Hanson Construction Materials

Erosion and Sediment Control Plan:

Concept Plan for the redevelopment of Lot 11 DP558723, Lot 1 DP400697 and Lot 2 DP262213 Eastern Creek, NSW.

ENVIRONMENTAL

WATER

WASTEWATER

GEOTECHNICAL

CIVIL

PROJECT MANAGEMENT

P0601396JR07_v2 Final Report
October 2006

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Acknowledgements

Survey data and development proposal layout plans have been provided by Hanson Australia Pty Ltd.

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Document and Distribution Status

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Revision No.	Status	Release Date	Document Location					
			File Copy	MA Library	Planning Workshop Australia	Hanson Construction Materials	Void	Void
1	Draft	26/09/2006	1H. 1P		1H, 1P	1P		
2	Final	03/10/2006	1H, 1P	1H	1H, 1P	1P		

Distribution Types: F = Fax, H = hard copy, P = PDF document, E = Other electronic format. Digits indicate number of document copies.

All enquiries regarding this project are to be directed to the Project Manager.

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1 Overview

1.1 Background

Hanson Australia Pty Ltd have commissioned this report for the purposes of supporting a proposed redevelopment of the Hanson owned Eastern Creek Quarry land industrial property. This report has been prepared to provide details of management strategies to be employed to appropriately manage erosion and sediment on the site. These measures have been provided for the entire development site to minimise the risk of adverse impacts on surrounding property and the local environment.

The land relevant to the redevelopment proposal is identified as Lot 11 DP 558723, Lot 1 DP 400697 and Lot 2 DP 262213. Indicative development layout plans have been supplied by Hanson Australia and Planning Workshop Australia. These have been relied upon for the purposes developing the erosion and sediment control plan.

1.2 Development Proposal Overview

The proposed development relocates and restructures the current operation uses into a small, consolidated area and introduces more efficient methods. The proposed redevelopment of the Eastern Creek Quarry is outlined in Table 1 below.

Table 1: Proposed land activities and development areas.

Proposed Activity	Indicative Land Area within each use is distributed (m^2)	Indicative Building and Plant Footprint (m^2)
Concrete Batching Plant	11,770	Office – 180 Workshop – 200 Fixed Plant Envelope – 3000
Concrete Recycling Plant	34,200	3000
Asphalt and Emulsion Plant	37,000	Office and Lab – 300 Workshop – 700 Asphalt Plant – 7000 Emulsion Plant – 2000
Materials Storage and Transfer Depot	12,100	6000
Concrete Masonry Plant	34,600	3200
Office and Laboratory	5,600	2000
Logistic Operation and Workshop	17,600	1400
Minor road realignment and internal roads	20,000	

The proposed new allotment is irregular in shape and has an area of approximately 27 hectares.

1.3 Project Scope

The scope of this erosion and sediment control plan is as follows:

1. Review of soil properties under both existing and construction conditions.

2. Assessment of soil loss from various site uses.

3. Sizing and location of necessary erosion and sediment control structures.

4. Integration of existing erosion and sediment control measures and existing water quality control structures.

5. Recommendations for on-going site management.

The attached plan set indicates the extent of site works and areas where works and disturbances to the site are not permitted.

1.4 Relevant Planning Controls, Policy Objectives and Guiding Principles

A number of specific planning controls and design principals have been considered in the development of this erosion and sediment control plan. They are as follows:

1. Blacktown City Council's Works Specification Civil (2005) Section 3;
2. Landcom (2004) best practice guidelines detailing the design and construction specification for sediment and erosion management measures.

2 Soil Properties

2.1 Land-use Changes

The site is characterised by mixed industrial operations, predominantly asphalt and concrete plants, and includes several large areas for stockpiling of materials and plant machinery. The proposed new uses within the redevelopment of the site are the emulsion plant and concrete masonry plant. Part of the redevelopment also involves the realignment of the existing internal roads and site boundaries as well as the reconfiguration of the existing sedimentation basins / dams on the site. Minimal earthworks will be required to regrade the site to achieve design objectives. The extents of earthworks, including final levels, have not yet been determined.

2.2 Existing Soil Properties

There are five (5) primary soil types that exist in the study area. These are summarised in Table 2.

Table 2: Summary of soils found on the site

	Type	Location	Description	Approximate % of Site
1	Unsealed Pavement	Internal site areas and work areas	Generally 0.5-0.8 thick mixture of road base and very stiff clays.	43
2	Fill in Work areas	Around existing plant equipment	Unknown depth and composition probably based on excavated material.	11
3	In-situ soils	Southern end of site	Clay loam to 0.1-0.15m below ground level overlying medium clays.	28
4	Soil Spoil Areas	Around sedimentation ponds	Unknown volume. Composed of mixture of original excavations for ponds and dumped dredged tailings.	3
5	Stockpile areas	See Attachment A	Generally coarse aggregate.	15

Note: BGL = metres below ground level.

2.3 Construction Activities

The site requires minimal clearing and earthworks; construction of hardstand areas; and the delivery and erection of some equipment, offices and laboratories. It is expected that the redevelopment will involve regrading of the existing site and re-positioning of most

stockpiles on site. Therefore there will be disturbance of pavement materials and stockpiles in the vicinity of the redevelopment area.

Proposed works also include the reconfiguration of existing sedimentation basins/dams as well as the construction and realignment of a drainage depression therefore resulting in the disturbance to the surrounding soils.

Anticipated construction works can be broken down into five (5) main categories with individual soil characteristics. These are outlined in Table 3. During construction, regrading works will expose existing surfaces as the site is developed.

Table 3: Extent of earthworks and soil properties

Category	Area (Ha)	Anticipated Soil type	Characteristic Grain Size (mm)
Road Construction	2.0	Very Stiff Clays and road base	1-20
Level Regrading	19.7	Very Stiff Clays and road base	1-20
Stockpile Relocation	4.21	Loose aggregate, bitumen, concrete and crushed rocks	Average 20
Water Quality Ponds	2.1	Clay loams, medium clays and fine sediments	0.005-1
Realignment of Stormwater Drainage Depression	0.5	Clay loams, medium clays and shales	0.01-1

3 Assessment of Soil Loss from Proposed Site Uses

3.1 Overview

Estimation of soil loss has four important applications to soil and water management. These are:

1. Assess the erosion risk at a site.
2. Identify suitable measures to overcome the erosion risk.
3. Estimate the required capacity of sediment retarding basins.
4. Compare the effectiveness of various erosion control measures

The main areas of soil loss and soil erosion for the redevelopment of the site are as follows:

- Pavement and hardstand areas including access roads.
- Footings, foundations and trenching of services.
- Stockpile areas.
- Sedimentation basins and surrounding areas.

3.2 Revised Universal Soil Loss Equation Calculations

The Revised Universal Soil Loss Equation (RUSLE) (Appendix 4: Landcom (2004)) has been used to determine the long-term average annual loss from sheet and rill flow at the site. The equation is represented by:

$$\mathbf{A = R\ K\ LS\ P\ C}$$

Where, **A** = computed soil loss (tonnes /ha/yr)

R = rainfall erosivity factor

K = soil erodibility factor

LS = slope length/gradient factor

P = erosion control practice factor

C = ground cover and management factor

3.2.1 Results

Using the RUSLE equation each area of the site can be given a soil loss class and an erosion hazard in accordance with Table 4.2 (Landcom 2004). The calculations are provided in Attachment B and summarised in Table 4 below.

Table 4: Adopted RUSLE soil parameters

Soil Type	R (mm/Ha/year)[1]	K	LS[2]	P[3]	C	A[4]
Very Stiff Clays and road base	2210	0.048	1.35	1.3	1	186.2
Loose aggregate, bitumen, concrete and crushed rocks	2210	0.014	1.35	0.8	1	33.4
Clay loams, medium clays and fine sediments	2210	0.022	1.35	1.2	1	78.8

NOTES: [1] 2 year ARI, 6 hour ARI of 10mm was calculated using figures from ARNR (1998) and the Rational Method. [2] Based on an average slope of 5% and average length of 100m. [3] Determined from Table A2 (Landcom 2004). [4]Tonnes/Ha/year.

Table 5 below shows soil loss class and erosion hazard in accordance with Table 4.2 Landcom (2004).

Table 5: Soil loss class, calculated soil loss, and erosion hazard.

Category	Calculated Soil Loss (tonnes/ha/year)	Soil Loss Class	Erosion Hazard
Road Construction	186.2	2	Low
Level Regrading	186.2	2	Low
Stockpile Relocation	33.4	1	Very Low
Water Quality Ponds	78.8	1	Very Low
Realignment of Channel	78.8	1	Very Low

Calculated soil loss for each of earth work types has been calculated in Table 6. It is noted that these areas are approximated from proposed site layout and information supplied by the Client.

Table 6: Estimated total soil loss (tonnes/year).

Category	Calculated Soil Loss (tonnes/ha/year)	Approximate Area (Ha)	Total Soil Loss (tonnes/ year)
Road Construction	186.2	2.0	372.4
Level Regrading	186.2	19.7	3668.1
Stockpile Relocation	33.4	4.21	140.6
Water Quality Ponds	78.8	2.1	165.5
Realignment of Channel	78.8	0.5	39.4
TOTALS		**28.51**	**4386**

4 Sediment and Erosion Control

4.1 General

Perimeter control measures shall be placed prior to or in conjunction with the first phase of earthworks. Construction shall be phased if directed by Council so that land disturbance is confined to areas of workable size. This limits the duration for which disturbed areas are exposed to erosion. Stabilisation measures shall be applied on the first disturbed section before the next section is opened up if possible.

Where site regrading or filling is to be undertaken, surface water shall be directed away from the face of batters and stock piles. All stockpiles shall be located outside hazard areas such as drainage depressions.

All areas not subject to construction works shall be retained free from disturbance or damage during the currency of the Works. Should these areas become disturbed or damaged they shall be reinstated by the Applicant.

4.2 Erosion and Sediment Control Devices

Where shown on the plan set, sediment and erosion control devices shall be constructed and maintained. Unless the device is a permanent structure, it shall be removed when the areas upstream of it have been stabilised. The control devices shall be constructed in the locations shown on the plan set unless an alternative location is directed by Council.

Local site stormwater measures for diversion of stormwater around construction areas shall be in accordance with the Erosion and Sediment Control Plan (ESCP - Sheet 1) and Erosion and Sediment Control Plan Details (ESCPD - Sheet 2) of the Plan Set. These measures are in accordance with Blacktown City Council Works Specification Civil (2005) Section 3 and 15 and Landcom (2004).

4.2.1 Temporary Construction Exit

The temporary construction exit shall be provided to shake off site material from exiting vehicles and shall consist of a pad of coarse crushed rock, (75mm to 1 50mm range) having a minimum depth of 200mm, a minimum length of 25m and a width as nominated ESCP - Sheet 1) or be of precast or prefabricated steel "cattle grid" type. See ESCPD – Sheet 2.

4.2.2 Diversion Channels/Banks

Diversion channels are earth channels with a minor ridge on their lower side constructed across the slope. The channel shall have side slopes not steeper than 1 in 3.

Where flows are too large to be contained by a simple channel, a diversion bank shall be constructed below the channel. The bank shall have a compacted height of at least 500mm with batter slopes no greater than 1 in 2 and a top width of 600mm. The channel behind the bank shall fall to the outlet point.

Diversions shall be stabilised by the method nominated on the ESCPD – Sheet 2 and shall be located as shown in ESCP - Sheet 1 or directed by Council so that runoff will discharge onto stable disposal areas without causing erosion.

4.2.3 Straw Bale Barrier

Straw bale barriers shall consist of wire bound bales laid lengthwise in an excavated trench nominally 100mm deep. Each bale shall be securely anchored by two stakes or star pickets skewer driven through its centre into the ground such that the top of the stake or star picket is level with the top of the bale as shown in ESCPD – Sheet 2.

The barrier shall be constructed on that part of the perimeter of the site or at other locations within the site where shown on the ESCP – Sheet 1 or where directed by Council.

4.2.4 Filter Bank

The filter bank, which is an auxiliary structure shall be installed in conjunction with and as part of a diversion bank or other structure designed to temporarily pond sediment-laden surface runoff as shown on the ESCP – Sheet 1.

The outlet shall be constructed in accordance with the details shown in ESCPD – Sheet 2. Aggregate shall be in the 50 to 75mm size range. The crest of the outlet shall be a minimum of 1 50mm lower than the top of the associated earth bank and may be either level or slightly concave. The gravel outlet shall otherwise have a similar cross-section to that of the adjacent earth bank. The length shall be as shown on the ESCP – Sheet 1.

4.2.5 Sediment Traps

Temporary de-silting structures shall be constructed at inlets to stormwater systems to trap sediment runoff as shown in ESCPD – Sheet 1.

4.2.5.1 Culverts

Existing road embankments with culverts beneath shall be converted to temporary sediment traps by building around the entrance to the culvert a box of unmortared standard masonry construction blocks nominal 150mm thickness, placed on side in accordance with the detail shown on the ESCPD – Sheet 2. A filter of gravel or coarse aggregate (50 to 75mm size range) shall be placed against the modified inlet. The filter material shall batter at 3 to 1 from the top of the blockwork. The width and height of the blockwork shall be as specified in the ESCPD – Sheet 2.

4.2.6 Filter Dams

Filter dams built of pervious materials such as straw bales, washed aggregate, gabions, or sandbags filled with aggregate shall be placed across minor drainage channels while ground cover is being established, to steady flow velocity and to trap sediment. In grassed channels they shall be embedded at least 100mm in the soil to prevent water tunnelling beneath them.

Aggregate filled sandbags shall be stacked in an interlocking fashion.

The dam shall be checked after each storm for structural damage or clogging by silt and other debris and the Applicant shall make prompt repairs or replacements to the satisfaction of Council.

4.2.7 Sediment Basins

Sediment basins, where specified, shall be constructed to the details shown on the Documents and detailed design at CC stage of the development. The basin shall be constructed as the first phase of the earthworks operation. The required minimum basin size is 6000 KL in accordance with Landcom's "Managing Urban Stormwater – Soil and Construction - Volume 1 " - 4 Edition (2004). Proposed basin size for the development is 6200KL as shown on Sheet 1.

5 Integration of Existing Erosion and Sediment Control Measures

5.1 Overview

Current stormwater management is controlled by directing flow of water into the existing dam system. Water is then released from this system into the natural water course (Ropes Creek) once treated.

Stormwater is captured and directed to these dams by diversion channels/banks that surround the boundaries of each use. In general they are 1.0-1.5m high, vegetated and have an average batter slope of 1:2-1:3 depending on the material used to construct them. These banks perform the task of directing surface water run-off away from steep embankments as well as providing a drainage channel for the surface flows to flow away from stockpiles and natural watercourses and vegetation south of the site.

The redevelopment will involve the filling and regrading of the sediment dams currently located in the redevelopment area. The approximate catchment area of these sediment dams to be removed is 14 Ha and the estimated desilted volume of these dams is approximately 4800m^3.

The only evidence of erosion control currently undertaken is the stabilising of slopes by producing appropriate batter angles and encouraging vegetation growth.

5.2 Integration of Existing Measures

The redevelopment should integrate the following existing measures into the proposed erosion and sediment control plan:

- Sedimentation Ponds – The sedimentation ponds on the lower level of the site shall be reconstructed to allow settling of sediments prior to water re-use in industrial processes and prior to discharging to Ropes Creek.
- Diversion channels/banks – All current diversion channels/banks shall remain on site where practical to prevent surface flows entering natural vegetation, watercourses and steep embankments.
- Stabilisation of Slopes – All slopes shall be stabilised by producing appropriate batter angles (especially stockpiles) and the encouragement of vegetation growth where practical to prevent soil erosion.

5.3 General Site Management Techniques

General site management requirements are as follows:

1. Minimise the period of land disturbance: The timing of vegetation removal, land surface regrading and vegetation replacement is to be such that the period of time where land is cleared of vegetation is to be minimised.

2. Minimise the area of cleared land at any time: Regrading is to be managed in such a way as to minimise the total site area being regraded at any time. This will minimise the total potential mass of soil mobilised on the site by a runoff event.

3. Minimise amount of relocation of stockpiles: Relocation of stockpiles is to be managed so that they are only done once and that appropriate erosion and sediment control devices are in place prior to relocation.

4. Material excavated from sedimentation dams/basins: The desiltation, dredging and reconstruction of the dams/basins shall be undertaken once all erosion and sediment control measure are in place. The tailings material shall be placed no more than 0.15m thick in the area designated on the site plan (north of site) for drying. Once appropriately dried, and subject to contamination testing, the material can be used for regrading and filling of the site.

5.4 Maintenance

All maintenance shall be in accordance with BCC Works Specification Civil (2005). All sediment and erosion control devices shall be maintained in a satisfactory working order throughout the Maintenance Period or until such earlier time as the area upstream has been stabilised and Council directs that the device be removed.

The devices shall be inspected after each storm for structural damage or clogging by silt and other debris and prompt repairs or replacement shall be made by the Applicant.

All sediment deposited within ponded areas shall be periodically removed to a disposal area as directed by Council.

Filter materials shall be cleaned and restacked or replaced when directed by Council to maintain effective performance.

In the case of the temporary construction exit, the contractor shall undertake periodical surface cleaning by drag broom or equivalent, to remove all build up of foreign material.

To control bank growth and to maintain healthy ground cover in channels and on banks, mowing shall be undertaken at regular intervals when directed by Council.

5.5 Dust Control

All reasonable steps shall be taken by the Applicant to limit the creation of any dust nuisance which might arise during the execution of the works. In this regard all haul roads, access tracks and construction areas shall be regularly watered.

Council may direct that work cease until such time as any particular dust nuisance has been controlled. All costs associated with control of dust shall be borne by the Applicant.

5.6 Diverting Water and De-watering

All necessary action shall be taken by the Applicant to prevent any surface and/or sub-soil water from interfering with the progress of the works. The work area shall be kept free from such water. All reasonable measures shall be taken to prevent any damage to the works by water due to flood, seepage or other causes.

Any work or material damaged by water from any source shall be removed, replaced with fresh material and reconstructed by the Applicant.

Provision shall be made for the temporary drainage of any road boxing excavation or pavements in the event of rain. The Applicant shall ensure that this temporary drainage does not cause erosion or siltation of any existing drainage works.

Appropriate arrangements must be made to provide anti-siltation measurements to prevent any deleterious matters entering the stormwater system.

6 Preliminary Erosion and Sediment Control Sequence

Sequence of construction works in relation to the Erosion and Sediment Control Plan are to be in general accordance with Blacktown City Council – Works Specification Civil (2005) and Landcom (2004). The following preliminary sequence of works is subject to change and should be used as a guide only until a construction management plan has been completed.

1. Erect site access control fencing, stabilise site access and construct temporary construction exit in accordance with Blacktown City Council (BCC) and standard drawing A(BS)115M.
2. Construction and maintenance of existing perimeter bank with channel around perimeter of the redevelopment area as shown and in accordance with BCC standard drawing A(BS)123M.
3. Construct sediment control fences and straw bale check fences around initial regarding areas in accordance with BCC standard drawing A(BS)121M.
4. Construction of suitable outlet (riprap >100mm rock size) from temporary drainage channels to existing sedimentation basin as shown and in accordance with Landcom.
5. Construct straw bale check dam upslope of temporary drainage channels outlet to sedimentation ponds as shown and in accordance with standard drawing BCC A(BS)116S.
6. Construction of sediment fence around sedimentation ponds/dams work area as shown and in accordance with BCC standard drawing A(BS)121M.
7. Construction of straw bale sediment filter around existing sedimentation ponds/dams outlet to Ropes Creek as shown and in accordance with BCC standard drawing A(BS)121M.
8. Locate temporary stockpile area and dredged tailings area with straw bale sediment fence and diversion channels/banks as shown and in accordance with standard drawings BCC A(BS)121M and A(BS)123M and Landcom drawing SD4-1.
9. Regrade and construction of access roads to allow all surface water from site to drain to temporary sediment basins as shown.
10. Construct straw bale and geotextile sediment fences along access roads as shown and in accordance standard drawing BCC A(BS)121M.
11. Relocation of stockpiles in accordance with Landcom standard drawing SD4-1.

12. Monitor sediment fences weekly or after rainfall of over 20mm in a day and remove collected sediment when fences reach 70% capacity.

7 References

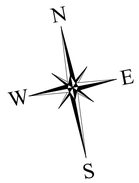
Bannerman S.M and Hazelton P.A (1990) *Soil Landscapes of the Penrith 1:100,000 Sheet*

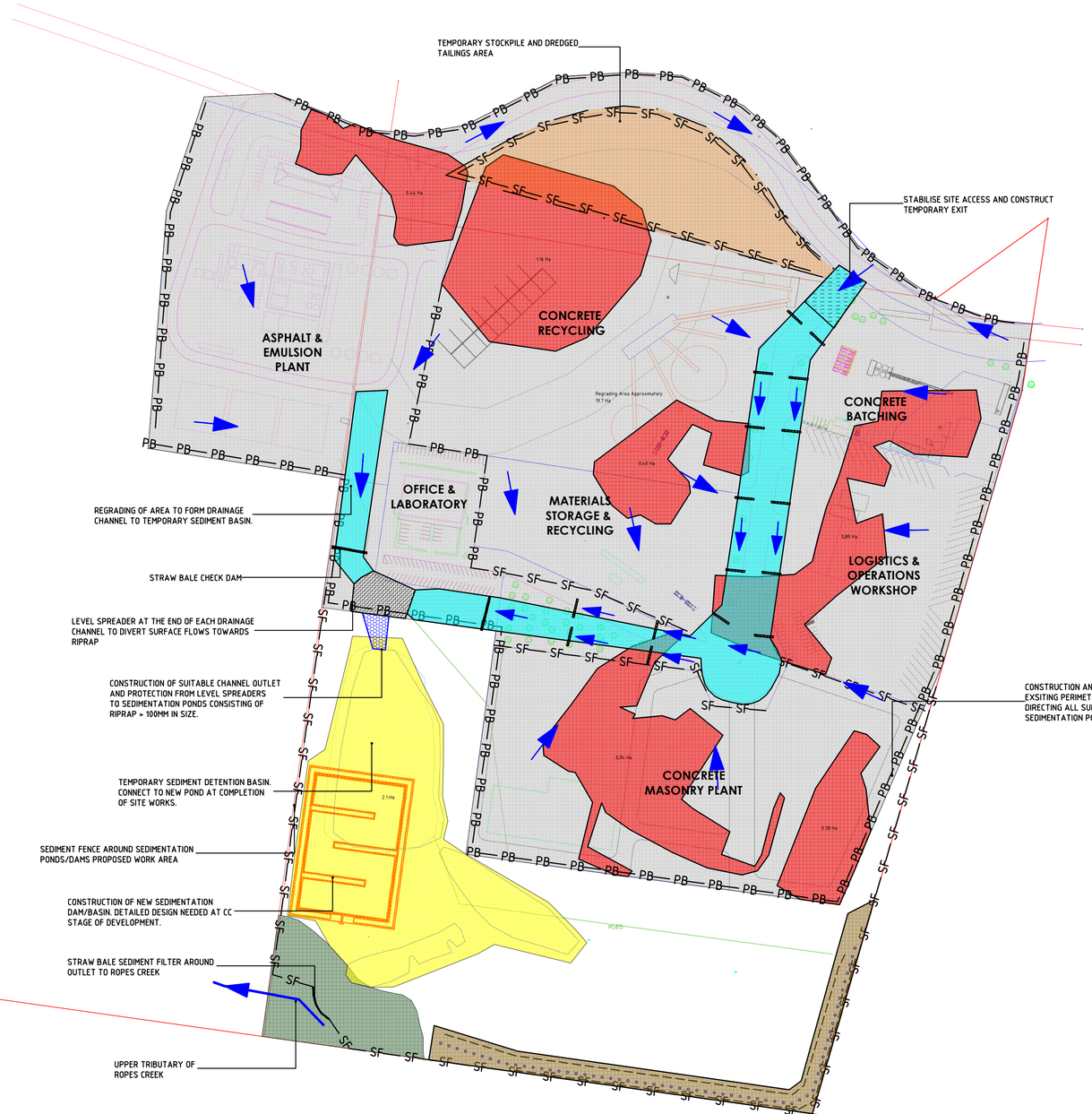
Blacktown City Council (2005) *Works Specification Civil*

Landcom (2004) *Managing Urban Stormwater – Soil and Construction - Volume 1 - 4 Edition.*

The Institution of Engineers, Australia (1987) *Australian Rainfall and Runoff – A Guide tom Flood Estimation Volume 1 and 2*

8 Attachment A – Plan Set





LEGEND

- SITE ENTRY AND EXIT
- STRAW BALE SEDIMENT FILTER
- OUTLET CHANNEL PROTECTION - RIPRAP
- STRAW BALE CHECK DAM
- STRAW BALE SEDIMENT FENCE
- SURFACE WATER FLOW DIRECTION
- SF SF SF — SEDIMENT FENCE
- PB PB PB — PERIMETER BANK
- TEMPORARY STOCKPILE AND DREDGED TAILINGS
- APPROXIMATE AREAS OF EXISTING STOCKPILES
- PROPOSED NEW CHANNEL
- TOP OF BANK NEW CHANNEL
- SEDIMENTATION PONDS/DAMS WORK AREA
- REGRADING AND CONSTRUCTION OF ACCESS ROADS/DRAINAGE CHANNELS
- AREA OF REGRADING
- AREA OF REALIGNMENT OF NEW CHANNEL
- LEVEL SPREADER AREA
- NEW SEDIMENTATION DAM/BASIN
- UPPER TRIBUTARY OF ROPES CREEK
- RIPARIAN CORRIDOR

PAGE BAR SCALE
0 20 40 60 80 100
UNITS - METRES
SCALE - 1:1750@ A1 1:3500@ A3

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CLIENT/ PROJECT
HANSON CONSTRUCTION MATERIALS
EASTERN CREEK QUARRY

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All measurements in m unless otherwise specified.

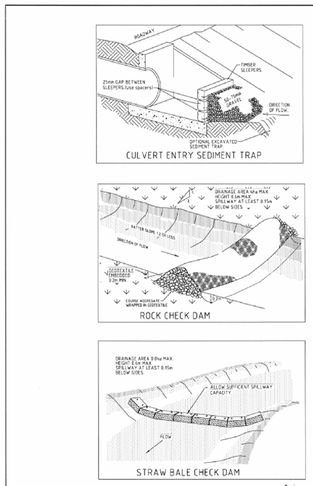
TITLE
EROSION AND SEDIMENT CONTROL PLAN

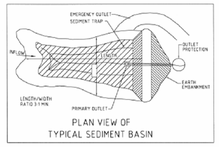
PROJECT MANAGER: DR DANIEL MARTENS

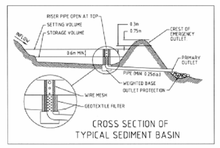
DRAWING NUMBER: P0601396JD13_V1

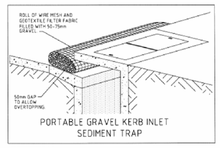
DESIGNED:	GT
DRAWN:	GT
REVIEWED:	DDM
DATUM:	AHD
HORIZONTAL RATIO:	1:1750 @ A1 1:3500 @ A3
VERTICAL RATIO:	1:1750 @ A1 1:3500 @ A3
SHEET	1 OF 2 SHEETS
PAPER SIZE:	A1 / A3

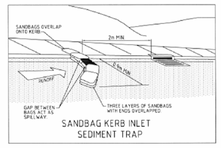
REV.	DESCRIPTION	DATE	ISSUED
1.0	EROSION AND SEDIMENT CONTROL PLAN	25.09.2006	GT
2.0	EROSION AND SEDIMENT CONTROL PLAN	03.10.2006	GT

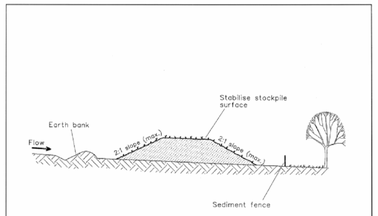










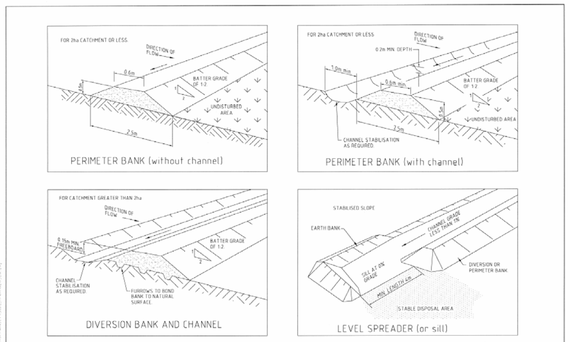


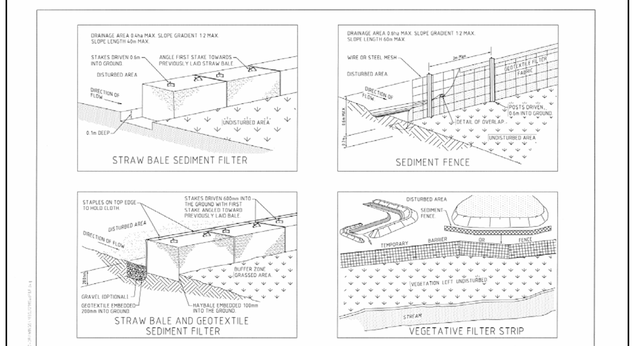
Construction Notes

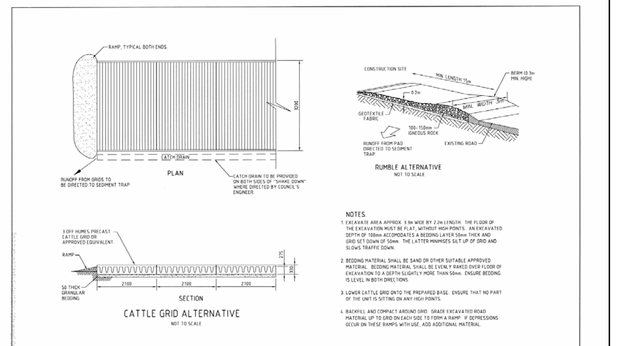
1. Place stockpiles more than 2 (preferably 5) metres from existing vegetation, concentrated water flow, roads and hazard areas.
2. Construct on the contour as low, flat, elongated mounds.
3. Where there is sufficient area, topsoil stockpiles shall be less than 2 metres in height.
4. Where they are to be in place for more than 10 days, stabilise following the approved ESCP or SWMP to reduce the C-factor to less than 0.10.
5. Construct earth banks (Standard Drawing 5-5) on the upslope side to divert water around stockpiles and sediment fences (Standard Drawing 6-8) 1 to 2 metres downslope.

STOCKPILES **SD 4-1**

4-5







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TITLE
EROSION AND SEDIMENT CONTROL DETAILS

THIS PLAN MUST NOT BE USED FOR CONSTRUCTION UNLESS SIGNED AS APPROVED BY PRINCIPAL CERTIFYING AUTHORITY
All measurements in m unless otherwise specified.

PROJECT MANAGER: DR DANIEL MARTENS

DRAWING NUMBER: P0601396JD13_V1

DESIGNED:	GT
DRAWN:	GT
REVIEWED:	DDM
DATUM:	None
HORIZONTAL RATIO:	None
VERTICAL RATIO:	None
SHEET	2 OF 2 SHEETS
PAPER SIZE:	A1 / A3

REV.	DESCRIPTION	DATE	ISSUED
1.0	EROSION AND SEDIMENT CONTROL PLAN	25.09.2006	GT