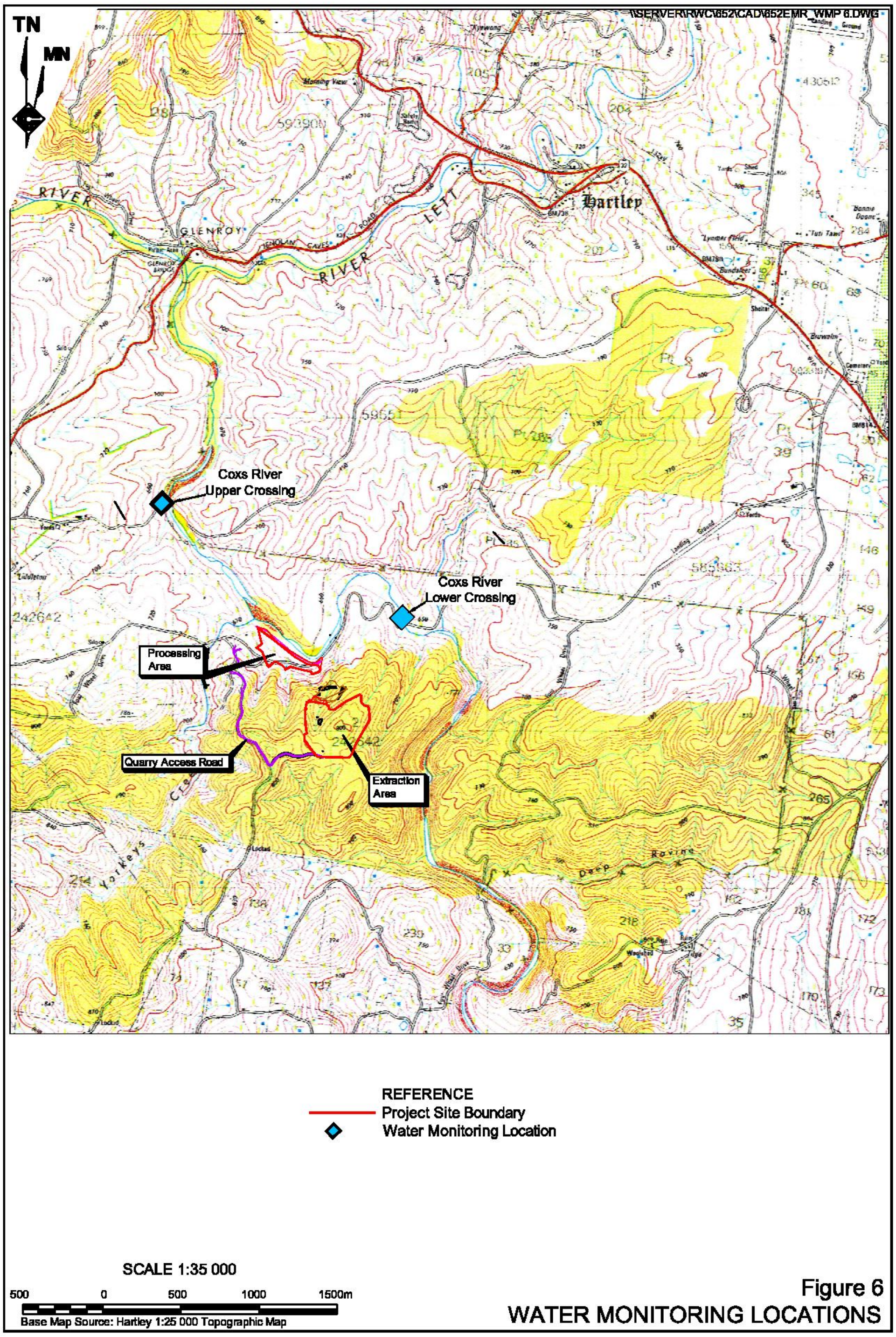

Figure 6
WATER MONITORING LOCATIONS

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APPENDICES

Appendix 1	**Generalised Design and Construction Notes: Earth Bank (High and Low Flow) (3 pages)**
Appendix 2	**Generalised Design and Construction Notes: Catch Drains (1 page)**
Appendix 3	**Generalised Design and Construction Notes: Energy Dissipater (1 page)**
Appendix 4	**Generalised Design and Construction Notes: Earth Basin – Wet (2 pages)**
Appendix 5	**Generalised Design and Construction Notes: Temporary Waterway Crossing (1 page)**
Appendix 6	**Generalised Design and Construction Notes: Sediment Fence (1 page)**
Appendix 7	**Generalised Design and Construction Notes: Straw Bale Filter (1 page)**

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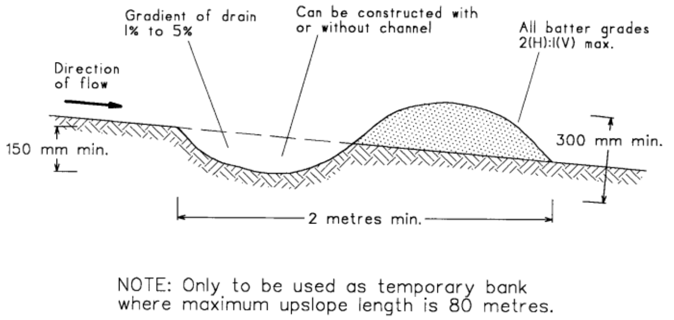
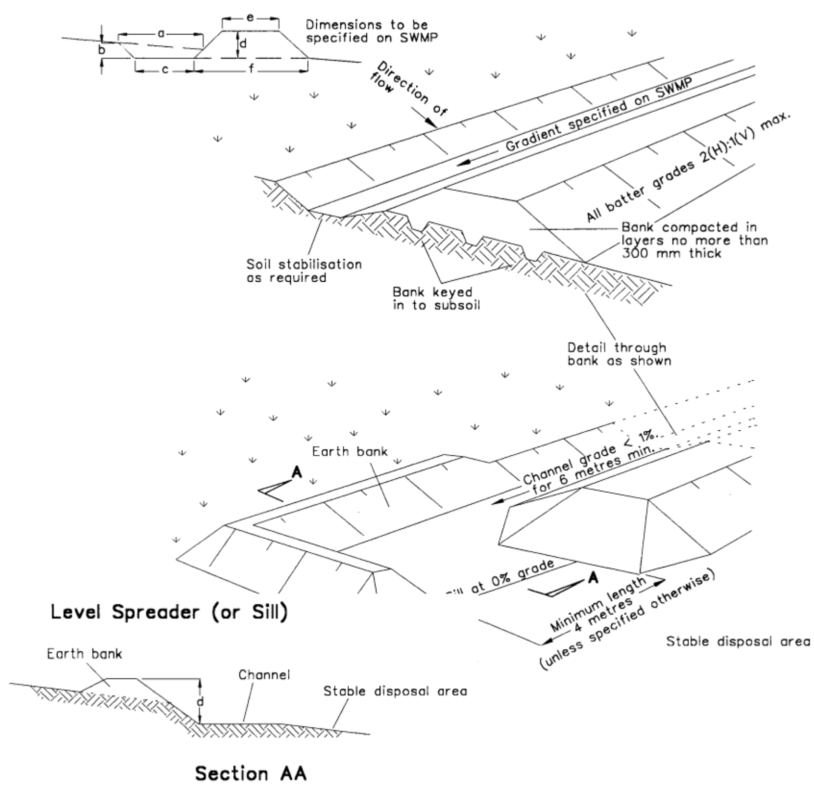
APPENDIX 1



EARTH BANK (LOW FLOW) SD5-2

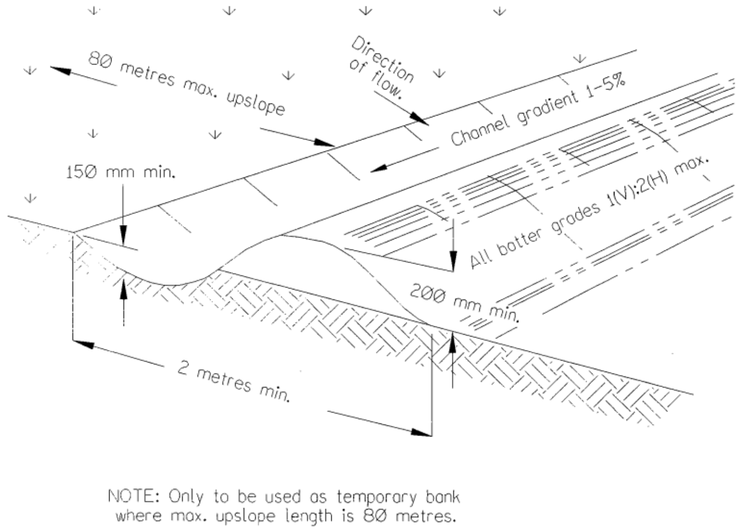
1. Construct with gradient of 1 per cent to 5 per cent.
2. Avoid removing trees and shrubs if possible.
3. Drains to be of circular, parabolic or trapezoidal cross section not V-shaped.
4. Earth banks to be adequately compacted in order to prevent failure.
5. Permanent or temporary stabilisation of the earth bank to be completed within 10 days of construction.
6. All outlets from disturbed lands are to feed into a sediment basin or similar.
7. Discharge runoff collected from undisturbed lands onto either a stabilised or an undisturbed disposal site within the same subcatchment area from which the water originated.
8. Compact bank with a suitable implement in situations where they are required to function for more than five days.
9. Earth banks to be free of projections or other irregularities that will impede normal flow.



EARTH BANK (HIGH FLOWS) SD 5-3

1. Construct along gradient as specified.
2. Avoid removing trees and shrubs if possible.
3. Drains to be of parabolic or trapezoidal cross section as opposed to V-shaped.
4. Earth banks to be adequately compacted in order to prevent failure.
5. Permanent or temporary stabilisation of the earth bank to be completed within 10 days of construction.
6. All outlets from disturbed lands are to feed into a sediment basin or similar.
7. Discharge runoff collected from undisturbed lands onto either a stabilised or an undisturbed disposal site within the same subcatchment area from which the water originated.
8. Compact with a suitable implement in situations where they are required to function for more than five days.
9. Earth banks to be free to projections or other irregularities that will impede normal flow.

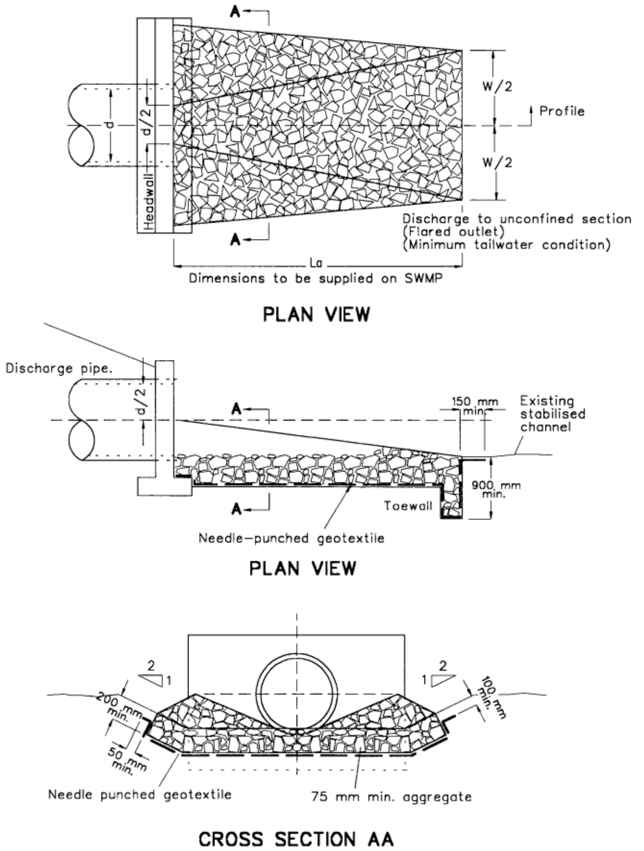
APPENDIX 2



CATCH DRAINS SD 5-8

1. Construct along gradient as specified.
2. Maximum spacing between banks shall be 80m.
3. Drains to be of parabolic or trapezoidal cross section not V-shaped.
4. Earth banks to be adequately compacted in order to prevent failure.
5. Construction is of a temporary nature and shall be completed at the end of days work or immediately prior to rain.
6. All outlets from disturbed lands are to feed into a sediment basin or similar.
7. Discharge runoff collected from undisturbed lands onto either a stabilised or an undisturbed disposal site within the same subcatchment area from which the water originated.
8. Compact with a suitable implement in situations where they are required to function for more than five days.
9. Earth banks to be free of projections or other irregularities that will impede normal flow.

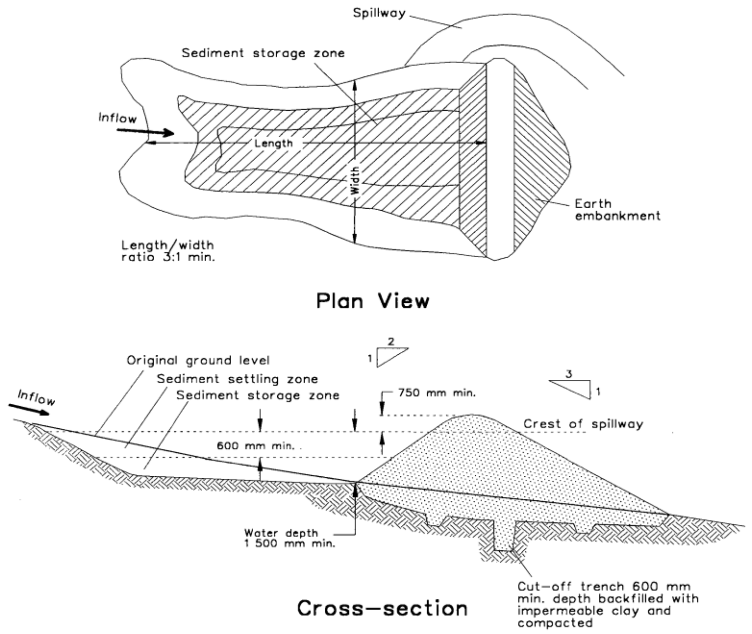
APPENDIX 3



ENERGY DISSIPATER SD 5-6

1. Subgrade fill to be compacted to the density of the surrounding undisturbed material.
2. Ensure that concrete or riprap used for energy dissipater or outlet protection conforms to the grading limits specified on the SWMP/ESCP.
3. Ensure that the geotextile does not sustain serious damage by preparing a smooth, even foundation.
4. Repair minor damage to the geotextile before spreading any aggregate. For repairs, patch one piece of fabric over the damage, making sure that all joints and patches overlap more than 300mm.

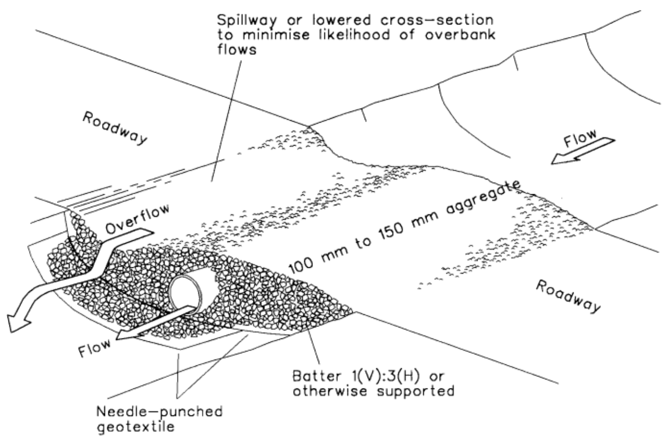
APPENDIX 4



EARTH BASIN –WET SD 6-4
(applies to *Type D* and *Type F* Soils only)

1. Remove all vegetation and topsoil from under the dam wall and from within the storage area.
2. Construct a cut-off trench 500mm deep and 1 200mm wide along the centreline of the embankment extending to a point on the gully wall level with the riser crest.
3. Maintain the trench free of water and recompact the materials with equipment specified in the SWMP to 95 per cent Standard Proctor Density.
4. Select fill according to the directions of the SWMP that is free of roots, wood, rock. Large stone or foreign material.
5. Prepare the site under the embankment by ripping at least 100mm deep to help bond compacted fill to existing substrate.
6. Spread fill in 100mm to 150mm layers and compact at optimum moisture content in accordance with the SWMP.
7. Construct emergency spillway.
8. Rehabilitate structure in accordance with the SWMP.
9. Place a “Full of Sediment” marker to show when less than design capacity occurs and sediment removal is required.

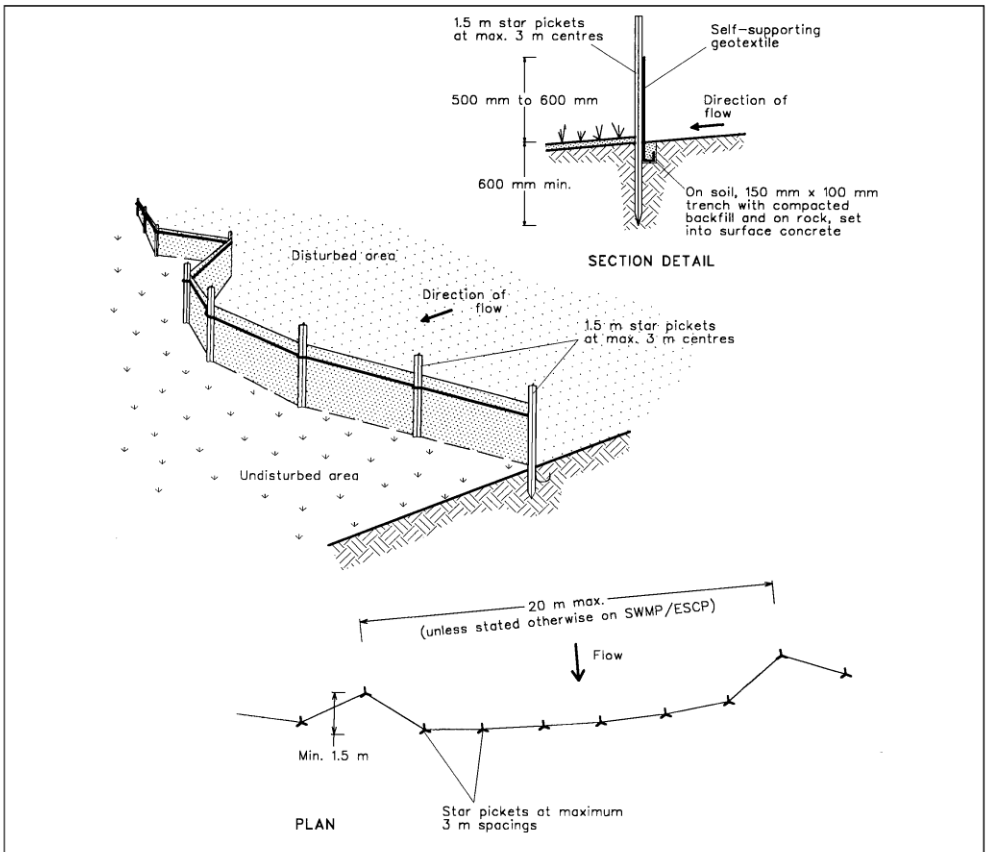
APPENDIX 5



TEMPORARY WATERWAY CROSSING SD 5-5

1. All traffic prohibited until access way is constructed.
2. Strip topsoil and place a needle punched textile over the base of the crossing.
3. Place clean rigid non-polluting aggregate or gravel in 100mm to 150mm class over fabric to a minimum depth of 200mm.
4. Provide 3 metre wide carriage way along with sufficient length of culvert pipe to all less than a 3(H):1(V) slope on side batters.
5. Ensure that culvert outlets extend beyond the toe of fill embankments.

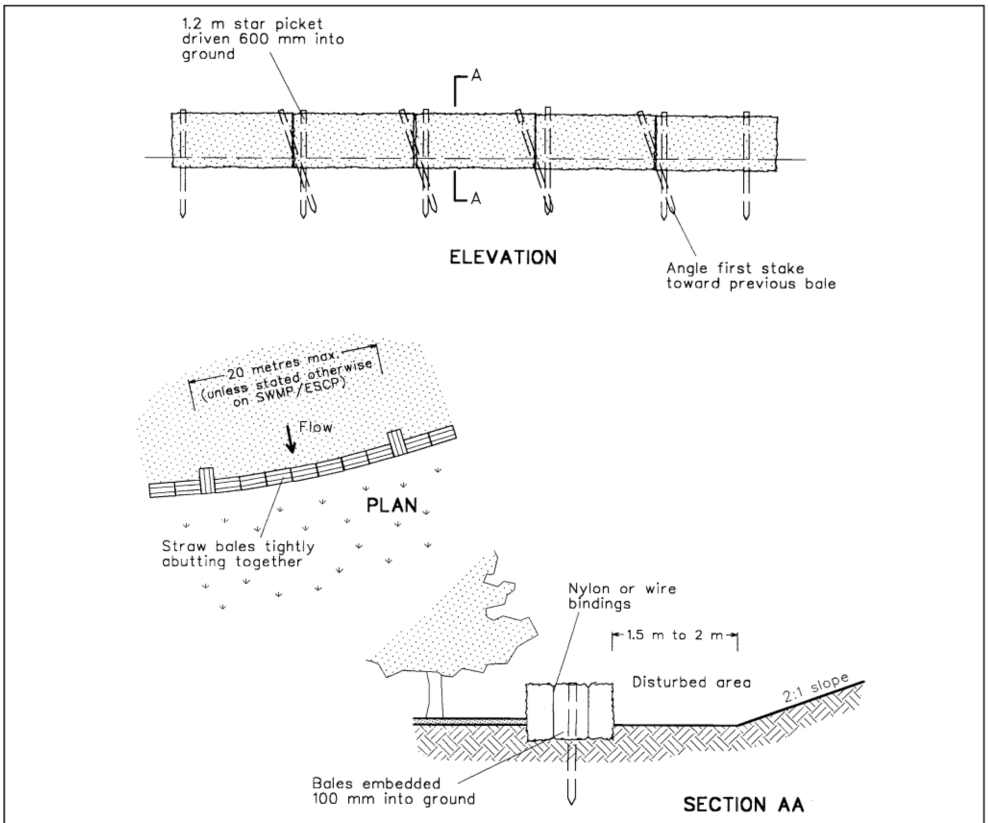
APPENDIX 6



SEDIMENT FENCE SD6-7

1. Construct sediment fence as close as possible to parallel to the contours of the site.

APPENDIX 7



STRAW BALE FILTER SD 6-6

1. Construct straw bale filter as close a possible to parallel to the contours of the site or at the toe of a slope.
2. Place bales lengthwise in a row with ends tightly abutting. Use straw to fill any gaps between bales. Straws to be placed parallel to ground.
3. Maximum height of filter is one bale.
4. On soft materials, embed each bale in the ground 75mm to 100mm and anchor with two 1.2m star pickets. Angle the first stake in each bale towards the previously laid bale. Drive stakes 600mm into the ground and flush with the top of the bales.
5. Where a straw bale filter is constructed downslope from a disturbed batter the bales should be located 1.5 to 2m downslope from the toe of the batter.

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figures

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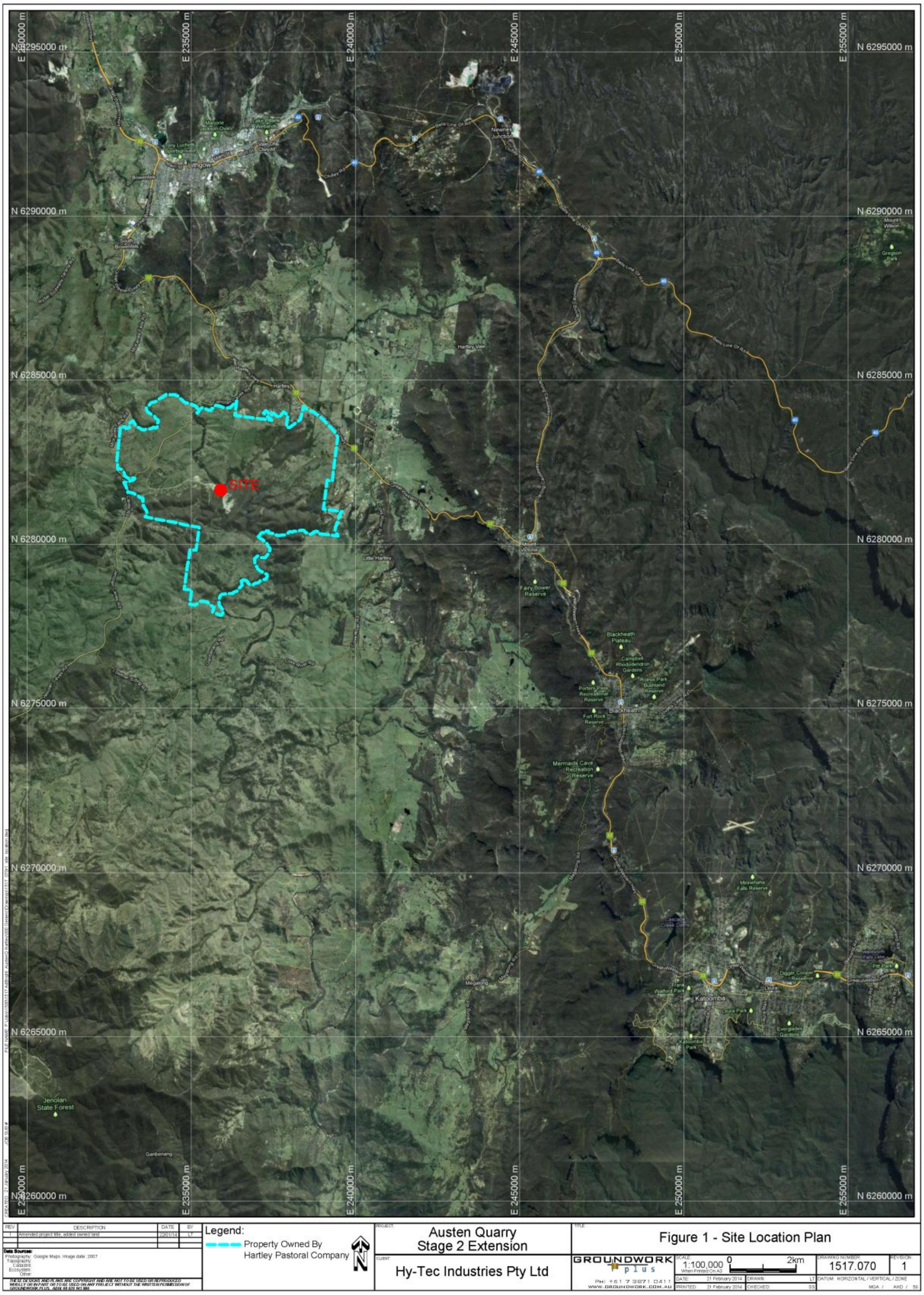
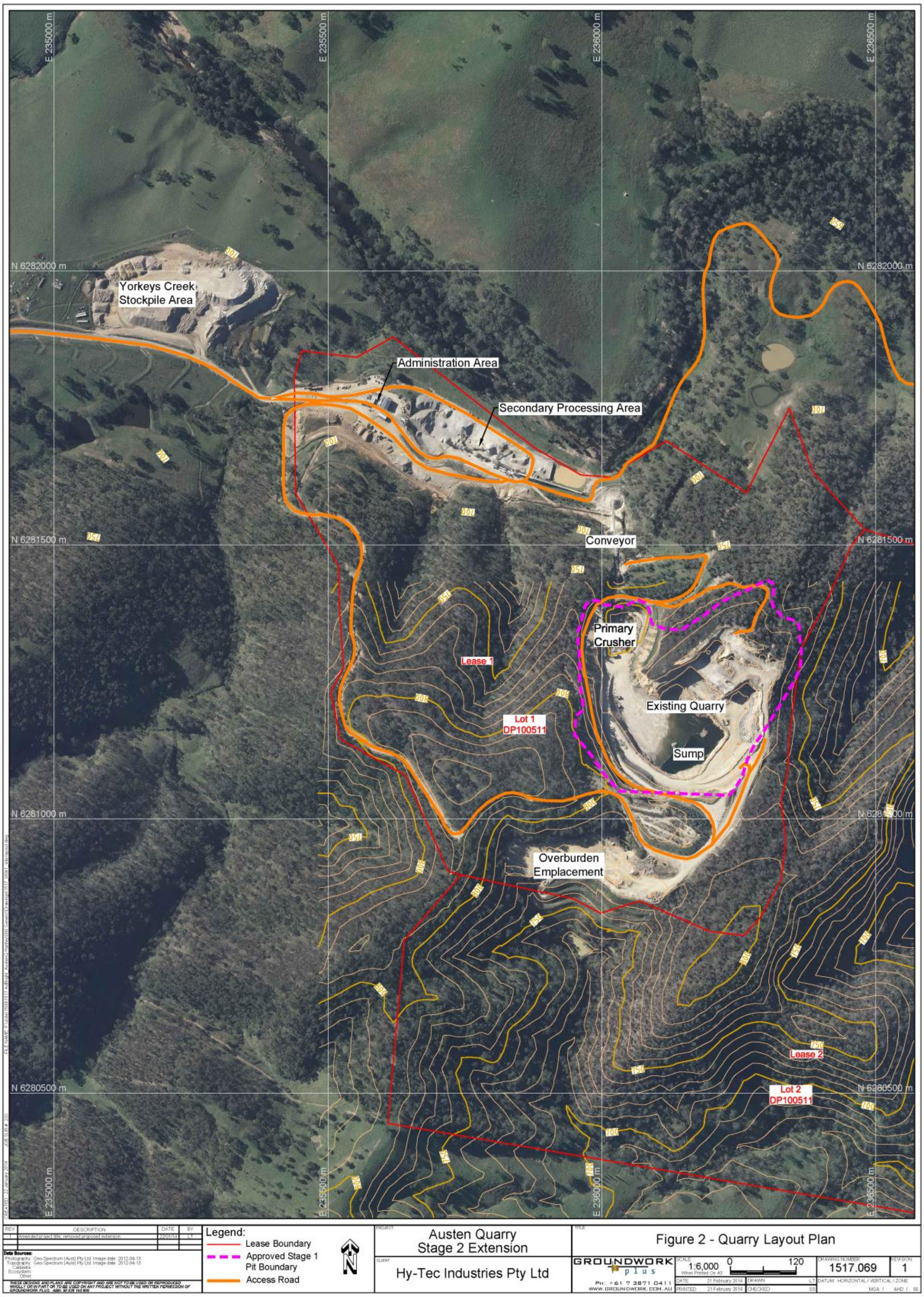
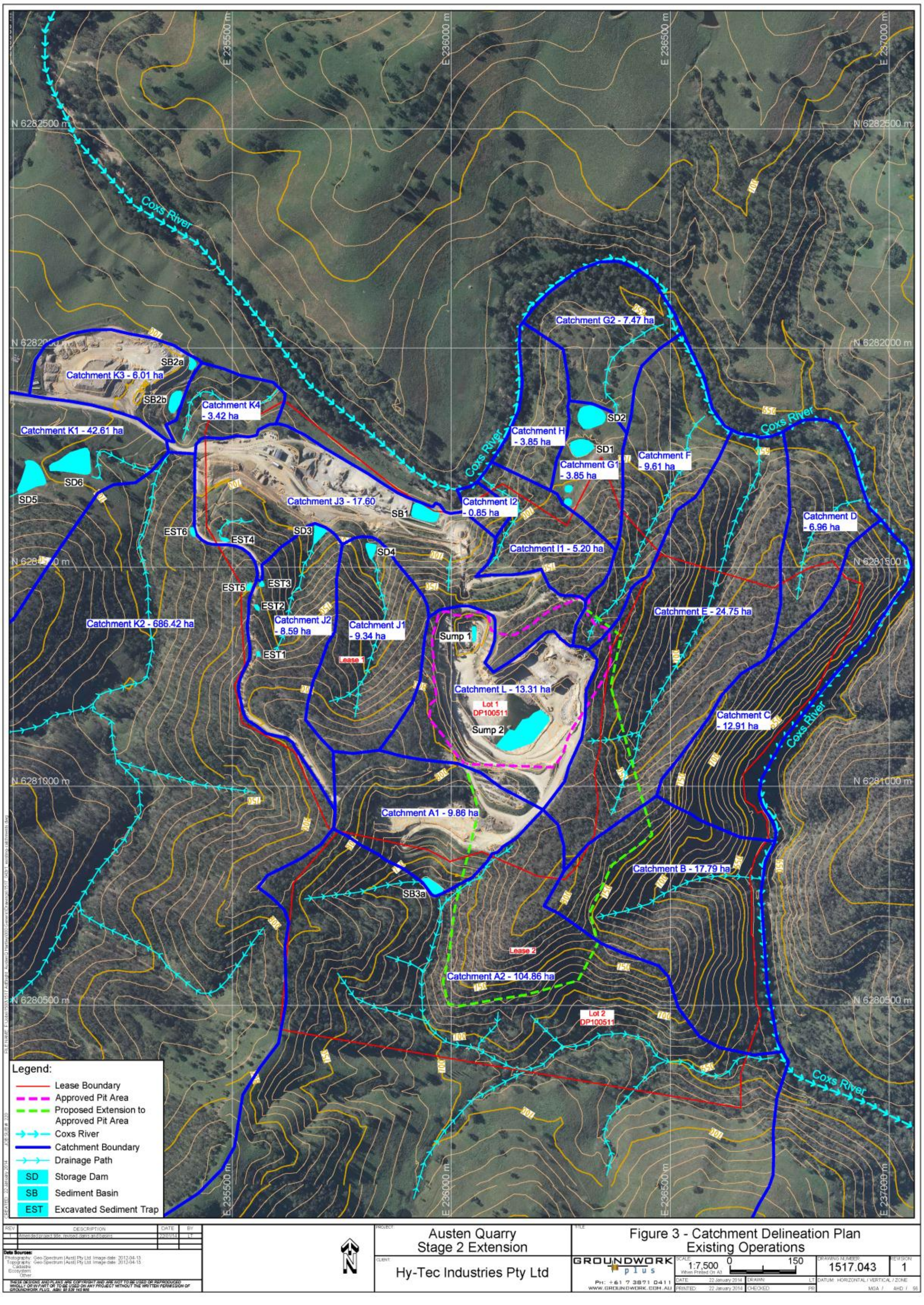
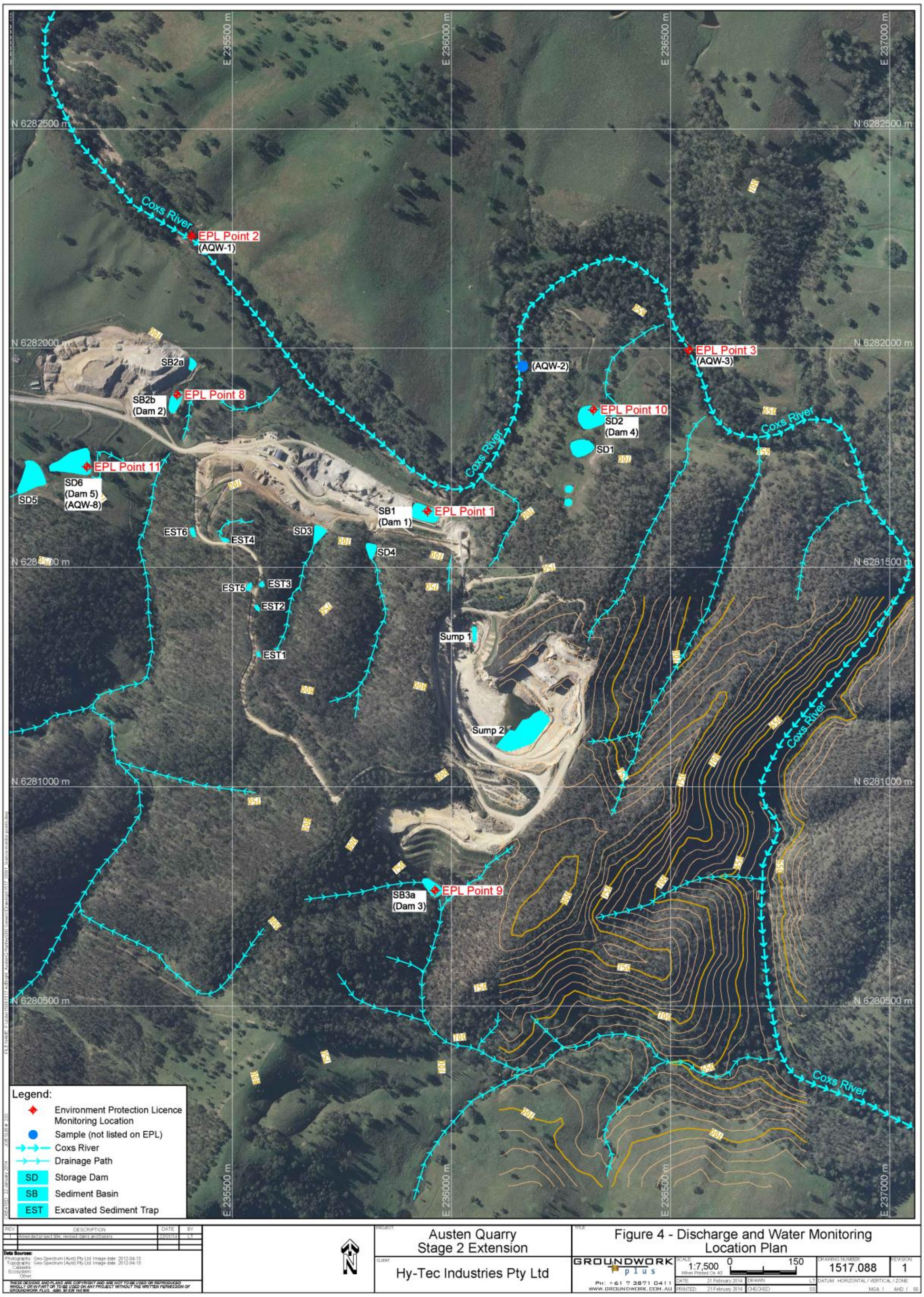

N 6295000 m
N 6290000 m
N 6285000 m
N 6280000 m
N 6275000 m
N 6270000 m
N 6265000 m
N 6260000 m
E 235000 m
E 240000 m
E 245000 m
E 250000 m
E 255000 m
SITE
Lithgow
Blackheath
Katoomba
Jenolan State Forest
Legend:
Property Owned By Hartley Pastoral Company
Austen Quarry
Stage 2 Extension
Hy-Tec Industries Pty Ltd
Figure 1 - Site Location Plan
GROUNDWORK plus
1:100,000
0
2km
1517.070
1


Yorkeys Creek Stockpile Area
Administration Area
Secondary Processing Area
Conveyor
Primary Crusher
Existing Quarry
Sump
Overburden Emplacement
Lease 1
Lot 1 DP100511
Lease 2
Lot 2 DP100511
E 235000 m
E 235500 m
E 236000 m
E 236500 m
N 6282000 m
N 6281500 m
N 6281000 m
N 6280500 m
Legend:
Lease Boundary
Approved Stage 1 Pit Boundary
Access Road
Austen Quarry Stage 2 Extension
Hy-Tec Industries Pty Ltd
Figure 2 - Quarry Layout Plan
GROUNDWORK plus
1:6,000
0
120
1517.069
1


Coxs River
Catchment G2 - 7.47 ha
Catchment K3 - 6.01 ha
SB2a
SB2b
Catchment K4 - 3.42 ha
Catchment K1 - 42.61 ha
SD6
SD5
SD2
SD1
Catchment H - 3.85 ha
Catchment G1 - 3.85 ha
Catchment F - 9.61 ha
Catchment J3 - 17.60
SB1
Catchment I2 - 0.85 ha
Catchment D - 6.96 ha
EST6
EST4
SD3
SD4
Catchment I1 - 5.20 ha
EST5
EST3
EST2
Catchment E - 24.75 ha
Catchment K2 - 686.42 ha
Catchment J2 - 8.59 ha
Catchment J1 - 9.34 ha
Sump 1
EST1
Lease 1
Catchment L - 13.31 ha
Lot 1 DP100511
Sump 2
Catchment C - 12.91 ha
Catchment A1 - 9.86 ha
Catchment B - 17.79 ha
SB3a
Lease 2
Catchment A2 - 104.86 ha
Lot 2 DP100511
N 6282500 m
N 6282000 m
N 6281500 m
N 6281000 m
N 6280500 m
E 235500 m
E 236000 m
E 236500 m
E 237000 m
Legend:
Lease Boundary
Approved Pit Area
Proposed Extension to Approved Pit Area
Coxs River
Catchment Boundary
Drainage Path
SD Storage Dam
SB Sediment Basin
EST Excavated Sediment Trap
Austen Quarry
Stage 2 Extension
Hy-Tec Industries Pty Ltd
Figure 3 - Catchment Delineation Plan
Existing Operations
GROUNDWORK plus
1:7,500
0
150
1517.043
1


Coxs River
EPL Point 2
(AQW-1)
EPL Point 3
(AQW-3)
(AQW-2)
SB2a
SB2b
(Dam 2)
EPL Point 8
EPL Point 10
SD2
(Dam 4)
SD1
EPL Point 11
SD5
SD6
(Dam 5)
(AQW-8)
SB1
(Dam 1)
EPL Point 1
EST6
EST4
SD3
SD4
EST5
EST3
EST2
EST1
Sump 1
Sump 2
SB3a
(Dam 3)
EPL Point 9
N 6282500 m
N 6282000 m
N 6281500 m
N 6281000 m
N 6280500 m
E 235500 m
E 236000 m
E 236500 m
E 237000 m
Legend:
Environment Protection Licence Monitoring Location
Sample (not listed on EPL)
Coxs River
Drainage Path
SD Storage Dam
SB Sediment Basin
EST Excavated Sediment Trap
Austen Quarry
Stage 2 Extension
Hy-Tec Industries Pty Ltd
Figure 4 - Discharge and Water Monitoring Location Plan
GROUNDWORK plus
1:7,500
0
150
1517.088
1

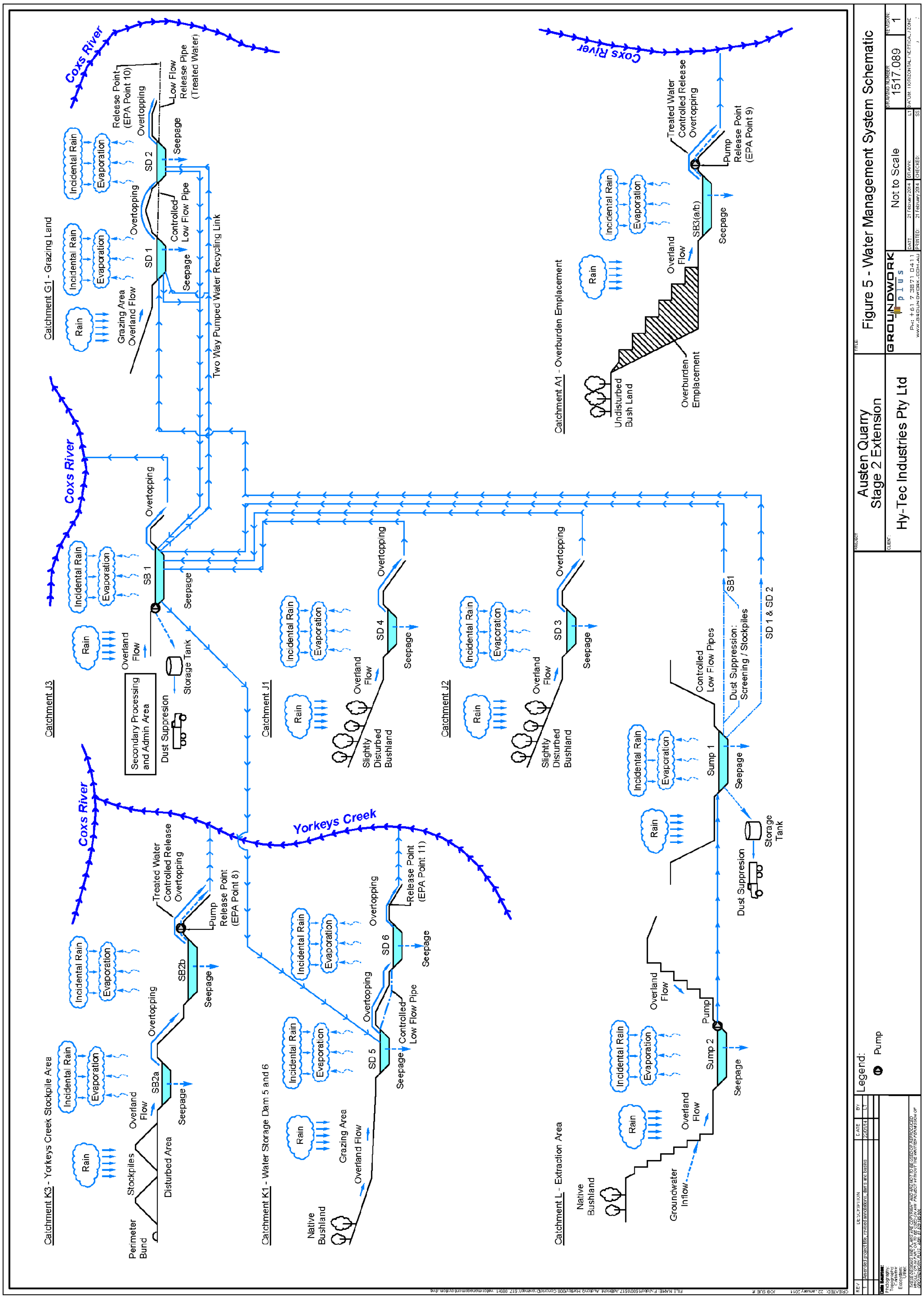
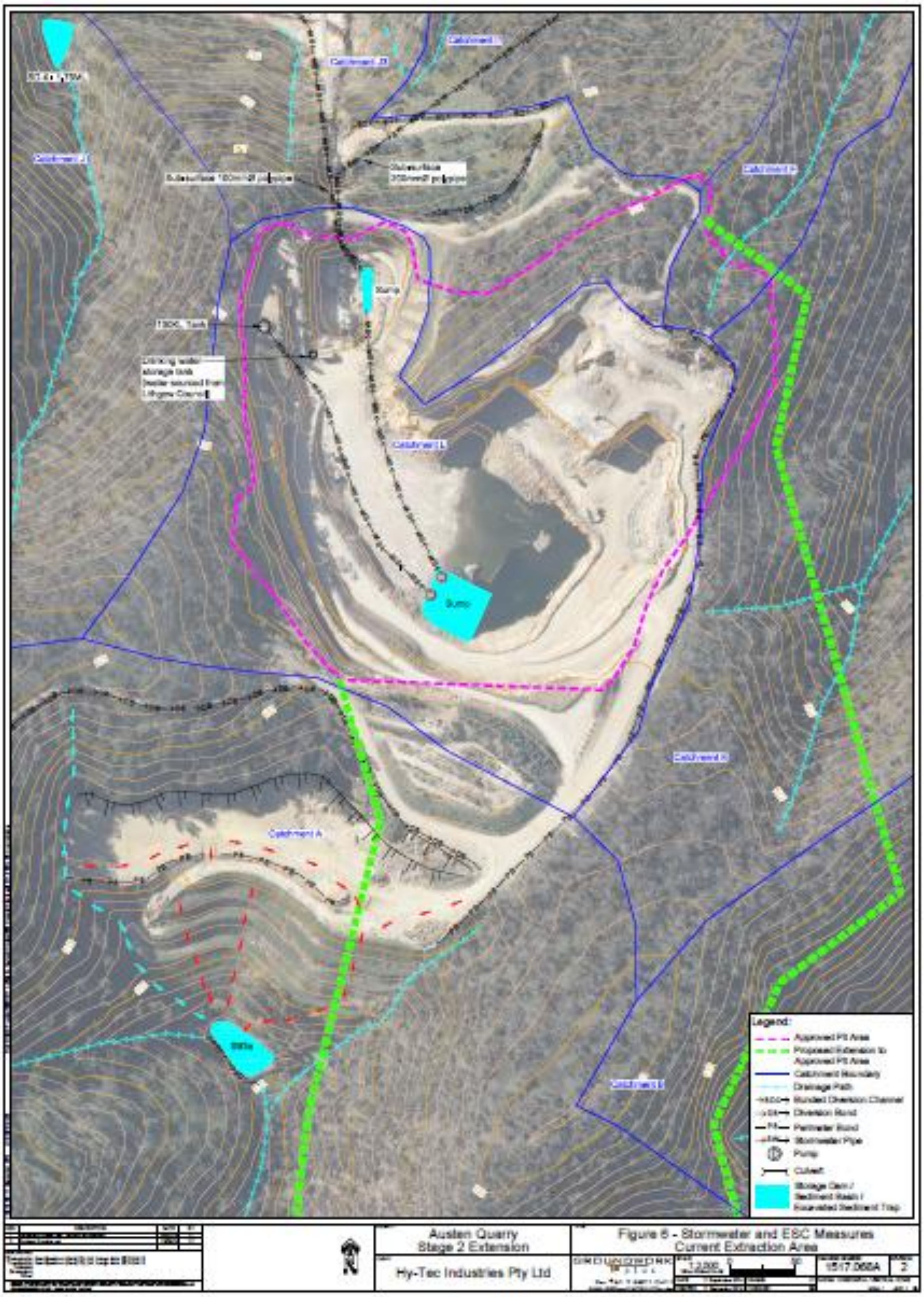
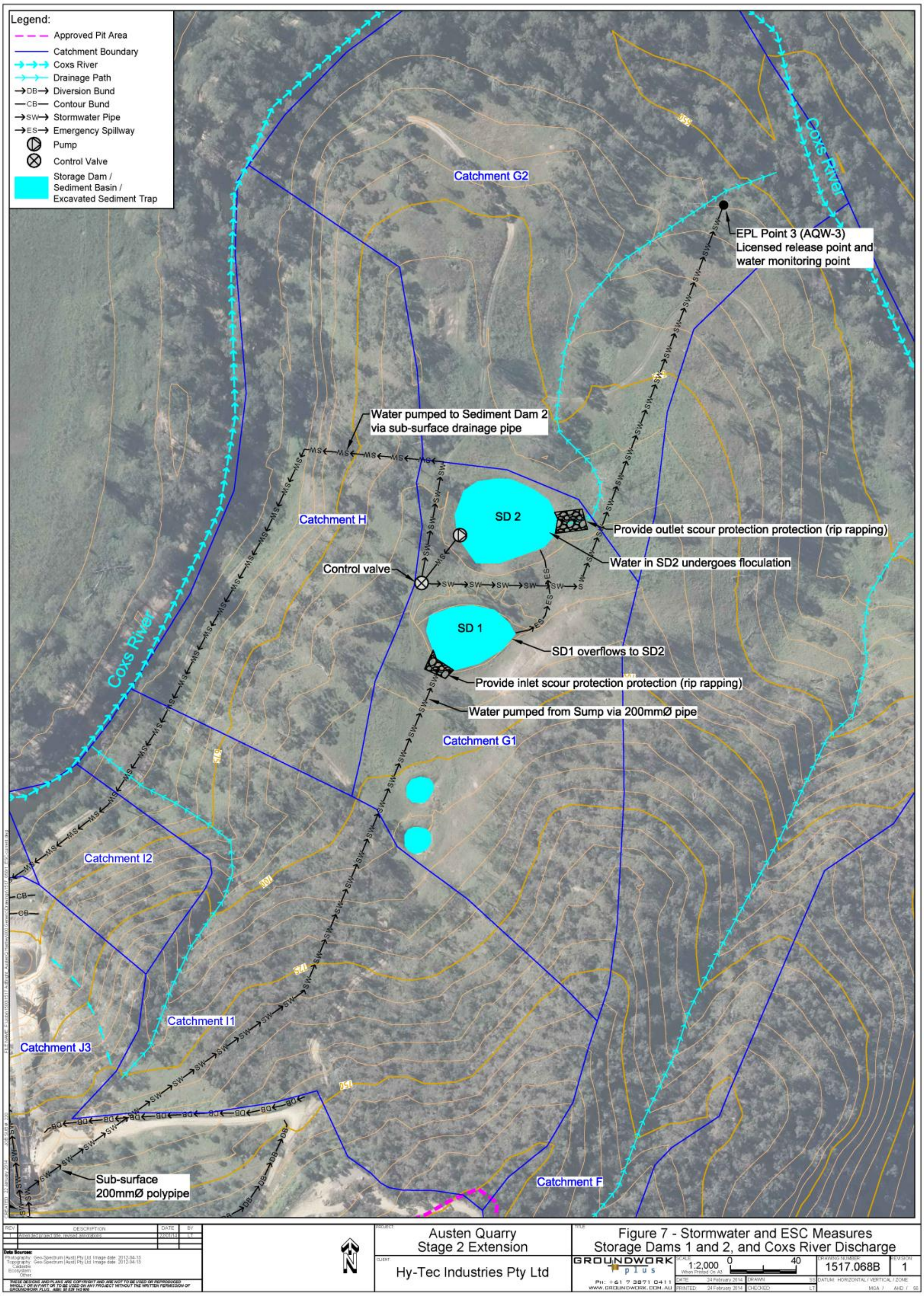
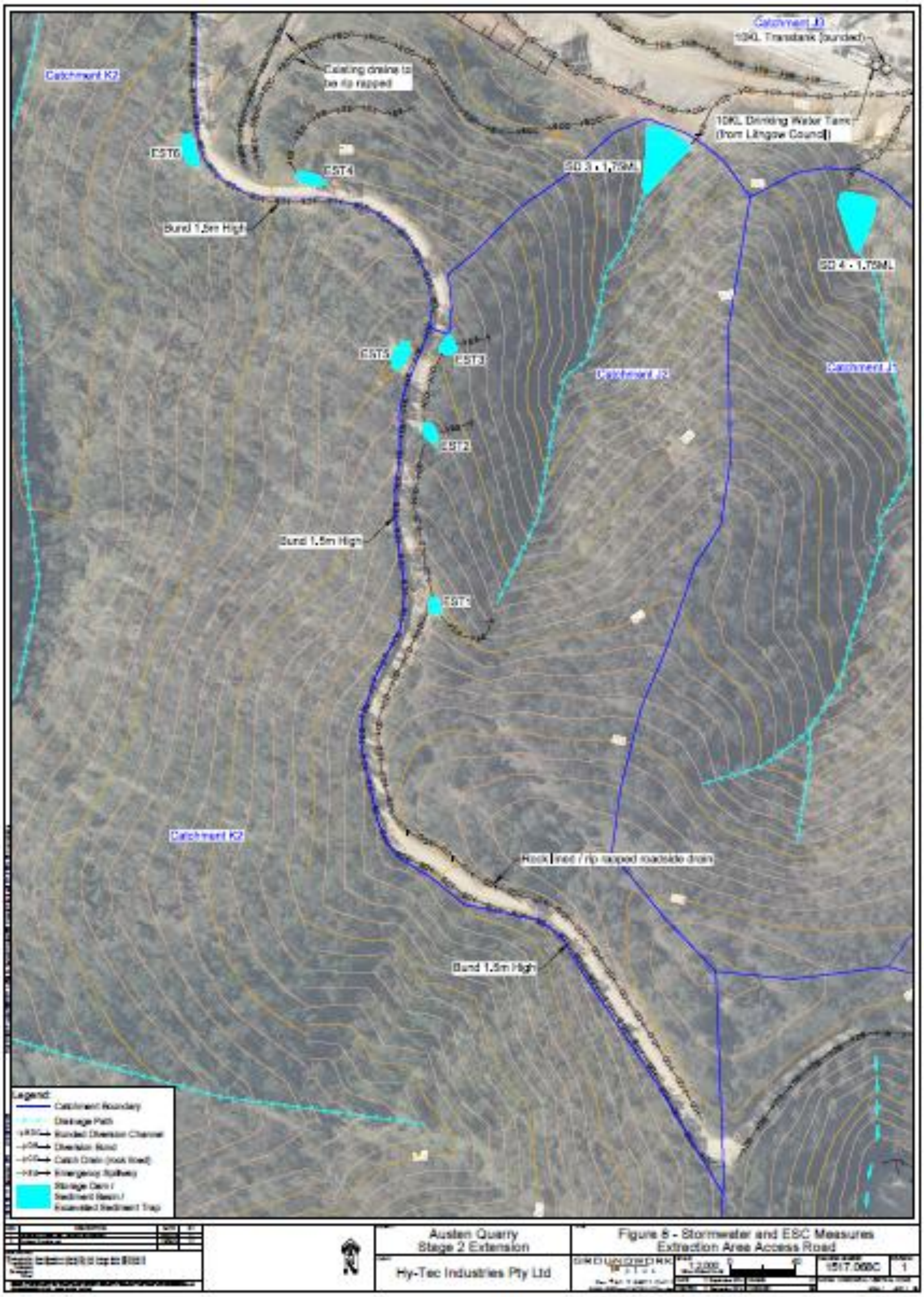


Figure 5 - Water Management System Schematic
Austen Quarry Stage 2 Extension
Hy-Tec Industries Pty Ltd
Not to Scale
1517.089
Legend:
Pump
Catchment G1 - Grazing Land
Catchment J3
Catchment K3 - Yorkeys Creek Stockpile Area
Catchment J1
Catchment K1 - Water Storage Dam 5 and 6
Catchment J2
Catchment A1 - Overburden Emplacement
Catchment L - Extraction Area
Coxs River
Yorkeys Creek
Rain
Incidental Rain
Evaporation
Overland Flow
Seepage
Overtopping
SD 1
SD 2
SB 1
SB2a
SB2b
SD 3
SD 4
SD 5
SD 6
SB3(a/b)
Sump 1
Sump 2
Release Point (EPA Point 10)
Low Flow Release Pipe (Treated Water)
Controlled Low Flow Pipe
Two Way Pumped Water Recycling Link
Grazing Area Overland Flow
Secondary Processing and Admin Area
Storage Tank
Dust Suppresion
Treated Water Controlled Release Overtopping
Pump Release Point (EPA Point 8)
Release Point (EPA Point 11)
Pump Release Point (EPA Point 9)
Slightly Disturbed Bushland
Undisturbed Bush Land
Overburden Emplacement
Controlled Low Flow Pipes
Dust Suppression: Screening / Stockpiles
SD 1 & SD 2
Perimeter Bund
Stockpiles
Disturbed Area
Native Bushland
Grazing Area Overland Flow
Groundwater Inflow


Catchment A
Catchment L
Catchment K
Catchment B
Sump
Legend:
Approved Pit Area
Proposed Extension to Approved Pit Area
Catchment Boundary
Drainage Path
Bunded Diversion Channel
Diversion Bund
Perimeter Bund
Stormwater Pipe
Pump
Culvert
Storage Dam / Sediment Basin / Excavated Sediment Trap
Austen Quarry
Stage 2 Extension
Hy-Tec Industries Pty Ltd
Figure 6 - Stormwater and ESC Measures
Current Extraction Area
1517.068A
2


Legend:
Approved Pit Area
Catchment Boundary
Coxs River
Drainage Path
Diversion Bund
Contour Bund
Stormwater Pipe
Emergency Spillway
Pump
Control Valve
Storage Dam / Sediment Basin / Excavated Sediment Trap
Catchment G2
Coxs River
EPL Point 3 (AQW-3) Licensed release point and water monitoring point
Water pumped to Sediment Dam 2 via sub-surface drainage pipe
Catchment H
SD 2
Provide outlet scour protection protection (rip rapping)
Control valve
Water in SD2 undergoes floculation
SD 1
SD1 overflows to SD2
Provide inlet scour protection protection (rip rapping)
Water pumped from Sump via 200mmØ pipe
Catchment G1
Coxs River
Catchment I2
Catchment I1
Catchment J3
Sub-surface 200mmØ polypipe
Catchment F
Austen Quarry Stage 2 Extension
Hy-Tec Industries Pty Ltd
Figure 7 - Stormwater and ESC Measures Storage Dams 1 and 2, and Coxs River Discharge
GROUNDWORK plus
1:2,000
1517.068B
1


Catchment K2
Existing drains to be rip rapped
Catchment J3
10KL Transtank (bunded)
10KL Drinking Water Tank (from Lithgow Council)
EST6
EST4
SD 3 - 1.72ML
SD 4 - 1.75ML
Bund 1.5m High
EST5
EST3
Catchment J2
Catchment J1
EST2
Bund 1.5m High
EST1
Catchment K2
Rock lined / rip rapped roadside drain
Bund 1.5m High
Legend:
Catchment Boundary
Drainage Path
Bunded Diversion Channel
Diversion Bund
Catch Drain (rock lined)
Emergency Spillway
Storage Dam / Sediment Basin / Excavated Sediment Trap
Austen Quarry
Stage 2 Extension
Hy-Tec Industries Pty Ltd
Figure 8 - Stormwater and ESC Measures
Extraction Area Access Road
1517.068C
1

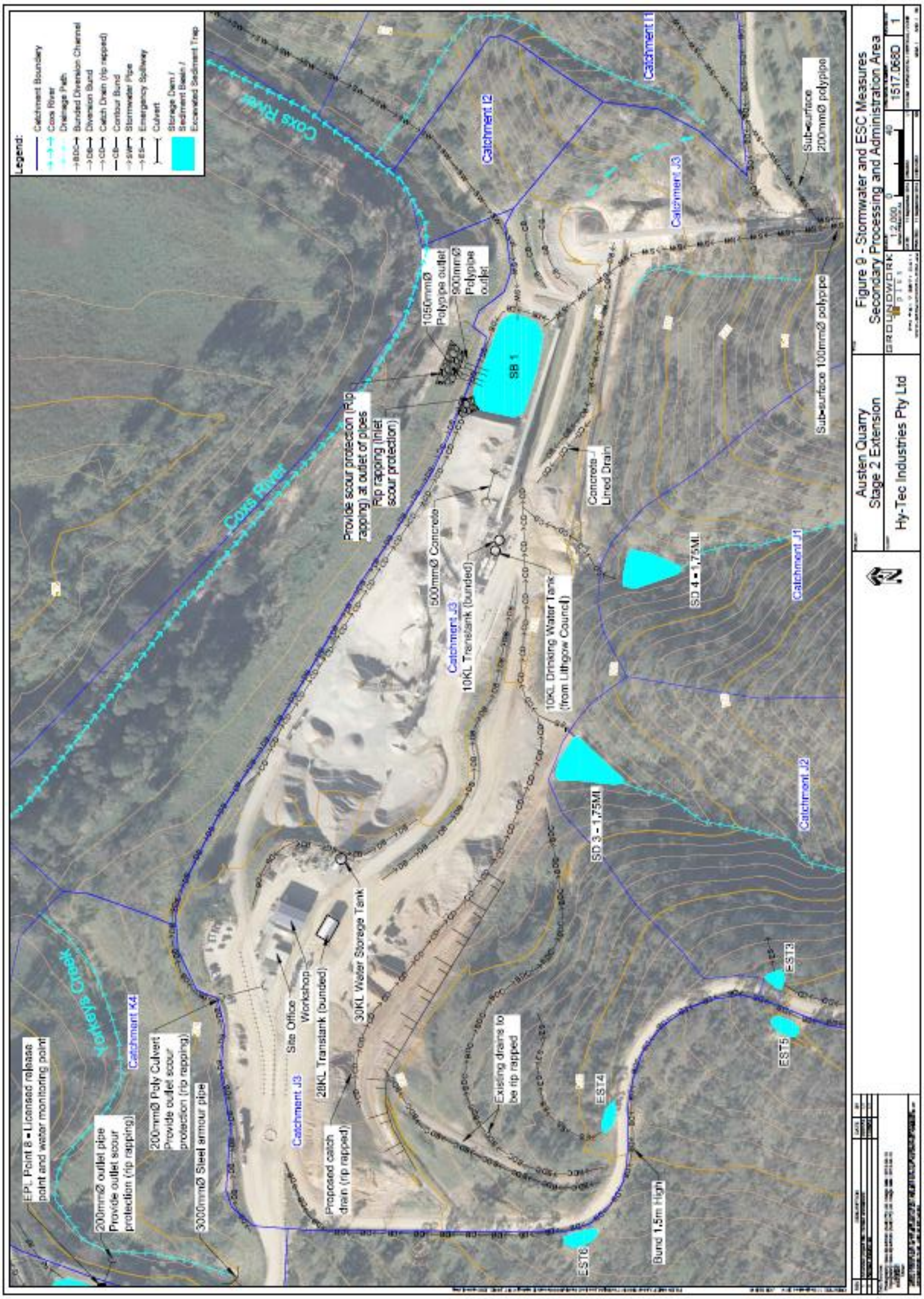
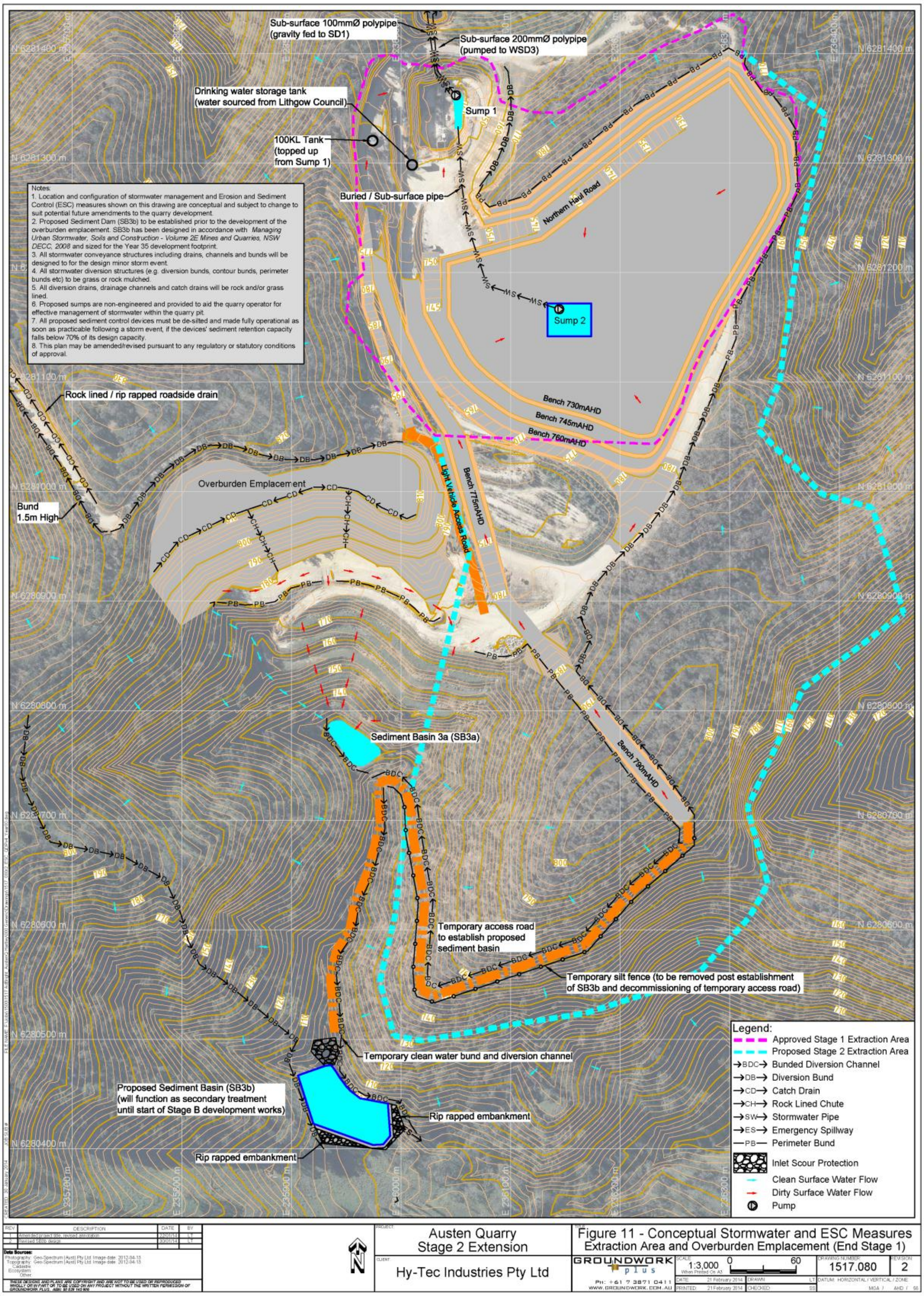

Legend:
Catchment Boundary
Coxs River
Drainage Path
Bunded Diversion Channel
Diversion Bund
Catch Drain (rip rapped)
Contour Bund
Stormwater Pipe
Emergency Spillway
Culvert
Storage Dam / Sediment Basin / Excavated Sediment Trap
Coxs River
Catchment I1
Catchment I2
Catchment J3
Catchment J1
Catchment J2
Catchment K4
Yorkeys Creek
SB 1
1050mmØ Polypipe outlet
900mmØ Polypipe outlet
Provide scour protection (Rip rapping) at outlet of pipes
Rip rapping (inlet scour protection)
500mmØ Concrete
10KL Transtank (bunded)
10KL Drinking Water Tank (from Lithgow Council)
Concrete Lined Drain
SD 4 - 1.75ML
SD 3 - 1.75ML
Sub-surface 100mmØ polypipe
Sub-surface 200mmØ polypipe
30KL Water Storage Tank
Site Office
Workshop
28KL Transtank (bunded)
Proposed catch drain (rip rapped)
Existing drains to be rip rapped
EST3
EST4
EST5
EST6
Bund 1.5m High
EPL Point 8 - Licensed release point and water monitoring point
200mmØ outlet pipe Provide outlet scour protection (rip rapping)
200mmØ Poly Culvert Provide outlet scour protection (rip rapping)
3000mmØ Steel armour pipe
Austen Quarry Stage 2 Extension
Hy-Tec Industries Pty Ltd
Figure 9 - Stormwater and ESC Measures Secondary Processing and Administration Area
1:2,000
1517.068D


Figure 10 - Stormwater and ESC Measures
Yorkeys Creek Stockpile Area
Austen Quarry
Stage 2 Extension
Hy-Tec Industries Pty Ltd
1517.066E
Coxs River
Yorkeys Creek
Catchment K1
Catchment K2
Catchment K3
Catchment K4
Catchment J3
Yorkeys Creek Stockpile Area
SB2a (acts primarily as sediment forebay)
Existing catch drain to be rip rapped
EPL Point 8 - Licensed release point and water monitoring point
200mmØ outlet pipe
Provide outlet scour protection (rip rapping)
200mmØ Poly Culvert
Provide outlet scour protection (rip rapping)
3000mmØ Steel armour pipe
SB2b
500mmØ Concrete
350mmØ Concrete
Site Office
Workshop
28KL Transtank (bunded)
30KL Water Storage Tank
Proposed catch drain (rip rapped)
Existing drains to be rip rapped
Provide outlet scour protection protection (rip rapping)
SD6 (pumped to SB1 and vice versa)
EPL Point 11 - Licensed release point and water monitoring point
SD5
Provide inlet scour protection protection (rip rapping)
Legend:
Catchment Boundary
Coxs River
Drainage Path
Bunded Diversion Channel
Diversion Bund
Catch Drain
Perimeter Bund
Contour Bund
Proposed Rock Filter Bund
Stormwater Pipe
Emergency Spillway
Culvert
Storage Dam / Sediment Basin / Excavated Sediment Trap


Sub-surface 100mmØ polypipe (gravity fed to SD1)
Sub-surface 200mmØ polypipe (pumped to WSD3)
Drinking water storage tank (water sourced from Lithgow Council)
Sump 1
100KL Tank (topped up from Sump 1)
Buried / Sub-surface pipe
Northern Haul Road
Sump 2
Notes:
1. Location and configuration of stormwater management and Erosion and Sediment Control (ESC) measures shown on this drawing are conceptual and subject to change to suit potential future amendments to the quarry development.
2. Proposed Sediment Dam (SB3b) to be established prior to the development of the overburden emplacement. SB3b has been designed in accordance with Managing Urban Stormwater, Soils and Construction - Volume 2E Mines and Quarries, NSW DECC, 2008 and sized for the Year 35 development footprint.
3. All stormwater conveyance structures including drains, channels and bunds will be designed to for the design minor storm event.
4. All stormwater diversion structures (e.g. diversion bunds, contour bunds, perimeter bunds etc) to be grass or rock mulched.
5. All diversion drains, drainage channels and catch drains will be rock and/or grass lined.
6. Proposed sumps are non-engineered and provided to aid the quarry operator for effective management of stormwater within the quarry pit.
7. All proposed sediment control devices must be de-silted and made fully operational as soon as practicable following a storm event, if the devices' sediment retention capacity falls below 70% of its design capacity.
8. This plan may be amended/revised pursuant to any regulatory or statutory conditions of approval.
Rock lined / rip rapped roadside drain
Bench 730mAHD
Bench 745mAHD
Bench 760mAHD
Overburden Emplacement
Bund 1.5m High
Light Vehicle Access Road
Bench 775mAHD
Bench 790mAHD
Sediment Basin 3a (SB3a)
Temporary access road to establish proposed sediment basin
Temporary silt fence (to be removed post establishment of SB3b and decommissioning of temporary access road)
Temporary clean water bund and diversion channel
Proposed Sediment Basin (SB3b) (will function as secondary treatment until start of Stage B development works)
Rip rapped embankment
Rip rapped embankment
Legend:
Approved Stage 1 Extraction Area
Proposed Stage 2 Extraction Area
BDC Bunded Diversion Channel
DB Diversion Bund
CD Catch Drain
CH Rock Lined Chute
SW Stormwater Pipe
ES Emergency Spillway
PB Perimeter Bund
Inlet Scour Protection
Clean Surface Water Flow
Dirty Surface Water Flow
Pump
Austen Quarry Stage 2 Extension
Hy-Tec Industries Pty Ltd
Figure 11 - Conceptual Stormwater and ESC Measures Extraction Area and Overburden Emplacement (End Stage 1)
GROUNDWORK plus
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1517.080
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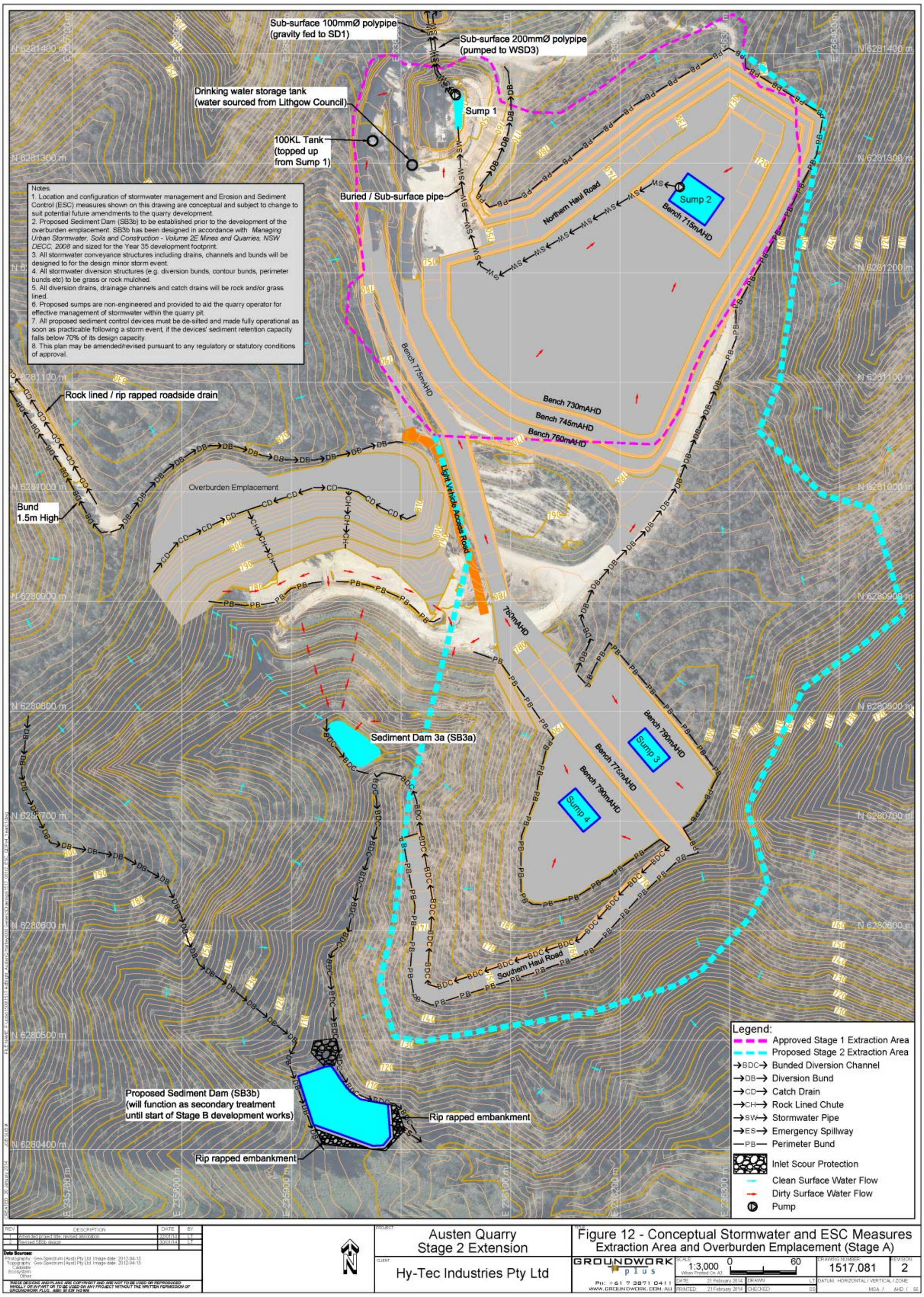
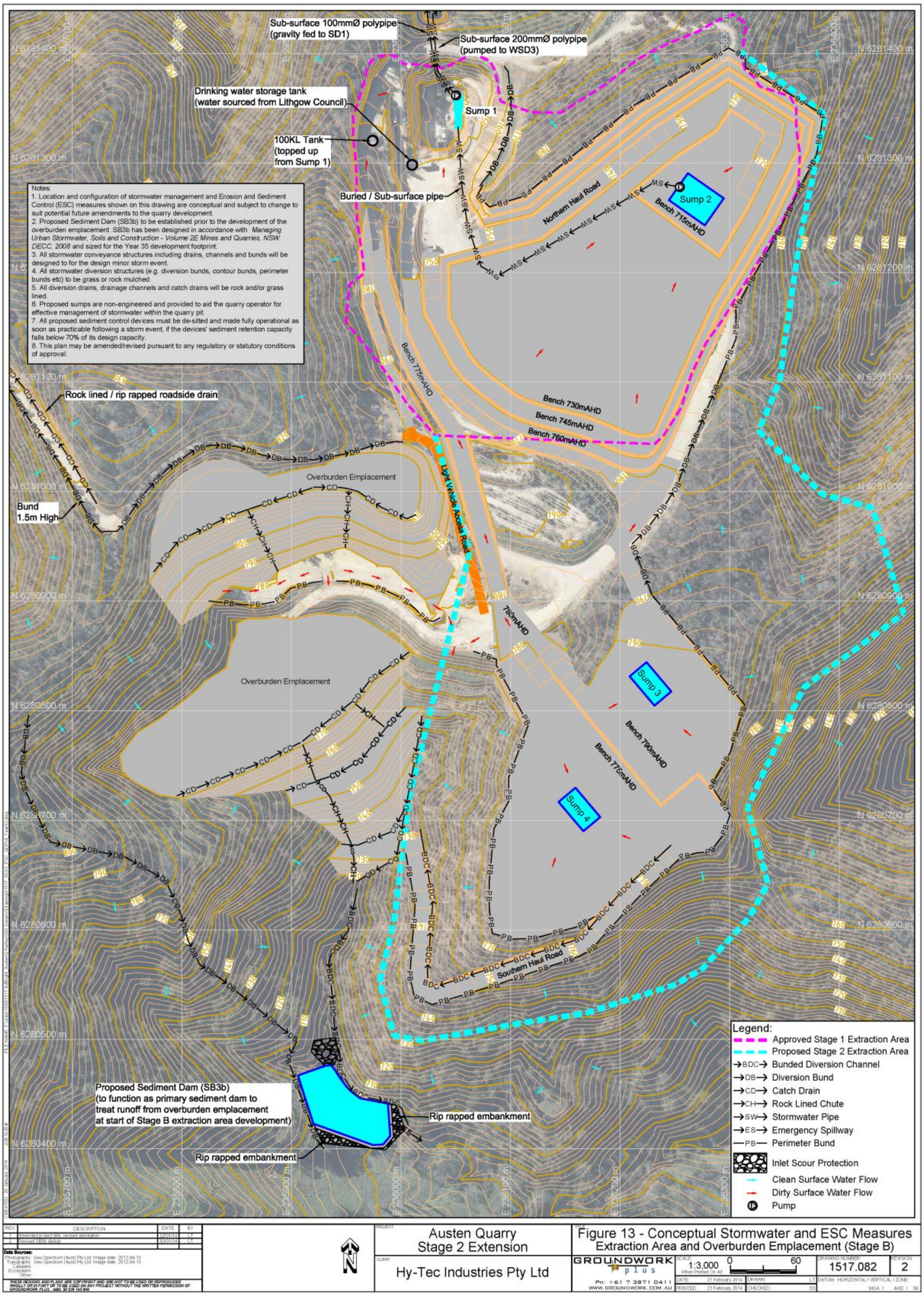

Sub-surface 100mmØ polypipe (gravity fed to SD1)
Sub-surface 200mmØ polypipe (pumped to WSD3)
Drinking water storage tank (water sourced from Lithgow Council)
Sump 1
100KL Tank (topped up from Sump 1)
Buried / Sub-surface pipe
Northern Haul Road
Sump 2
Bench 715mAHD
Bench 775mAHD
Bench 730mAHD
Bench 745mAHD
Bench 760mAHD
Rock lined / rip rapped roadside drain
Bund 1.5m High
Overburden Emplacement
Light Vehicle Access Road
780mAHD
Sediment Dam 3a (SB3a)
Bench 790mAHD
Bench 775mAHD
Bench 790mAHD
Sump 3
Sump 4
Southern Haul Road
Proposed Sediment Dam (SB3b) (will function as secondary treatment until start of Stage B development works)
Rip rapped embankment
Rip rapped embankment
Notes:
1. Location and configuration of stormwater management and Erosion and Sediment Control (ESC) measures shown on this drawing are conceptual and subject to change to suit potential future amendments to the quarry development.
2. Proposed Sediment Dam (SB3b) to be established prior to the development of the overburden emplacement. SB3b has been designed in accordance with *Managing Urban Stormwater, Soils and Construction - Volume 2E Mines and Quarries, NSW DECC, 2008* and sized for the Year 35 development footprint.
3. All stormwater conveyance structures including drains, channels and bunds will be designed to for the design minor storm event.
4. All stormwater diversion structures (e.g. diversion bunds, contour bunds, perimeter bunds etc) to be grass or rock mulched.
5. All diversion drains, drainage channels and catch drains will be rock and/or grass lined.
6. Proposed sumps are non-engineered and provided to aid the quarry operator for effective management of stormwater within the quarry pit.
7. All proposed sediment control devices must be de-silted and made fully operational as soon as practicable following a storm event, if the devices' sediment retention capacity falls below 70% of its design capacity.
8. This plan may be amended/revised pursuant to any regulatory or statutory conditions of approval.
Legend:
Approved Stage 1 Extraction Area
Proposed Stage 2 Extraction Area
→BDC→ Bunded Diversion Channel
→DB→ Diversion Bund
→CD→ Catch Drain
→CH→ Rock Lined Chute
→SW→ Stormwater Pipe
→ES→ Emergency Spillway
—PB— Perimeter Bund
Inlet Scour Protection
Clean Surface Water Flow
Dirty Surface Water Flow
Pump
REV DESCRIPTION DATE BY
1 Amended project title, revised annotation LT
2 Revised SB3b design LT
Data Sources:
Photography: Geo-Spectrum (Aust) Pty Ltd Image date: 2012-04-13
Topography: Geo-Spectrum (Aust) Pty Ltd Image date: 2012-04-13
Cadastre
Ecosystem
Other
PROJECT: Austen Quarry Stage 2 Extension
CLIENT: Hy-Tec Industries Pty Ltd
TITLE: Figure 12 - Conceptual Stormwater and ESC Measures Extraction Area and Overburden Emplacement (Stage A)
GROUNDWORK plus
PH: +61 7 3871 0411
WWW.GROUNDWORK.COM.AU
SCALE: 1:3,000 When Printed On A3
0 60
DATE: 21 February 2014
PRINTED: 21 February 2014
DRAWN: LT
CHECKED: SS
DRAWING NUMBER: 1517.081
REVISION: 2
DATUM: HORIZONTAL / VERTICAL / ZONE
MGA / AHD / 56


Sub-surface 100mmØ polypipe (gravity fed to SD1)
Sub-surface 200mmØ polypipe (pumped to WSD3)
Drinking water storage tank (water sourced from Lithgow Council)
Sump 1
100KL Tank (topped up from Sump 1)
Buried / Sub-surface pipe
Sump 2
Northern Haul Road
Bench 715mAHD
Notes:
1. Location and configuration of stormwater management and Erosion and Sediment Control (ESC) measures shown on this drawing are conceptual and subject to change to suit potential future amendments to the quarry development.
2. Proposed Sediment Dam (SB3b) to be established prior to the development of the overburden emplacement. SB3b has been designed in accordance with Managing Urban Stormwater, Soils and Construction - Volume 2E Mines and Quarries, NSW DECC, 2008 and sized for the Year 35 development footprint.
3. All stormwater conveyance structures including drains, channels and bunds will be designed to for the design minor storm event.
4. All stormwater diversion structures (e.g. diversion bunds, contour bunds, perimeter bunds etc) to be grass or rock mulched.
5. All diversion drains, drainage channels and catch drains will be rock and/or grass lined.
6. Proposed sumps are non-engineered and provided to aid the quarry operator for effective management of stormwater within the quarry pit.
7. All proposed sediment control devices must be de-silted and made fully operational as soon as practicable following a storm event, if the devices' sediment retention capacity falls below 70% of its design capacity.
8. This plan may be amended/revised pursuant to any regulatory or statutory conditions of approval.
Rock lined / rip rapped roadside drain
Bench 775mAHD
Bench 730mAHD
Bench 745mAHD
Bench 760mAHD
Bund 1.5m High
Overburden Emplacement
Light Vehicle Access Road
760mAHD
Overburden Emplacement
Sump 3
Bench 790mAHD
Bench 775mAHD
Sump 4
Southern Haul Road
Proposed Sediment Dam (SB3b) (to function as primary sediment dam to treat runoff from overburden emplacement at start of Stage B extraction area development)
Rip rapped embankment
Rip rapped embankment
Legend:
Approved Stage 1 Extraction Area
Proposed Stage 2 Extraction Area
→BDC→ Bunded Diversion Channel
→DB→ Diversion Bund
→CD→ Catch Drain
→CH→ Rock Lined Chute
→SW→ Stormwater Pipe
→ES→ Emergency Spillway
—PB— Perimeter Bund
Inlet Scour Protection
Clean Surface Water Flow
Dirty Surface Water Flow
Pump
REV DESCRIPTION DATE BY
1 Amended project title, revised annotation
2 Revised SB3b design
Data Sources:
Photography: Geo-Spectrum (Aust) Pty Ltd Image date: 2012-04-13
Topography: Geo-Spectrum (Aust) Pty Ltd Image date: 2012-04-13
N
PROJECT: Austen Quarry Stage 2 Extension
CLIENT: Hy-Tec Industries Pty Ltd
Figure 13 - Conceptual Stormwater and ESC Measures
Extraction Area and Overburden Emplacement (Stage B)
GROUNDWORK plus
PH: +61 7 3871 0411
WWW.GROUNDWORK.COM.AU
SCALE 1:3,000 When Printed On A3
0 60
DATE 21 February 2014
PRINTED 21 February 2014
DRAWN LT
CHECKED SS
DRAWING NUMBER 1517.082
REVISION 2
DATUM: HORIZONTAL / VERTICAL / ZONE MGA / AHD / 56

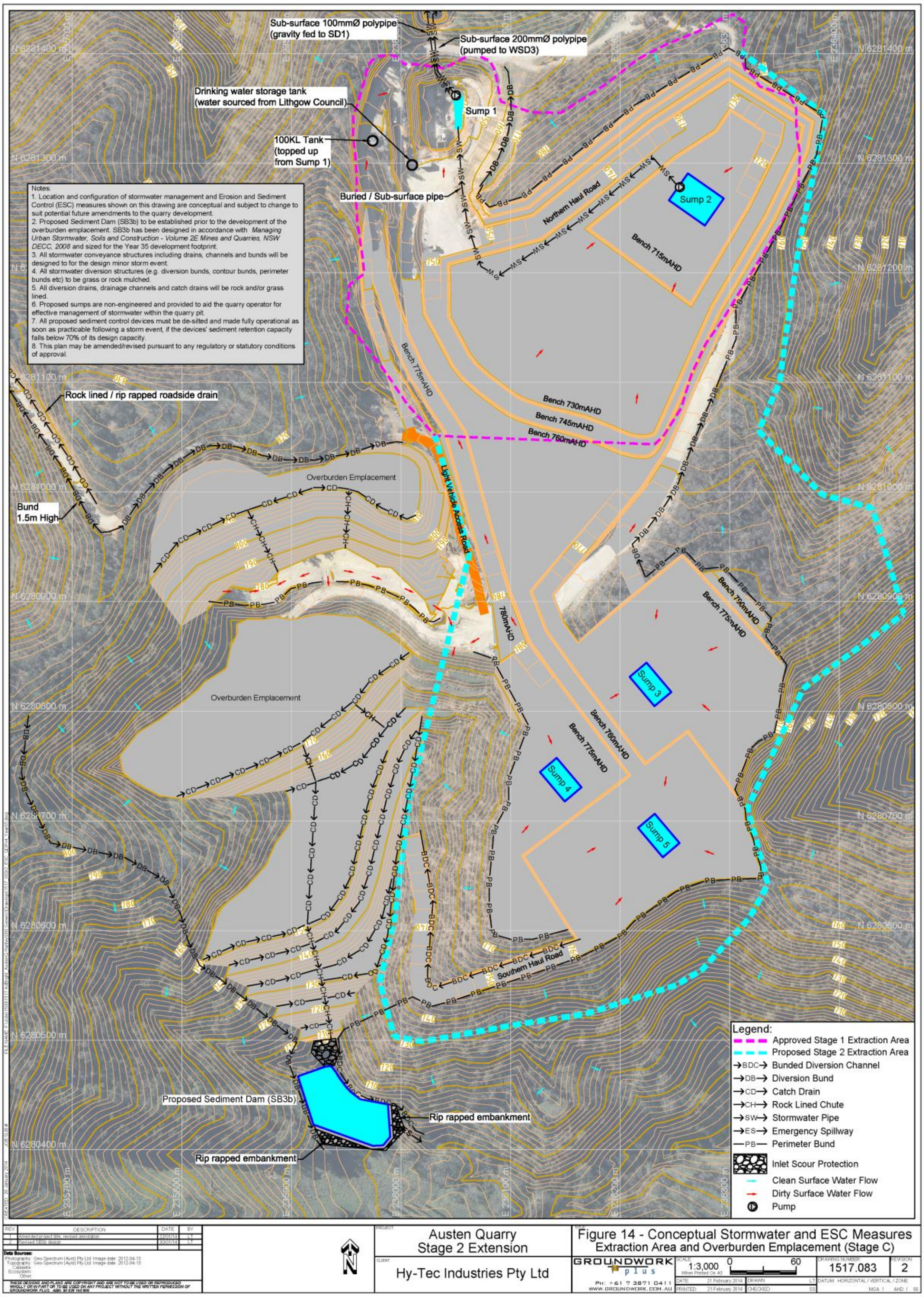


Figure 14 - Conceptual Stormwater and ESC Measures
Extraction Area and Overburden Emplacement (Stage C)

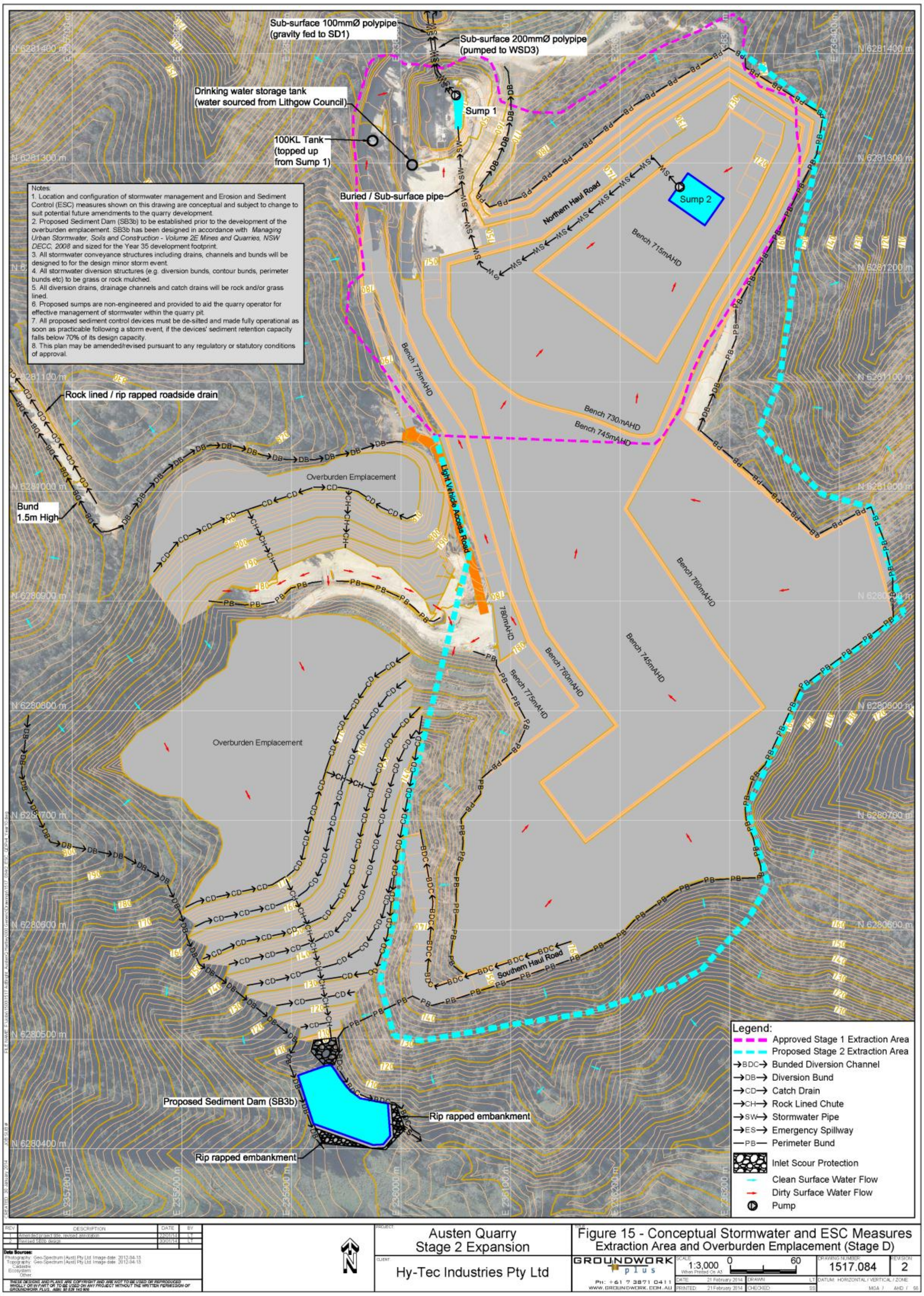
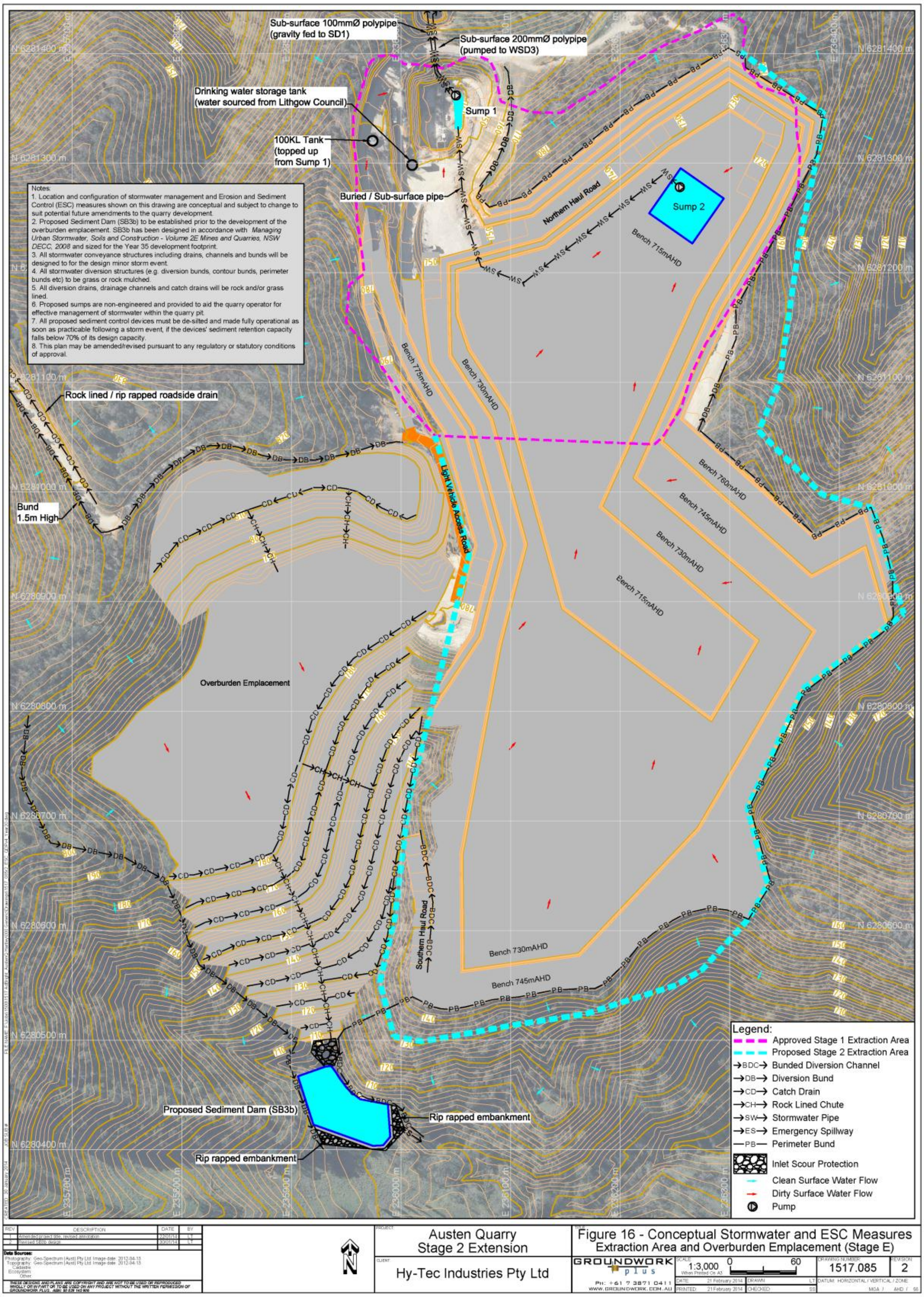
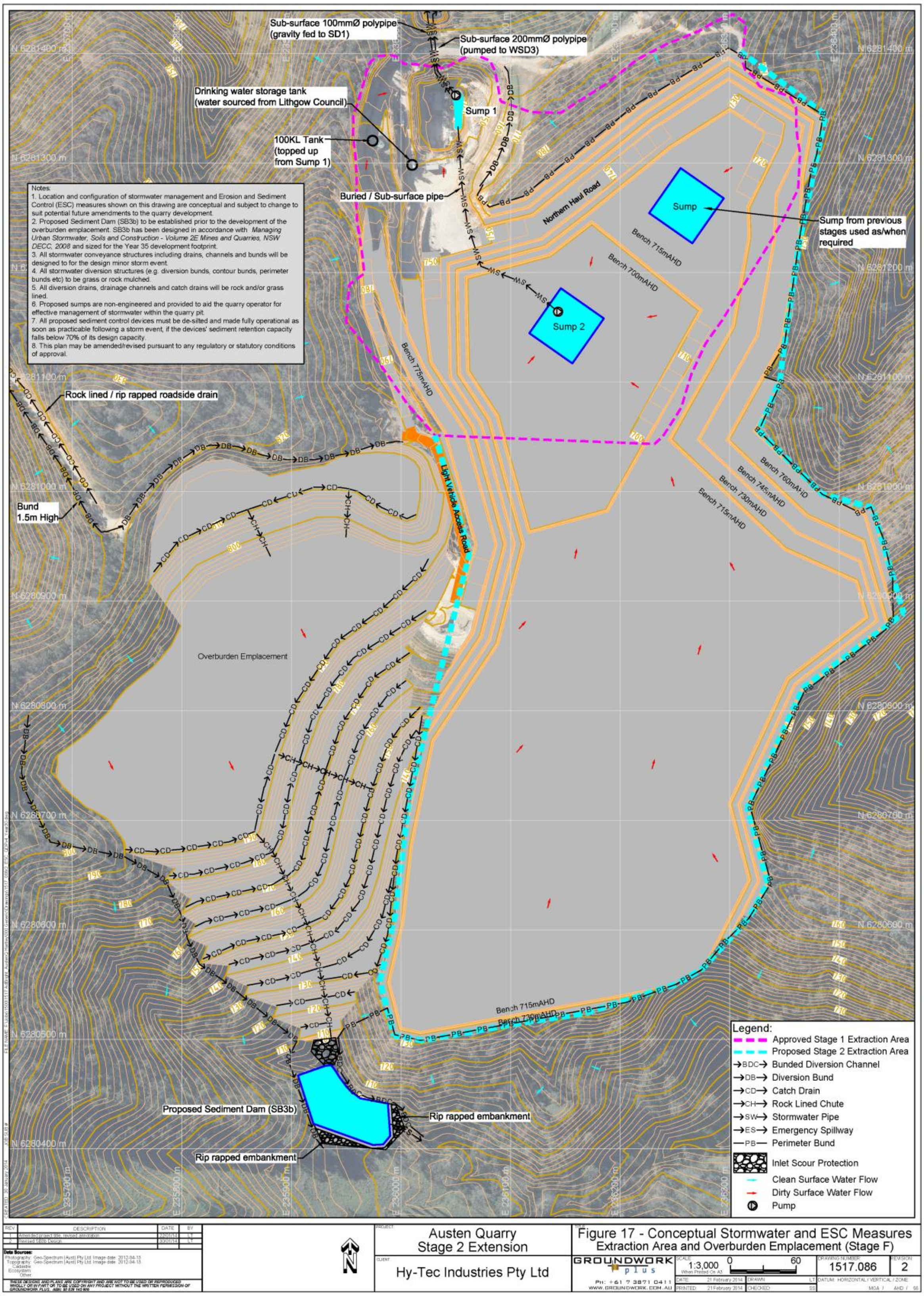


Figure 15 - Conceptual Stormwater and ESC Measures
Extraction Area and Overburden Emplacement (Stage D)


Sub-surface 100mmØ polypipe (gravity fed to SD1)
Sub-surface 200mmØ polypipe (pumped to WSD3)
Drinking water storage tank (water sourced from Lithgow Council)
Sump 1
100KL Tank (topped up from Sump 1)
Buried / Sub-surface pipe
Northern Haul Road
Sump 2
Bench 715mAHD
Notes:
1. Location and configuration of stormwater management and Erosion and Sediment Control (ESC) measures shown on this drawing are conceptual and subject to change to suit potential future amendments to the quarry development.
2. Proposed Sediment Dam (SB3b) to be established prior to the development of the overburden emplacement. SB3b has been designed in accordance with *Managing Urban Stormwater, Soils and Construction - Volume 2E Mines and Quarries, NSW DECC, 2008* and sized for the Year 35 development footprint.
3. All stormwater conveyance structures including drains, channels and bunds will be designed to for the design minor storm event.
4. All stormwater diversion structures (e.g. diversion bunds, contour bunds, perimeter bunds etc) to be grass or rock mulched.
5. All diversion drains, drainage channels and catch drains will be rock and/or grass lined.
6. Proposed sumps are non-engineered and provided to aid the quarry operator for effective management of stormwater within the quarry pit.
7. All proposed sediment control devices must be de-silted and made fully operational as soon as practicable following a storm event, if the devices' sediment retention capacity falls below 70% of its design capacity.
8. This plan may be amended/revised pursuant to any regulatory or statutory conditions of approval.
Bench 775mAHD
Bench 730mAHD
Rock lined / rip rapped roadside drain
Bund 1.5m High
Light Vehicle Access Road
Bench 760mAHD
Bench 745mAHD
Bench 730mAHD
Bench 715mAHD
Overburden Emplacement
Southern Haul Road
Bench 730mAHD
Bench 745mAHD
Proposed Sediment Dam (SB3b)
Rip rapped embankment
Rip rapped embankment
Legend:
Approved Stage 1 Extraction Area
Proposed Stage 2 Extraction Area
BDC Bunded Diversion Channel
DB Diversion Bund
CD Catch Drain
CH Rock Lined Chute
SW Stormwater Pipe
ES Emergency Spillway
PB Perimeter Bund
Inlet Scour Protection
Clean Surface Water Flow
Dirty Surface Water Flow
Pump
Austen Quarry
Stage 2 Extension
Hy-Tec Industries Pty Ltd
Figure 16 - Conceptual Stormwater and ESC Measures
Extraction Area and Overburden Emplacement (Stage E)
GROUNDWORK plus
PH: +61 7 3871 0411
WWW.GROUNDWORK.COM.AU
SCALE 1:3,000 When Printed On A3
0 60
DRAWING NUMBER 1517.085
REVISION 2
DATE 21 February 2014
PRINTED 21 February 2014
DRAWN LT
CHECKED SS
DATUM HORIZONTAL / VERTICAL / ZONE
MGA / AHD / 56


Sub-surface 100mmØ polypipe (gravity fed to SD1)
Sub-surface 200mmØ polypipe (pumped to WSD3)
Drinking water storage tank (water sourced from Lithgow Council)
Sump 1
100KL Tank (topped up from Sump 1)
Buried / Sub-surface pipe
Northern Haul Road
Sump
Sump from previous stages used as/when required
Bench 715mAHD
Bench 700mAHD
Sump 2
Bench 775mAHD
Notes:
1. Location and configuration of stormwater management and Erosion and Sediment Control (ESC) measures shown on this drawing are conceptual and subject to change to suit potential future amendments to the quarry development.
2. Proposed Sediment Dam (SB3b) to be established prior to the development of the overburden emplacement. SB3b has been designed in accordance with *Managing Urban Stormwater, Soils and Construction - Volume 2E Mines and Quarries, NSW DECC, 2008* and sized for the Year 35 development footprint.
3. All stormwater conveyance structures including drains, channels and bunds will be designed to for the design minor storm event.
4. All stormwater diversion structures (e.g. diversion bunds, contour bunds, perimeter bunds etc) to be grass or rock mulched.
5. All diversion drains, drainage channels and catch drains will be rock and/or grass lined.
6. Proposed sumps are non-engineered and provided to aid the quarry operator for effective management of stormwater within the quarry pit.
7. All proposed sediment control devices must be de-silted and made fully operational as soon as practicable following a storm event, if the devices' sediment retention capacity falls below 70% of its design capacity.
8. This plan may be amended/revised pursuant to any regulatory or statutory conditions of approval.
Rock lined / rip rapped roadside drain
Bund 1.5m High
Light Vehicle Access Road
Bench 760mAHD
Bench 745mAHD
Bench 730mAHD
Bench 715mAHD
Overburden Emplacement
Bench 715mAHD
Bench 730mAHD
Proposed Sediment Dam (SB3b)
Rip rapped embankment
Rip rapped embankment
Legend:
Approved Stage 1 Extraction Area
Proposed Stage 2 Extraction Area
BDC Bunded Diversion Channel
DB Diversion Bund
CD Catch Drain
CH Rock Lined Chute
SW Stormwater Pipe
ES Emergency Spillway
PB Perimeter Bund
Inlet Scour Protection
Clean Surface Water Flow
Dirty Surface Water Flow
Pump
Austen Quarry
Stage 2 Extension
Hy-Tec Industries Pty Ltd
Figure 17 - Conceptual Stormwater and ESC Measures
Extraction Area and Overburden Emplacement (Stage F)
GROUNDWORK plus
1:3,000
1517.086
2

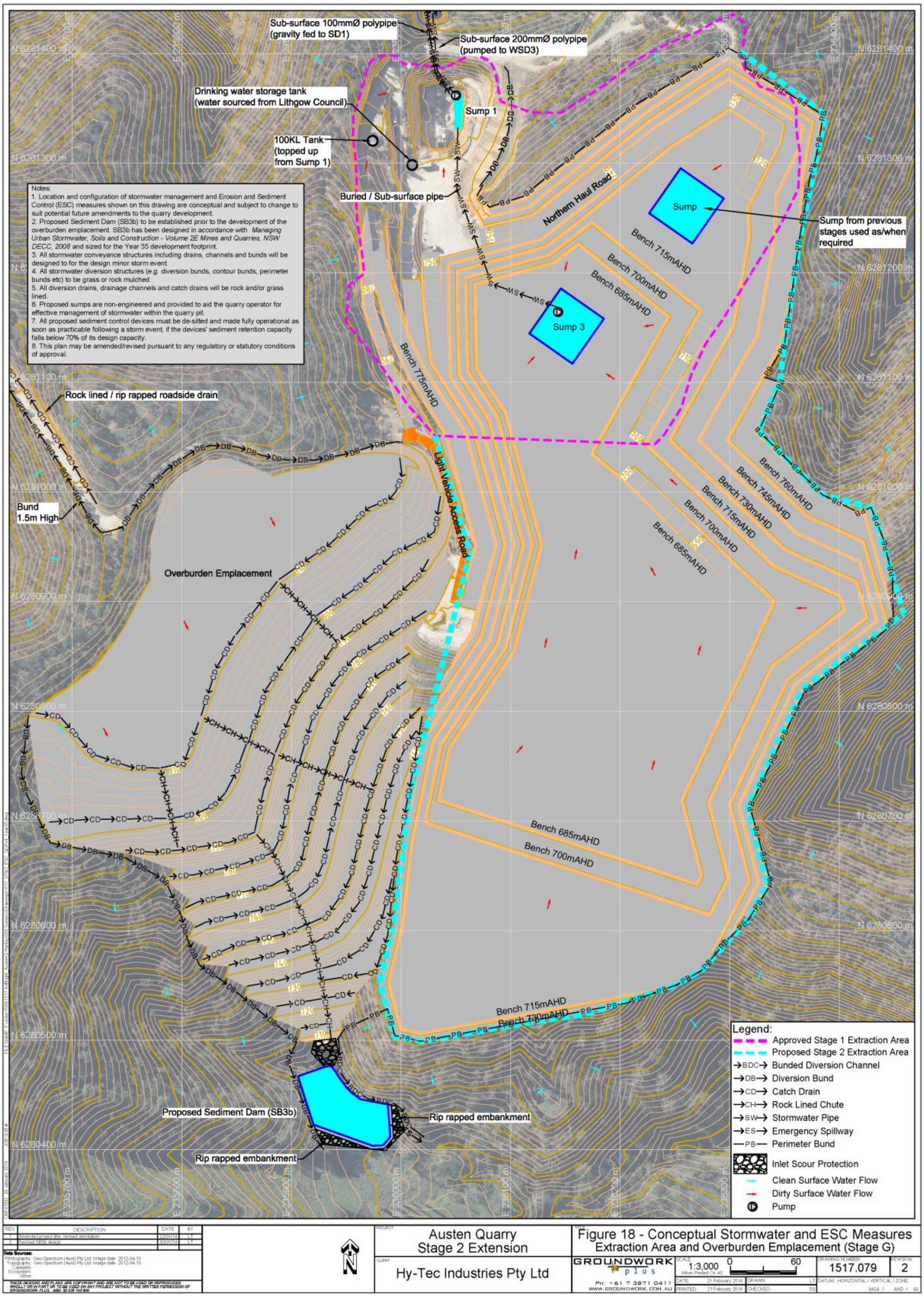


Figure 18 - Conceptual Stormwater and ESC Measures
Extraction Area and Overburden Emplacement (Stage G)