A Construction Safety Study Report
for
Blue Circle Southern Cement
No. 6 Kiln Upgrade Project
Berrima Works
Berrima, NSW

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Date:

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1. EXECUTIVE SUMMARY

The purpose of this study report is to provide evidence to relevant authorities that all issues related to safety during construction operations have been adequately addressed.

1.1 Description of the construction proposal

This Project is to upgrade Blue Circle Southern Cement's existing No 6 Kiln at the Berrima Cement Works. Works to be undertaken on the Blue Circle Southern Cement Berrima Cement Works site as part of the Kiln 6 Upgrade Project are confined generally to the area of the Berrima Works with particular emphasis on the No.6 Kiln and surrounds and associated work areas such as HV switchyard

The Project will be constructed while the Cement Works continues production. The Cement Works operates on a continuous 24 hours per day, seven days per week basis. Much of the construction activity will not be noticeable due to the continuing operation of the Cement Works. The construction will involve typical building construction activities.

Construction activities will be undertaken by a number of different contractors operating under contracts of varying scope and duration. The NSW OHS ACT 2000 and OHS Regulations 2001 are applicable, and for the purposes of this legislation BCSC is named as the "Principal Contractor" and Hatch and Associates acting as "Project Managers".

The Hatch Project Managers are responsible for ensuring that all activities are carried out by the Contractors in accord with the Safety and Health Management Plan (attached as Appendix E)

This document includes specific safety actions that address OHS issues that can be identified at this stage. Ongoing investigations and risk assessments during the implementation of the Project will identify other issues and responses to these will be developed as the Project proceeds.

BCSC is committed to implementing the Berrima No 6 Kiln Upgrade Project in a manner consistent with todays environmental and safety standards.

The Contractors will comply with the following site rules:

- Blue Circle Southern Cement Occupational Health and Safety Policy
- Environmental Policy, and
- Safety Management System Standards.

The Contractors will work in accordance with a range of Site Rules that positively affect environmental and safety performance. These Site Rules include the following:

- Risk assessment of all work
- Contractor's on-site Officer in Charge
- Contractor Equipment Inspections
- Contractor's Record Book
- Isolation Procedures
- Vehicle requirements and drivers
- Protective equipment

- Hand tools inspection and testing
- Confined space
- Digging permits
- Working at heights policy

1.2 The purpose and scope of the study

The NSW Department of Planning, as part of the draft conditions of consent (condition 6.2 (c)) for this project, required that this Construction Safety Study be prepared in accordance with their "Hazardous Industry Planning Advisory Paper No 7-Construction Safety Study Guidelines".

This study was commissioned to help identify potentially hazardous incidents during deconstruction, construction and commissioning and to identify appropriate upgrading and revision of programs, safeguards and safety and emergency procedures.

It is to be used to help ensure that all measures are in place, so that the selection, checking, fabrication, construction and commissioning of all the safety critical elements of a facility are in accordance with design intent and specifications, consistent with requirements and findings arising from other safety studies, and that design and specifications are appropriate.

1.3 Major considerations and findings

- People falling whilst working aloft
- Tools, equipment and waste falling
- People working or walking under suspended loads
- People and equipment falling from ground level to below ground
- Pedestrian and mobile plant interface
- Electric shock (commissioning)
- Equipment operating or starting without notice (commissioning)

1.4 The identification of major potential hazardous incidents

A construction method review meeting was held to identify the major potential hazards associated with the upgrade works. The list of attendees is included below :

Name	Company	Title
Mitch Mitchell	Minerva	Facilitator
Gerry Gal	Hatch	Construction Manager
David M Wilson	Hatch	Safety Advisor
Keith Partridge	Hatch	Project Manager
Raif Hilmi	BCSC – Berrima	Team Leader
Peter Hall	Hatch	Mechanical Site Supervisor
John Ward	Hatch	Civil Site Supervisor
Bill Lockley	BCSC – GES	Electrical Engineer
Mark Nolan	BCSC – Berrima	Project Superintendent
Garry Hinton	BCSC – GES	Mechanical Engineer
Karl Zabaks	BCSC – GES	Mechanical Engineer
Graham Benson	Boral Timber	Engineering Manager Hardwood Division
Sunil Ram	BCSC – Berrima	Process Engineer
John Ruddiman	BCSC – GES	Mechanical Engineer Manager
John Neal	Hatch	Senior Project Engineer
Michael McIlveen	Hatch	Project Engineer/ Cost Control/ Scheduler

2. OUTLINE OF PROPOSED AND EXISTING OPERATIONS

2.1 The site location in relation to surrounding land uses

See Appendix B - Project Construction Environmental management plan

2.2 The site layout

See Appendix B - Project Construction Environmental Management Plan

2.3 The purpose of the proposed operation and the major steps in the process

See Appendix B - Project Construction Environmental Management Plan

2.4 The existing operations

See Appendix B - Project Construction Environmental Management Plan

2.5 Major contractors to be used

Kiln 6 Upgrade - Site Contractors (as at 06/08/03)

Contract Number: GES495
Contract Package Description: Shop fabrication of PHT steelwork, including the draughting of shop fabrication drawings.
Contract Award Date: 24 March 2003
Contract Scheduled Completion Date: Practical completion 27 August 2003
Contractor: Ahrens Engineering Pty Ltd.
Subcontractor(s): N/A
Subcontractor(s) Work Package Description: N/A

Contract Number: GES496
Contract Package Description: Shop fabrication of PHT process equipment, which will flow onto the site due to transport limitation. Estimated site hours are X hours.
Contract Award Date: 17/04/03
Contract Scheduled Completion Date: Practical completion 13 September 2003
Contractor: H & M Engineering & Construction Pty Ltd.
Subcontractor(s):
Subcontractor(s) Work Package Description:

Contract Number: GES502
Contract Package Description: H.V. Power System
Contract Award Date: 28 April 2003
Contract Scheduled Completion Date: 1st December 2003
Contractor: O'Donnell Griffin
Subcontractor(s): Excavation Contractor - Southern Cross Contractors, Directional Boring - UEA, Cable Installation - National Cable Installers, HV Cable Terminations - Keith Krampton
Subcontractor(s) Work Package Description: Southern Cross Contractors - All excavations for HV cabling and cable access way conduits, UEA - Directional boring under rail lines/roadway, National Cable Installers - Installation of main cable runs, Keith Krampton - Terminations of HV cables.

Contract Number: GES506
Contract Package Description: Construction of concrete foundations for preheater tower, raw mill and tower crane.
Contract Award Date: 17 April 2003
Contract Scheduled Completion Date: 11 June 2003
Contractor: De Martin & Gasparini Pty Ltd.
Subcontractor(s): Piling Contractors, Jim Godfrey Excavations, Concrete Sealing Services
Subcontractor(s) Work Package Description: Pile driving; Excavation (for raw mill); Concrete finishing; Placing and tying reinforcement

Contract Number: GES517
Contract Package Description: Site Compound Electrics
Contract Award Date: 13 May 2003
Contract Scheduled Completion Date: 23 May 2003
Contractor: FRH Electrical
Subcontractor(s): N/A
Subcontractor(s) Work Package Description: N/A

Contract Number: GES511 Installation of Preheater Tower and Equipment
Contract Package Description: Construction of a new PHT and the installation of PHT process equipment and ductwork.
Contract Award Date: 02/04/2003
Contract Scheduled Completion Date: Practical completion 31 January 2004
Contractor: H & M Engineering and Construction Pty Ltd.
Subcontractor(s): Lindores Cranes
Subcontractor(s) Work Package Description: Supply and install and operate FAVCO 1500 Tower Crane

Contract Number: GES514 Switchroom construction
Contract Package Description: Construction of new substation 4 switchroom, coal mill switchroom and cooler switchroom.
Contract Award Date: 27/05/2003
Contract Scheduled Completion Date: Practical completion 27 August 2003
Contractor: Able Engineering
Subcontractor 1: Ev'ry Digging
Subcontractor(s) Work Package Description: Earthwork and civil work for substation 4.
Subcontractor 2: FRH Electrical
Subcontractor(s) Work Package Description: Electrical work associated with the construction of the switchrooms.
Subcontractor 3: Wollongong Civil Services
Subcontractor(s) Work Package Description: Formwork and reinforcing steel installation.

3. STUDY METHODOLOGY

3.1 The methodology used and the relationship with safety studies being undertaken concurrently

The NSW WorkCover Authority endorsed method of Construction Hazard Assessment Implication Review (CHAIR) was used to help project stakeholders come together to reduce construction, maintenance, repair and deconstruction safety risks associated with design.

An independent facilitator sufficiently removed from the design process was selected to help use the experience and expertise of the study team to challenge safety in design and explore whether issues have been overlooked or sufficiently thought through.

The following process was used:

1. A CHAIR study team including all stakeholders was brought together and included the following people/organizations

Name	Company	Title
Mitch Mitchell	Minerva	Facilitator
Gerry Gal	Hatch	Construction Manager
David M Wilson	Hatch	Safety Advisor
Keith Partridge	Hatch	Project Manager
Raif Hilmi	BCSC – Berrima	Team Leader
Peter Hall	Hatch	Mechanical Site Supervisor
John Ward	Hatch	Civil Site Supervisor
Bill Lockley	BCSC – GES	Electrical Engineer
Mark Nolan	BCSC – Berrima	Project Superintendent
Garry Hinton	BCSC – GES	Mechanical Engineer
Karl Zabaks	BCSC – GES	Mechanical Engineer
Graham Benson	Boral Timber	Engineering Manager Hardwood Division
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John Ruddiman	BCSC – GES	Mechanical Engineer Manager
John Neal	Hatch	Senior Project Engineer
Michael McIlveen	Hatch	Project Engineer/ Cost Control/ Scheduler

2. The objectives and the scope of the study were defined
3. A set of guidewords and prompts were used in the review process to help identify safety aspects/issues
4. The associated risks were discussed and the team determined whether any of the identified risks could be eliminated
5. Where it was deemed to be not reasonably practicable to eliminate a risk, the team determined how it might be reduced
6. The team then assessed whether the proposed risk controls (i.e. expected safeguards, etc.) were appropriate (is the risk as low as is reasonably practicable).
7. The comments, actions and recommendations were documented and appropriate methods for design issues still to be resolved were agreed upon

4. HAZARDS IDENTIFIED AND PROPOSED SAFEGUARDS

4.1 Construction phase

Area/Activity	Hazard	Consequences	Proposed safeguards
Weather	Welding in the wet weather High Winds during lifting Cold and hot weather Lighting strikes Inadequate signage	Possible electric shock Lift Studies and Crane operation Critical procedure Fatigue, Frost bite Electric Shock.	Electric shock management policy, procedure Education, training, PPE, Amenities Daily monitoring of weather forecast, Continual monitoring where appropriate
External safety interface	Unauthorised site access Traffic control on site Power sources External emergencies that affect the site Hours of work and fatigue issues	Member of the public Injured Transportation Code and Driver Code of Conduct	(See Appendix E - Site Safety Management Plan for Site OHS Rules) Approved copy to be signed off Booklets printed and disseminated (See BCSC Emergency response plan) Fatigue management program to be developed

Area/Activity	Hazard	Consequences	Proposed safeguards
Fire and Explosion	Hot work or hazardous work: in coal storage, handling and firing systems or areas	Flammable dust concentrations Isolation of fire explosion or fire suppression systems Emergency control systems failure Unreported, uncontrolled incident	(See Appendix A Project Fire Safety Study) Hot work permit program, no smoking policy and procedures Site-specific induction pointing out the requirements Isolation procedure, ATW(s) Hazardous work clearance Near miss and incident reporting and investigation process
Environmental	Waste: Scrap; Wood; Steel; Old refectory: Concrete; Liquid waste; Solid waste; Human waste; Contaminated waste water; SMF and other hazardous waste Waste removal Noise	Slips, trip and falls to same level or below, Waterway contamination Community complaint form and follow up process Follow up with Keith	(See Appendix B Project Construction Environmental management plan) Adequate waste and recycling bins Liquid waste to be collected and removed from site by an approved and licensed service provider to licensed land fill or waste management company
Utilities and services	Inadequate lighting: general; work or task specific; walkways and street crossings; storage areas Unsafe leads or connections: Electrical; Welding; Air; Unsafe water: Potable; Non potable	Slips, trips and falls to same level or below Pinch and nip points Vehicle/ Plant pedestrian incidents and injuries Rodents, insect and vermin Slips, trips and falls to same level or below Electric shock from poorly maintained leads, connections and welding handles Injection injuries form the use of compressed air to clean body Foreign bodies in the eyes Struck by loose or uncontrolled hose, connection failures All non-potable supplies to be identified and sign posted on the construction site and other areas of the	A review of the lighting requirements Contracts, tender documents and induction Dedicated and marked pedestrian crossing Transport code of conduct Drivers code of conduct Portable and temporary lighting Site OHS rules and OHS induction and OHS information All electrical equipment to be checked and marked as per the construction code of practice Regular Pest Inspection and control of amenities Housekeeping reviews

Area/Activity	Hazard	Consequences	Proposed safeguards
		plant adjacent to the construction site All water being used in Site Sheds, abolition block and other areas connected to potable water	
Safety Equipment	Inadequate supply or non-use of personal protective equipment: Temporary static lines; fall arrest systems; fall arrest harnesses; inspection methods; barriers and barricades; signage; dust	Injuries due to inappropriate selection, use, or lack of training Eye injuries when eye protection is inappropriate for the task	Project management to ensure strict adherence to OHS Act, regulations, site rules, codes of practices, standards. Appropriate training in the use care, maintenance and storage of and correct fit of critical equipment. Review of contractors safety management systems and training and education program
Natural Hazards	High winds Thunderstorms and lightning Fog	Falls Electric shock Impact or interaction due to lack of visibility	Monitoring of weather:- Daily Prior to major lifts Continual during bad weather periods
Inspection and testing	Pre-heater tower structural Unsafe loads during construction: existing building; new structure Unsafe access to high voltage electrical switch gear	Structural failure Floor collapse Fire and explosion Electrocution	Engineering reviews Access permit and HV permit program Electricity isolation procedures Danger tag policy and procedures
Construction Equipment	Unsafe contractor plant and equipment or contractor-hired plant and equipment: Cranes Lifting equipment • Spreader bars • Chains and slings • Man Boxes • Riggers and competency for specialized lifts Power hand tools	Unsafe equipment being used during construction, Breach of Act and Regulation Injury or incident Electric shock Fall from height from failure of ladders Unsafe equipment Delays, people, equipment and supplies the wrong location or position Inadequate for type, of and duration of work	Tender documents outlined requirements Safety management plan, copies disseminated to contractor Special conditions of contract Site Safety Rules, BCSC Polices and procedures Ongoing and spot check audits of contractors system and equipment and hired equipment brought to site Operators certified and competent where required to ensure correct operation

Area/Activity	Hazard	Consequences	Proposed safeguards
	Ladders Elevated Work Platforms (EWP) contractors own equipment; contractor Hired in equipment Bobcats: Sub Contractors - Hired equipment; Fitness; correct use and operation Interface with other contractors Real-estate Sequence and timing	duration of work Failure of equipment, crane overloaded, interaction between crane, plant and people Interaction with other plant, equipment and people working on site Boom lifts > 11m Certified operators Boom Lifts < 11 m Scissor Lifts: Inspections; maintenance; competent and trained operator	Communication and consultation process in place and disseminated in tender, contract, safety management plan, site rules and induction information Crane lift study, critical procedure, communication process Daily meetings, project progress meetings High visibility clothing
Heights and Depths	Unsafe working at heights No overhead protection at lift entry Unsafe access; Unsafe excavations and trenching; Unsafe confined spaces and work at heights; Unsafe access inside ductwork; Unsafe load management; Unsafe monorails; Location; Engineering; Access; Clearance; Load management; Transferring from crane to monorail; Chain blocks; Safe working loads; Inspection and testing of monorails and other bits No rescue plan for people working at height incidents	People, tools, equipment and waste products fall from height to ground, or from ground level to below ground level. People fall from the ground to below the ground Injuries due to time required to wait for emergency services	Working at heights procedure that looks to mitigate and control the risk Policies and procedures imbedded in the safety management plan, site OHS rules, OHS induction Crane lift engineering reviews Lift studies and engineering reviews of the lifting point and equipment being used to lift or shift loads Rescue and emergency response procedure Tools and equipment registers Sling inspections Monorails reviewed by Engineering Barriers and barricade process

Area/Activity	Hazard	Consequences	Proposed safeguards
Confined Spaces	Unsafe access Unsafe tools and equipment Unsafe people working above and below Unsafe waste management Unsafe air quality and ventilation Unsafe emergency response Unsafe safety watchers Unsafe contractors equipment	Injury or death	Confined Spaces permit program as per the regulation and Australian and New Zealand OHS Standards Extra gas monitoring equipment Trained and competent people undertaking work Confined space education and training
Access/Egress	Unsafe plant; site; or unsafe specific work areas Cartage areas Storage Lay down Sheds	Injury or death	Plant Induction process Site/Project specific induction JSA and Work Method Statements Confined spaces policy and procedure Lift studies; barricades; dedicated storage areas; dedicated lay down areas; contactor sheds amenities Visitor control process outlined in OHS site rules and induction, Log book at site office
Position /Location	Access points Attachment points for some lifts	Unsafe or inappropriate access, increase need to work at heights with out protection	Critical procedure in place Access ways, platforms, hand rails to be installed prior to being lifted in place where possible and practicable Design review to ensure what can be done is done before construction or installation

Area/Activity	Hazard	Consequences	Proposed safeguards
Poor Ergonomics	Temporary access Manual handling of refectory Unsafe access to conveyor gantries Slippery surfaces from snow and ice Unsafe wet conditions Instability	Slips, trips, fall to the same level or below Tools, equipment and people falling form heights Sprain, strain injuries Slips, trips, fall to the same level or below	Polices and procedures, education and training during the induction training Good signage and housekeeping to be reviewed on an ongoing basis
Movement and Direction	Traffic Crane loads Dual crane lift Individual Crane communication	Interaction between plant and plant, Plant and People and Plant and Structures.	Crane lifts studies, competent and qualified persons, barriers and barricades Use of radios to control lifts being done by Tower Crane Traffic control Transport code conduct Drivers code conduct
Load and Force	Pre-heater tower: existing; new; Crane monorails Scaffolding and loading Incomplete construction Caught between pinch points and nip points	Structural failure Failure of fixing points and lifting equipment Failure of scaffolds People or items falling from above Injuries and incidents	Engineering reviews Engineering review of attachment points, monorails Regular reviews and inspections of all scaffolds and engineered platforms Clear communications during lifting process Dunnage to be used where appropriate All loads to be controlled by qualified person, loads to be rested until alignment is correct and all limbs are out of the way JSA and Tool box meetings

4.2 Commissioning phase

Area/Activity	Hazard	Consequences	Proposed safeguards
Commissioning and Start-up	Power Communication Access and control of plant Too many people on site during commission process Induction Education and training Appropriate tagging or control system Down stream effect during commissioning process Operation manual development and language Disposal of test material and spoil	Appropriate for use and intention Unauthorized entry People in wrong position during commissioning phase possible injury Lack of communication	Commissioning plan to be developed by Commission engineer Pre start meeting Site access control process

4.3 Deconstruction phase

Area/Activity	Hazard	Consequences	Proposed safeguards
Deconstruction	TBA		

4.4 Hazardous materials to be used

(See Appendix F – Hazardous Substances Register)

4.5 Hazardous materials stored or handled in adjacent plant or on adjacent sites

Area/Activity	Hazard	Consequences	Proposed safeguards
Toxicity	Lead Asbestosis Synthetic Mineral Fibres Old refectory PCB(s) Stack emission Radiation - Cobalt	Exposure Exposure to hazardous substances, asphyxiation. Exposure to cobalt radiation,	(See Appendix B Project Construction Environmental Management Plan) Investigation to be done before start of work to identify and control areas where hazardous substances are identified Removal of substances by licensed and specialist removal company (See Appendix D - Review of the Air quality report submitted to PNSW & EPA) Review of the national exposure limits Review of meteorology records (See Appendix C) Monitoring as required Review of sources and possible exposure limits

The safeguards proposed to protect against specific hazards are considered by the study team to be adequate to meet the constraints imposed by the contract and legislation.

5. ASSESSMENT OF OPERATIONAL SAFEGUARDS

The Health and Safety Management Plan demonstrates that all operational safeguards necessary for safe construction and commissioning are in place and adequate (See Appendix E – Health and Safety Management Plan)

Following safe working practices is essential if risks (both onsite and offsite) are to be minimised.

The following safety related documentation and operational safeguards are amongst those covered by the Health and Safety Management Plan:

- Work and entry permit systems
- Hot work procedures
- Isolation and tagging procedures
- Procedures for control of onsite work by contractors
- Access arrangements for external personnel and vehicles
- Emergency procedures
- Availability of materials safety data sheets for hazardous materials
- Operating procedures for construction/commissioning/deconstruction activities;
- Operating procedures for adjacent plant
- Arrangements for security of electronic safety controls;
- Fire safety and fire fighting arrangements;
- Incident/injury reporting systems; and
- Training/qualifications requirements.

(See Appendix I – BSCS Site OHS Rules)

Emergency procedures are integrated with those for operations onsite and for neighbouring sites. All potential incidents which have been identified are catered for in the emergency plan. Head count arrangements will account for fluctuating numbers of contractors on the site. Responsibility for each of these safeguards has been clearly assigned. Commitment has been sought as part of this review.

6. SAFETY ASSURANCE

Area/Activity	Hazard	Consequences	Proposed safeguards
Document Control	General correspondence Safety Information Contract document Sketches and drawings Correct issue of drawing to contractors Document review and sign off process	Incorrect documents and drawing used	Document and drawing control process in place along with iPAS.

A satisfactory safety assurance system is in place. Details of the QA system are listed below.

K6 Drawing Control Procedure - (Draft 23/06/03)

No	Procedure / Process / What Happens	Action Required	*Action Required* (By Whom)	*Action Required* (When)
1.0	**FOR ALL INCOMING DRAWINGS: Softcopy (e-mail) drawings**			
1.1	Forward e-mails to GES e-mail address	Forward e-mail Drawings to ges.drawingoffice@boral.com.au	Each person receiving an e-mail Drawing	Within 1 day
1.2	Cc. the e-mail to to Sally Ives,	Cc the e-mail to to Sally Ives (Sally will file the email message).	Each person receiving an e-mail Drawing	Within 1 day
1.3	Allocate incoming drawings to be registered	Allocate incoming drawings to be registered	MR (MC when MR is absent)	(on a daily basis)
1.5	Register drawing	see details below	Drawing Office staff	
2.0	**Registering Incoming Drawings :**			
2.1	File Transmittal	File a print copy of the incoming drawing transmittal into the Incoming Transmittals Folder. Folder is located in the Green Room	MC / MR	(on a daily basis)
2.1.1	The electonic copy of all incoming transmittals to be filed.	File Electonic copy of incoming transmittal in "GroupEng$\Berrima\GBM332 No. 6 Kiln Upgrades Step 1 and Step 2\Drawings\Transmittals\Incoming"	MR/MC	
2.2	The attachment from the email message to be saved	Save attachment from the email message in a Temp file under "\Drawings Received".	MR/MC	

2.3	The database to be checked to ascertain if the drawing is already in the Database	Check Database - using the Maker's Number - to ascertain if the drawing is "New" or a "Revision" (ie. Check if new drawing or new revision of existing drawing)	MR/MC/LB
2.4	The drawing will then be registered	Register the drawing (insert a GES stamp on drawing) Record Drawing information into the Database	MR/MC/LB
2.4.1	**New Drawing**: Assign Works No.	Next Works No is taken from the database in relevant section. GES stamp inserted into drawing. File saved as the Works No and revision. Eg: 49456-A. The drawing details are recorded in the database.	MR/MC/LB
2.4.2	**New Revision of Existing Drawing:** Obtain Works No from database	GES stamp inserted into drawing. File saved as the Works No and revision. Eg: 49456-B. The new revision and status is "checked in" to the database.	MR/MC/LB
2.5	Filing and Printing the drawing.	If Autocad format, a .pdf file is created, and saved to the same location in the Temp folder. An A3 and B1 print of the drawing is made. The A3 drawing is stamped "Original" and filed in the "Original Folders" in the Green Room. The B1 is filed on the relevant clamp in the Green Room.	MR/MC/LB
2.5.1	Filing and Printing the drawing.	If the drawing is a "New" Revision of an "Existing" drawing, it will be registered as above, AND the previous revision will be "Superseded" electronically AND in the “Original Folders”, located in the Green Room. (A “Superseded” stamp inserted onto the electronic file and the hardcopy A3 "Red lined". The superseded B1 will be removed from the clamp)	MR/MC/LB
2.6	Complete Registration Process	The electronic copy will be moved from the Temp folder to the Drawings*numberseries* eg: Drawings\47000 Raw Mill. Temp folder will be deleted.	MR
2.7	Drawings in Autocad format	If the drawing is in Autocad format, attention needs to be given to assigning the correct plot file, and checking all x-refs correctly are loaded.	MR/MC/LB
2.8	Maintain "Controlled" set of drawing at Site Hut	Issue 3 B1's and A3 Drawing copy to the "Site Hut".	MR/MC/LB
2.8.1	See Above	Redline the previous "Superseded" Drawing revisions in the "Site Hut".	MR/MC/LB

3.0	**There are separate folders for:**	
3.1	Major Suppliers	Note
3.1.1	a. FLS	Note
3.1.2	b. Pfeiffer	Note
3.1.3	c. IKN	Note
3.1.4	d. Connell Hatch (Preheater/Cooler	Note
3.2	Register of Parts Lists, Manuals.	Note
3.3	Register of all CD's received, which are numbered and stored.	Note
3.4	Information downloaded from CD's and registered accordingly	Note
3.5	A File of drawings issued for each Contract (to be kept)	Note
4.0	**For All Incoming Hardcopy Drawings**	
4.1	Drawings to be given to the Drawing Office	Give Drawings to the Drawing Office
4.2	Register Drawing	Registerer Drawings as per above system.
4.3	File Transmittal	File the Drawing Transmittal
4.4	The original Drawing will be stored in the Black folder	File the Original Drawings in the Black folder
4.5	Copies of Drawings to be circulated to the K6 team.	Circulate opies of Drawings to the K6 team.

K6 Drawing Control Procedure - (Revision 19th June 2003)

No	Procedure / Process / What Happens	Action Required	*Action Required* (By Whom)	*Action Required* (When)
1.0	**FOR ALL OUTGOING DRAWINGS: Softcopy (e-mail) and Hardcopy**			
1.1	**All** drawings leaving GES must be accompanied by a drawing transmittal.	Issue Drawing Transmittal		
1.2	**All** drawings leaving GES must be be issued by the drawing office	See below	MR/MC	
1.3	i.e. Emails **must** contain:	e-mails to contain Drawing Transmittal		
1.3.1	Transmittal (Softcopy to be filed on server, hardcopy to be printed out and filed in the Transmittals folder in the Green Room)	File Drawing Transmittal (Softcopy and Hardcopy)		
1.3.2	**All** Outgoing Drawings (must have been registered by Drawing Office)	Register Drawings		
1.4	**All** drawings must be stamped. Preliminary, Provisional, For Construction, etc	Stamp Drawings		
1.5	Drawings issued for Construction **must** be issued as hardcopy drawings	If drawings are being issued for Construction and emailed - a stamped B1 and A3 set accompanied by transmittal must be mailed as well	MR/MC	

2.0	**OUTGOING DRAWINGS:**		
2.1	**Drawings issued for information or tendering purposes**	Supply list of drawings, destination and purpose to MR/MC	Engineers
2.1.1	Prepare transmittal	Check database for latest revision, prepare transmittal	MR/MC
2.1.2	Confirm drawing set and revision	The Drawing Office will check the latest revisions and confirm each drawing revision with the project engineer.	MR/MC
2.1.3	Prepare drawings	Print required no of copies as requested. All drawings must be stamped,(Preliminary, For Tendering, Approved for Construction) and all must have GES registration stamp	MR/MC/LB
2.1.4	Check drawing set and transmittals	Check that drawings are correctly stamped and numbers and revision match transmittal	MR/MC/LPM/HC (not author of transmittal)
2.1.5	File Transmittal	Soft copy of transmittal filed in \Drawings\Transmittals. Hardcopy to be filed in folder in Green Room	
2.2	**Drawings issued for Construction**		
2.2.1	Request to issue drawings for construction	Supply list of drawings and destination to MR/MC. Indicate whether drawings will be issued by Construction Engineer	Project Engineer
2.2.2	Prepare transmittal	Check database for latest revision, prepare transmittal.	MR/MC
2.2.3	Confirm drawing set and revision	The Drawing Office will check the latest revisions and confirm each drawing revision with the project engineer.	MR/MC
2.2.4	Prepare drawings	Each drawing to be stamped "GES Approved for Construction". 3 B1 copies to be made of stamped original (2 for Contractor and 1 for site hut). 2 A3 sets stamped "GES Approved for construction" (1 for Contractor 1 for site hut)	MR/MC/LB

2.2.5	Check drawing set and transmittals	Check that drawings are correctly stamped and numbers and revision match transmittal	MR/MC/LPM/HC (not author of transmittal)
2.2.6	Transmittal to be signed off	Drawing Office to sign transmittal	MR/Mc
		Design Engineer to sign transmittal	Design Engineer
		Project Engineer to sign transmittal	Project Engineer
2.2.7	File Transmittal	Soft copy of transmittal filed in \Drawings\Transmittals. Hardcopy to be filed in folder in Green Room	
2.2.8	Issue Drawings (Construction Engineer)	Drawings and transmittal to be issued to Construction Engineer	MR/MC/LB
2.2.8.1	Sign Receipt	Transmittal "receipt box" to be signed,	Construction Engineer
2.2.8.2	Return copy of signed transmittal to GES	Transmittal to be signed by CE and Contractor, photocopied and returned to GES	Construction Engineer
2.2.8.3	File "Receipted" Transmittal	"Receipted" transmittal to be filed in Transmittal folder	MR/MC/LB
2.2.9	Issue Drawings (off site)	Drawings and transmittal to be mailed or hand delivered to Contractor	DO or Project Engineer
2.2.9.1	Sign Receipt	Transmittal "receipt box" to be signed, copied and returned to GES	Contractor
2.2.9.2	File "Receipted" Transmittal	"Receipted" transmittal to be filed in Transmittal folder	MR/MC/LB
2.3	File Outgoing drawings and transmittal	File an A3 set of drawings along with transmittal in a folder either as the "Inquiry/Tender" no, or to the specific Contractor	MR/MC (author of transmittal)

6.1 Involvement of all parties

To ensure the involvement of and communication with those working on the construction and the operating staff a series of communication and consultation process has been developed.

Examples of this process include:-

- Pre stat meetings
- Weekly project meeting
- Project team meetings
- Steering group meeting
- Involvement in BCSC safety committee meetings
- Site safety group meetings
- Tool box meetings

6.2 Documentation

To document and show our commitment to Health and Safety a series of document, tools and check lists have been developed to assist in our compliance with the Project Safety Management Plan as well to ensure compliance with the NSW OHS Act and Regulations.

This document includes but is not limited to the following documents:-

- BCSC Policies and Procedures
- Hatch Associates Policies and Critical Safety Requirement
- Project Evacuation Plan
- HAZOP Reports
- Hazard Register
- Non conformance Reports
- Communication with Contractors
- Safety Audit Form
- Site Rules
- Industrial Information
- Induction Register
- Permits

6.3 Materials of construction

The materials of construction are specified by the designers to comply with the relevant Australian or equivalent standards. The engineering drawings details the material specifications for each of the components used in the upgrade and these engineering drawings are used in the instruction process to validate compliance with the specifications.

6.4 Fabrication

Each fabrication contracts specify the preparation of documented quality assurance plans. These are in conjunction with the engineering specifications and drawings are used to ensure fabrication compliance to the designed specifications.

6.5 Installation

Each of the installation contractors prepares a Safety management Plan in line with the Project Management Plan. This requires risk assessments and risk reduction initiatives in line with appropriate Australian Standards, Workcover Codes and practices and OHS Act 2000.

These take the form of a job safety analysis and the contractors work force participate in the final documentation and development of the safe work methods to be employed for this particular work.

Audits are carried out on a regular basis to ensure the safe systems of work are in place and properly applied in the work place.

6.6 Critical verifications/safety reviews

- Critical Procedure Audits
- JSA (Job Safety Analysis)
- System Audits
- SMP Audits (Safety Management Plan Audit)

6.7 Training/qualifications

To ensure work is done safely all persons undertaking work on sire must be competent for the work they undertake.

Where a National Certificate of Competency is required, contractors working on site must have a registration of the Competence for their employees. Certificate holders must be able to provide the Certificate on request.

Where a Certificate is not required other systems are in place to ensure that people have received the appropriate training to do their work.

To ensure Professionals working on site are suitably qualified, a review of their CV's and Professional qualification is undertaken to ensure they are appropriate for the work they undertake

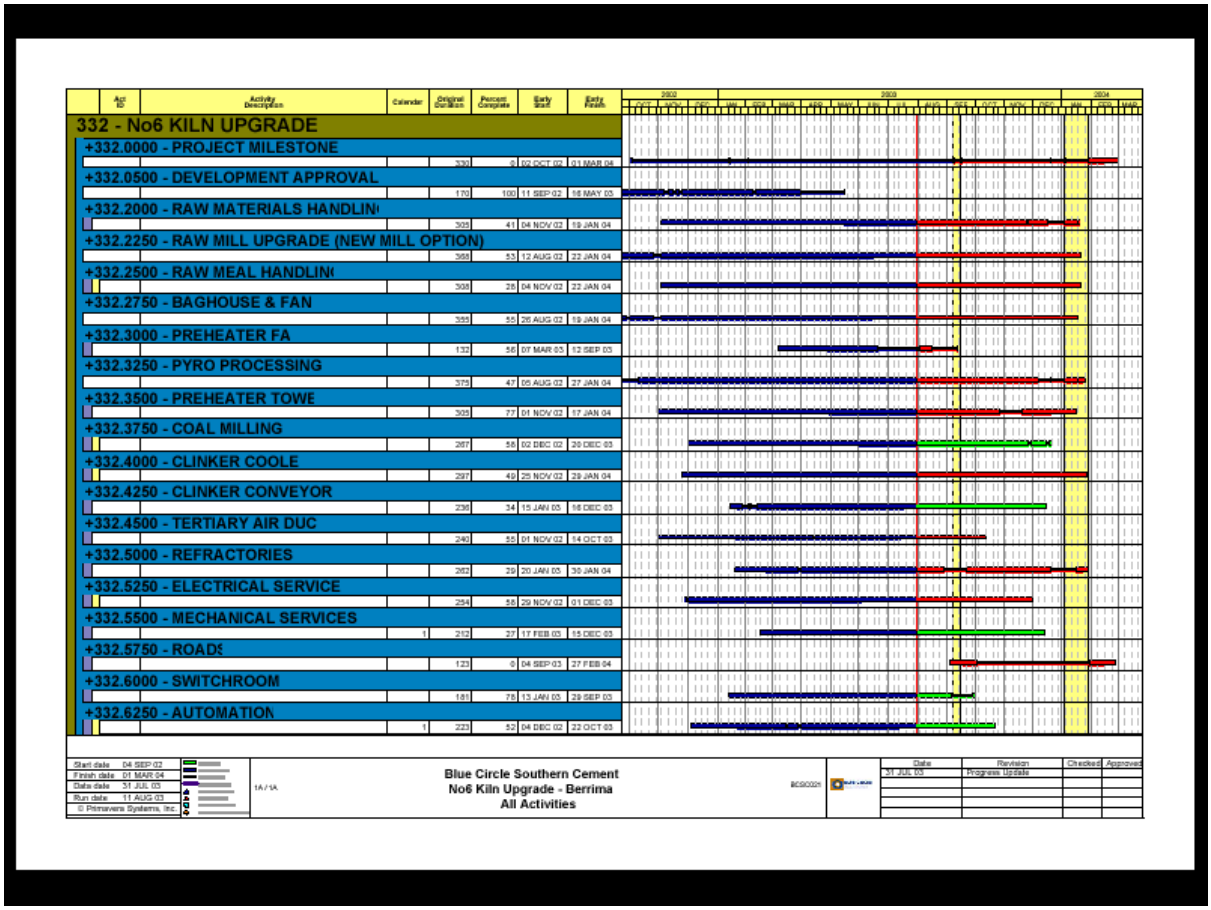
6.8 Definition of responsibilities

(See section 2.3 of Safety Management Plan)

7. CONSTRUCTION/COMMISSIONING/DECONSTRUCTION PROGRAMS

The timeline below details the following:

- Critical steps and safety reviews highlighted
- The proposed sequencing of activities and interfacing between programs
- The proposed timing of statutory inspections and approval requests



This timeline is attached as Appendix J – Project Schedule (Sure Trak BCS 021)

8. MANAGEMENT OF CHANGE

After the start of construction, some modification of the project program may be necessary.

During commissioning, it may become apparent that permanent modifications to hardware or operational safeguards are necessary. In either circumstance, changes will be controlled to ensure that safety will not be compromised.

Where changes will be beyond the scope of the development approval, or will create additional risks, which significantly contribute to the risks from the facility, the relevant authorities will be consulted.

Project Management has satisfied itself that appropriate procedures are in place for the management of the following matters.

8.1 Modification of project schedule

The change management procedures for the project will ensure that any disruptions to the project schedule will not have an adverse impact on safety. Personnel involved in this construction safety study will be available to review the safety implications of any modifications. Responsibilities have been clearly defined and relevant authorisations have been given.

8.2 Permanent modifications of hardware/ operational safeguards

The change management procedures for the project will ensure that any permanent modifications likely to be encountered during construction and commissioning such as physical changes to plant hardware or layout, changes to operating or emergency procedures, changes to control logic, or changes to operating parameters such as temperature and pressure will not have an adverse impact on safety.

The boundaries of safe operating parameters have been predetermined to allow operators to identify what constitutes a change to operating parameters.

The change management procedures define the extent of the review, the personnel involved, and authorisation processes required for the likely types of modifications.

The review process will include reference to all relevant safety studies associated with the project. (Depending on the nature of the modification, this might include review of the hazard and operability study, final hazard analysis, fire safety study and emergency plan.) The modifications will also be incorporated into the plant's safety management system.

9. GLOSSARY AND ABBREVIATIONS

BCSC	Blue Circle Southern Cement
EPA	Environment Protection Authority
EWP	Elevated Work Platform
iPAS	Integrated Project Administration System
JSA	Job Safety Analysis
PCB	Polychlorinated Bi-Phenyl
SWL	Safe Working Load

10. APPENDIXES

Appendix A - Project Fire Safety Study

Appendix B - Project Construction Environmental Management Plan

Appendix C - Meteorology Records

Appendix D - Air quality report submitted to PNSW & EPA

Appendix E - Health and Safety Management Plan

Appendix F - Hazardous Substances Register

Appendix G - NSW WorkCover Authority - CHAIR Safety in Design Tool 2001

Appendix H – Planning NSW Conditions of Consent

Appendix I – BSCS Site OHS Rules

Appendix J – Project Schedule (Sure Trak BCS 021)

Appendix A

Project Fire Safety Study

Note :

The Project Fire Safety Study has been submitted to Planning NSW as a separate document.

Appendix B

Project Construction Environmental management plan

BERRIMA KILN 6 UPGRADE PROJECT

CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN

21 JULY 2003
(Revision 2)

prepared by Olsen Environmental Consulting

Table of Contents

1. Introduction

This Project has the fundamental objective of upgrading Blue Circle Southern Cement's existing No 6 Kiln at the Berrima Cement Works.

The Project has been planned by an integrated team consisting of representatives of BCSC Berrima Plant Operations, BSCS Group Engineering Services and Hatch.

The work will be undertaken by Contractors who will be supervised by HATCH on behalf of Blue Circle Southern Cement (BCSC).

The Project will be constructed while the Cement Works continues production. The Cement Works operates on a continuous 24 hours per day, seven days per week basis. Much of the construction activity will not be noticeable due to the continuing operation of the Cement Works.

The construction will involve typical building construction activities.

The site operations ('the Site') is defined generally as the Berima Works with particular emphasis on the No.6 Kiln and surrounds and associated work areas such as HV switchyard, etc
The HATCH Project Manager appointed by BCSC will be responsible for ensuring that all activities are carried out by the Contractors in accord with this Construction Environmental Management Plan (CEMP), in accordance with provisions of any EPA Licence requirements, safely and efficiently. The Project Manager, will ensure a suitably qualified person oversees the environmental aspects of the operation during the Project Manager's absences from the site during operations associated with the Project.

The Cement Works is a Licensed Premises under the EPA Protection of the Environment (Operations) Act. All Contractors are responsible for compliance with the conditions of the licence in relation to works undertaken as part of the contract and any other EPA Licence requirements that are relevant to the contract.

The Project will operate in accordance with a number of Plans, Rules and Procedures. The Project will be managed in accordance with this plan and the site safety management plan, which will ensure environmental and safety aspects are constantly identified and addressed.

This document includes specific environmental actions that address soil and water issues that can be identified at this stage. Ongoing investigations and risk assessments during the implementation of the Project will identify other issues and responses to these will be developed as the Project proceeds.

BCSC is committed to implementing the Berrima No 6 Kiln Upgrade Project in a manner consistent with today's environmental and safety standards.

The works will be implemented in accordance with undertakings outlined in the Statement of Environmental Effects prepared for the Project and approved by Planning NSW.

As an existing operating plant, BCSC already has in place environmental management controls to meet current EPA license conditions. These include :

- Water re-circulation and clarification ponds
- Perimeter catch drains
- Truck wash facility
- Bitumen access roads

As the Kiln 6 upgrade works fall within the bounds of these existing controls, only minimal additional controls are required and will be targeted to specific work activities being undertaken by the construction contractors. Refer to Appendix A – Site Plan of Environmental Controls.

BCSC is committed to ensuring that all contractors who perform work on any site for which it is responsible, carry out the work to the same high standards for Occupational Health and Safety and Environment as that of all its operations.

When requesting tenders for the works, BCSC actively seeks those organisations with the capability to undertake the Project in a suitable environmental and safe way.

2. Works Contractor

BCSC will award construction contracts for the Berrima No 6 Kiln Upgrade Project to various Contractors (the Contractors). Detailed information on the Contractors' environmental and safety procedures will be obtained during the tendering process to enable a Safety and Environmental Assessment of the Contractor to be performed as part of the tender assessment process.

The information will be provided by way of questions in the tender documents, followed up by audit to ensure compliance.

The Contractor's responses to the Tender document questionnaire will be reviewed as part of the Tender Assessment Process.

There will be Special Conditions to the Contract which will identify additional operational restrictions which address environmental aspects of the Project.

The following requirements will be included in the Contract Special Conditions:

- It is noted that the site is subject to a wide range of Acts of Parliament and Regulations arising from them, eg.

  Clean Air Act 1961,

  Clean Waters Act 1970,

  Dangerous Goods Act 1975,

  Environmentally Hazardous Chemicals Act 1985,

  Environmental Offences and Penalties Act 1989,

  Noise Control Act 1975,

Occupational Health and Safety Act (OHS) 1983, and,

Ozone Protection Act 1979.

In addition the Contractors must operate with an awareness of the Plant Manager's Statutory obligations flowing from the above Acts.

- The Contractors have to comply with the following site rules:

  Blue Circle Southern Cement Occupational Health and Safety Policy, Environmental Policy, and, the Safety Management System Standards.

- The Contractors have to work in accordance with a range of Site Rules that positively affect environmental and safety performance. These Site Rules include the following:

  Risk assessment of all work,

  Contractor's on-site Officer in Charge,

  Contractor Equipment Inspections,

  Contractor's Record Book,

  Isolation Procedures,

  Vehicle requirements and drivers,

  Protective equipment,

  Hand tools inspection and testing,

  Confined space, and,

  Digging permits and Working at heights.

- During the establishment and operation of its Site facilities and the performance of the works, the Contractors shall strictly comply with any and all requirements of any appropriate and applicable law, act, rule, or regulation of NSW including any Statutory Body which has jurisdiction over environmental requirements. The Contractors will be required to notify BCSC promptly upon discovery of any instances where they have not complied with these requirements.

- All employees of the Contractors or their subcontractors shall be suitably qualified in the appropriate aspects of the duties they are to perform.

- the Contractors shall plan, establish implement and maintain a Quality System in accordance with the contract Specification. The Contractors shall control the work under the Contract for quality in accordance with the Quality System.

- The Contractor is responsible for carrying out all testing which is necessary to demonstrate compliance with the Contract requirements.

3. Environmental Guidelines

The Contractors will be operating on land owned by Blue Circle Southern Cement (BCSC). BCSC operates under a Pollution Control Licence issued by the Environment Protection Authority (EPA). The Licence places legal obligations on the Contractors for responsible environmental performance.

Planning NSW have issued a conditional Development Consent for the Berrima No 6 Kiln Upgrade Project. The Contractor must be aware of the conditions attached to the Development Consent and ensure that construction is carried out in a way that is consistent with those conditions.

This Construction Environmental Management Plan (CEMP) is part of, and will assist in meeting, these obligations. The following Management Plans have been specifically identified by Planning NSW as being part of this CEMP :

- Fire Safety Study – this study has been prepared by Broadleaf Capital International Pty Ltd and issued as a separate document.
- Hazard and Operability Study - this study has been prepared by Hatch Associates and issued as a separate document.
- Construction Safety Study - this study has been prepared by Minerva Consulting Group and issued as a separate document.
- Erosion and Sedimentation Management Protocol – this item is inherent within this CEMP.

The main restrictions imposed on the Contractors are as follows:

- They shall not discharge any water from their work site without the prior written approval of the Project Manager,
- They shall obtain written approval from the Project Manager before disturbing any topsoil or vegetation and shall implement an environmental management programme as part of the Works,
- Potential pollutants such as oil, grease and other chemicals, shall be stored in secure containers,
- Waste materials such as oil, rags, filters and other waste, shall be cleaned up by them and disposed at an approved waste disposal site,
- In the event of a substantial pollution event, such as an oil spill, then they shall have in place an Emergency Response Plan approved by BCSC, take all reasonable steps to contain the pollutant and minimise its effect on the environment, and inform the Project Manager immediately,
- They shall take all reasonable steps to ensure that dust generation is minimised,

- Chemicals shall not be brought to site without the prior written approval of the Project Manager. Chemicals shall be accompanied by a Material Safety Data Sheet, accessible to all personnel and are to be stored, dispensed, used and disposed of in the approved manner,

- All machinery used by them is to be fitted with approved noise control equipment and shall be properly operated and maintained to minimise noise emissions and avoid impact on the hearing ability of all personnel and disturbance to neighbours, in accordance with current EPA Guidelines and Requirements,

- They shall properly dispose of solid, liquid and gaseous contaminants or waste in accordance with all statutory and contractual requirements,

- BCSC will implement a community liaison process. This will include a complaints protocol outlining the following:

  Date and time of complaint,

  Method by which the complaint was made,

  Any personal details of the complainant which were provided by the complainant or, if no such details were provided, a note to that effect,

  The nature of the complaint,

  Action taken in relation to the complaint, including any follow up contact with the complainant, and,

  If no action was taken, the reasons why no action was taken.

4. Site Establishment

Works to be undertaken on the Blue Circle Southern Cement Berrima Cement Works site as part of the Kiln 6 Upgrade Project shall be confined generally to the area of the Berrima Works with particular emphasis on the No.6 Kiln and surrounds and associated work areas such as HV switchyard. These areas lie within the bounds of the existing environmental control area of the Berrima Works.

Personnel facilities shall be established on a specified area generally beside the access road and south of Kiln 6. The Contractors shall be responsible for setting up and managing the facility which shall consist of office accommodation, meal rooms, washing facilities, portable toilets and car parking spaces.

The Contractors shall provide rubbish bins for each building and regular sanitation service for the toilets and rubbish removal in accordance with local council requirements..

Water shall be connected from the Cement Works' supply system and the Contractors will supply water for human consumption.

The area around this facility will be graded to permit run-off water to drain away from the facility into the site stormwater drainage system.

No on-site living accommodation shall be permitted.

Areas on the site shall be allocated for the Contractors to use as lay-down areas for building activities associated with construction of the Project structures. They shall provide location and size details of the areas required which shall be approved by the Project Manager before site work commences.

The Contractors shall provide suitable storage containers on the Site for the secure storage of equipment. Contractors shall ensure that all equipment is securely locked away in the containers at the end of each shift.

The Contractors shall provide their own workshop, maintenance and work area and diesel storage facilities. All structures shall be constructed in accordance with the requirements of the relevant authorities and the relevant Australian Standards.

The diesel storage tanks shall be mounted inside an impervious containment system large enough to contain 110% of the volume of all tanks. The diesel storage area shall be provided with fire extinguishers, signs and all other equipment necessary to comply with the requirements of the Dangerous Goods Act 1975 and Regulation 1978. The Contractors shall obtain and maintain any licences required by the legislation for fuel tanks.

All drums containing chemicals or oils shall be stored inside an impervious containment system large enough to contain 110% of the volume of all of the tanks. All oils, greases, and hydraulic wastes extracted from equipment shall be contained in drums stored in a similar containment system. All waste disposal shall be handled by licensed operators. The Contractors shall provide BCSC with a copy of these licences.

Any service vehicle for re-fuelling and lubricating earthmoving equipment shall be parked up, when not in use, in a bunded area having the same parameters as for diesel storage tanks.

The Contractors shall ensure that all maintenance of equipment and machines is carried out in the designated work area and not elsewhere.

The Contractors shall pay particular attention to compliance with the requirements of the Wingecarribee Shire Council and the EPA with regard to refuse disposal.

The Contractors shall provide suitable receptacles for the contained storage of refuse, fuel, oil, grease, scraps, and other deleterious matter and shall provide for their regular disposal in an appropriate manner.

Particular attention shall be paid to oil contaminants and materials which may cause a health, fire or environmental hazard. Any spillage of fuel, oil or grease by the Contractors shall be immediately cleaned up, including any contaminated ground, and properly disposed of off-site in conformity with the regulatory guidelines.

The Contractors shall ensure that waste fuel, oil, grease, tyres and air-conditioning gases are collected by reputable licensed recycling companies, and shall provide evidence to the Project Manager of the arrangements that are in place in this regard.

The Contractors shall arrange for the collection and recycling of the maximum amount of waste materials including, but not limited to, scrap steel, fuel, oil, grease and aluminium cans.

No more than a total of 1,000 litres of waste fuel, oil and grease shall be retained on the Site at any one time, and this shall be stored in bulk waste oil tanks, suitably protected by a bund wall capable of containing 110% of the volume of the largest tank.

A high standard of housekeeping shall be set for the whole of the Site and it shall be maintained free from waste and litter.

The Contractors shall promptly remove from existing roadways all dirt and other materials that have been deposited by its hauling and other operations.

Construction plant or equipment shall not be allowed to park on or within the pavement or shoulders of any existed trafficked roadway.

Contractors shall notify the Project Manager of any complaints received from members of the public concerning the work. The Project Manager shall deal with all such complaints.

5 Environmental Management

BCSC recognises that the Project will have some impacts on the environment. The Contractors shall undertake all activities in such a manner as to limit damage to the environment to that which is unavoidable. The next Section describes an environmental protection management process, which the Contractors must implement to provide environmental protection during the Project and also identifies environmental conditions of approval for the Project, which they must satisfy.

Berrima Cement Works is a Licensed Premises under the EPA Protection of the Environment (Operations) Act and therefore all construction activities must comply with the pollution control regulations that apply to the site.

As a licensed premises, BCSC has in place existing environmental control procedures and the Contractors shall comply with the EPA Licence and plan any works to ensure compliance at all times.

The Contractors shall put in place additional appropriate pollution control measures and adhere to acceptable work practices that will ensure that adverse environmental impacts do not occur as a consequence of the construction works. They will be responsible for implementing pollution control protection measures during construction to ensure no contaminated water from the construction works enters the site drainage system, construction noise impacts are within acceptable limits, airborne dust is created by the earthworks is minimised and erosion and sedimentation impacts are avoided.

The measures to be considered include but are not limited to the following:

- Diversion of overland flows to bypass construction works,
- Erection of earth berms, silt fencing and straw bale barriers on the down slope side of construction work areas,
- Establishment of diversion drains to control water runoff on to construction work areas,
- Minimising the area of excavations left open for extended periods,
- Limiting earthworks activities during wet weather,

- Keeping construction areas secure and tidy at all times,
- Leaving the exposed surface of cleared areas and areas disturbed by earthmoving equipment scaled by back-blading or rolling at the end of each shift or if wet weather is likely, to minimise erosion and sedimentation,
- Site dust suppression, and,
- Construction works noise attenuation.

Each Contractor shall prepare, and submit to the Project Manager for approval, a Contractor Environmental Management Plan (CEMP) that builds upon the existing plant environmental controls and identifies, in point form, the additional environmental risks, protection measure to be put in place and work practices to be adhered to that will prevent adverse environmental impacts resulting from the works. CEMPs will address site access and work area restrictions, erosion and sedimentation control plan, water contamination, construction procedures, housekeeping, demobilisation and emergency responses to be established on the site during the construction period. The CEMP is to be posted in the Contractor's site facilities and be made available to the site workforce prior to work commencing.

Areas on the Site shall be allocated for the stockpiling of bulk construction materials. The Project Manager shall approve the location and preparation of storage areas before the materials arrive on the site. The Contractors shall prepare the stockpile areas with provision to prevent the loss of material through erosion or wind. When a stockpile area is no longer required, all remaining stockpile material shall be removed from the Site and the area restored.

Waste materials are to be disposed of properly in containers provided for the purpose or removed from the site at the completion of operations each day.

Material Safety Data Sheets (MSDS) are to be obtained for each chemical or other potentially hazardous substance brought on site, for use in case of an accident.

The Contractors shall put in place measures to manage or divert stormwater flows within the Site so that the work areas are free as much as practicable from inundation from stormwater flows..

Stormwater runoff from the site shall be directed where possible into existing stormwater channels or pipes.

6 Environmental Protection Management Process

The Contractors shall undertake the following tasks:

- Identify statutory requirements, compliance limits and adverse environmental effects which could occur during execution of the Works,
- Plan work activities and environmental protection measures to minimise environmental risks and comply with specified environmental protection requirements. The Contractor's EMP is the outcome of this planning process,
- Set up the planned environmental protection measures and train site personnel to be environmentally aware,

- Routinely monitor the effectiveness of the environmental protection measures,
- Set up response procedures, which will initially contain then remedy, any environmental damage when it does arise, and,
- Improve environmental protection measures and revise their CEMP promptly when deficiencies are identified.

The Contractors shall apply non-conformance control and corrective and preventive action procedures to address any environmental management deficiencies. Non-conformance control shall apply to containment measures, clean-up and restoration of the environment as well as rectification of deficient environmental protection measures.

7. Contractor Environmental Management Plan (CEMP)

7.1 Preparation of CEMP

7.1.1 Scope

Each Contractor is to prepare a Contractor Environmental Management Plan (CEMP) for the works. The CEMP shall build upon the existing plant environmental controls and cover the additional environmental protection practices, resources and sequence of activities required to comply with all the requirements of the Project Specification.

The CEMP shall include the following, as applicable:

(a) A description of the works covered by the CEMP;

(b) assignment of responsibility for planning, approving, implementing, maintaining, assessing and monitoring of environmental controls;

(c) copies of approvals, licences and permits to meet statutory requirements;

(d) details of the potential environmental effects and the operational control measures which are to be implemented to comply with statutory requirements and provide environmental protection in accordance with the requirements of the Contract;

(e) details of how environmental protection will be maintained for each subcontractor's activities, including full details in accordance with (b) and (c) above;

(f) environmental monitoring programme and report forms for recording all monitoring activities including periodic inspections of the adequacy of operational controls together with measurements for aspects where compliance limits have been specified;

(g) locations of environmental controls;

(h) supplementary plans for environmental protection and operational control (including an Erosion and Sedimentation Control Plan, Soil and Water Management Plan, Noise Management Plan, Waste Management Plan, and an Emergency Spill Response Plan,where appropriate);

(i) how non-conformance control, corrective and preventive actions will be implemented and closed out;

(j) communication procedures;

(k) emergency response procedures for containing environmental damage and procedures for planning restoration activities;

(l) environmental training programme;

(m) authorised personnel and procedure for changing and issuing the CEMP;

(n) details of how the changes to the environmental management documentation and data are to be identified and communicated to relevant Project personnel;

(o) mechanism for regular evaluation of environmental performance; and

(p) environmental auditing programme;

The CEMP shall identify potential adverse environmental effects, applicable regulatory requirements and/or compliance limits for the physical, human and biological environment. Appropriate environmental protection measures shall be documented to keep environmental effects within compliance limits and shall show the person responsible for implementation in each case.

Three distinct phases of activity shall be addressed, as appropriate:

(i) before construction and site establishment;
(ii) during construction; and
(iii) after construction (including rehabilitation activities and maintenance of erosion and sedimentation controls).

7.1.2 Submission of Documents

The CEMP shall be a "controlled" document and may be submitted progressively to suit construction stages.

Each Contractor shall submit their CEMP at least 5 working days prior to the proposed commencement of theworks.

Work shall not commence until it has been addressed in the EMP.

The Contractors shall revise their CEMP and implement better environmental protection measures if the original protection measures prove to be not fully effective. The staging of CEMP submissions shall comply with the requirements of the nominated authorities. The submissions of the CEMP at each stage shall contain sufficient information and detail to enable an assessment of the proposed environmental protection measures by the nominated authority.

7.2 Resources

The CEMP shall indicate the names, responsibilities and authority of the Contractor's Site Management personnel who have primary responsibility for implementing the CEMP for the works under the Contract, monitoring its effectiveness, rectifying any environmental deficiencies, controlling further construction activities until deficiencies are rectified and keeping environmental records. Each Contractor shall provide a sufficient level of resources at the site to ensure effective environmental management throughout the duration of the Contract.

Each Contractor shall nominate a full time member of their site management team to be the authorised contact person for communications with the Project Manager and the Environment Protection Authority (EPA) on environmental matters. This person shall be fully conversant with the CEMP, operational controls, monitoring programme, complaints, pollution incidents, control of environmental non-conformances and environmental records and shall promptly provide access to or copies of environmental records to the Project Manager as required.

Where the Contractor has established corporate responsibilities for environmental management the relationship between their site management personnel with environmental responsibility and the corporate environmental functions shall be detailed in the CEMP.

7.3 Communication

The Contractors shall establish site communication, external communication and communication with subcontractors in relation to notification of environmental problems and emergencies. They will maintain a current list of relevant contact names, telephone numbers and facsimile numbers for the works.

7.4 Emergency Planning and Response

Each CEMP shall include details of:

- a list of the Contractor's key emergency response personnel showing responsibilities and contact details including all-hours telephone numbers,
- details of emergency services (eg. ambulance, fire brigade, spill clean-up services),
- communications strategy (internal and external),
- details of containment measures to be taken in the event of emergency situations that may arise during the work under the Contract, and,
- location on site of the register and information on hazardous materials (as defined in the Waste Minimisation and Management Act) including MSDS sheets.

7.5 Training, Awareness and Competence

The Contractors shall ensure that all staff and subcontractors working on the Site are provided with appropriate environmental instruction to achieve a level of awareness and competence appropriate to their assigned activities. Persons, including subcontractors' personnel, without appropriate environmental training are not permitted to work on the Site.

The Contractors shall train relevant employees to use the plant and materials on site efficiently and minimise all potential environmental impacts including noise, air and water quality and waste and contamination.

The Contractors shall establish and maintain a register of environmental training carried out including dates, names of persons trained and trainer details.

7.6 Subcontractors

The Contractors shall include environmental management requirements in the planning, selection and management of subcontractors. They shall undertake appropriate monitoring of each subcontractor's work to ensure that the specified environmental protection requirements are effectively implemented.

For subcontracted work, each Contractor shall include in the CEMP the processes they will implement to ensure subcontractor compliance, including details of.

- the duties of each subcontractor for planning, implementing and monitoring environmental protection measures and for keeping environmental records,
- the duties the Contractor will retain for environmental protection of subcontracted work,
- how environmental protection measures on subcontracted work interface with adjacent work areas, as applicable, and,
- The Contractor’s surveillance programme to monitor effectiveness of each subcontractor's environmental protection measures.

7.7 Community Liaison

So that the local community may be advised, each Contractor shall notify the Manager about new or changed construction activities, which may affect local residents. Such notification shall be made at least 7 working days before commencing work affecting residents and shall advise the nature of the work, why it is necessary and indicate the expected duration.

7.8 Liaison With EPA

Each Contractor shall nominate in their CEMP at least two (2) persons (and their contact telephone numbers) who will be available to the Project Manager on a 24-hour basis and who have authority to take immediate action to shut down any activity, or to effect any pollution control measure.

The Project Manager will notify the EPA Regional Manager (or the EPA Pollution Line on telephone 131555 should the incident occur outside normal EPA business hours) of pollution incidents on or around the site which have occurred in the course of the Contractors' activities in the following circumstances:

- if the actual or potential harm to the health or safety of human beings or ecosystems is not trivial,
- if actual or potential loss or property damage (including clean-up costs) associated with a pollution incident exceeds $ 10, 000,

The Contractors shall notify the Project Manager verbally within 2 hours and in writing within 24 hours of any pollution incidents. Contractors shall prepare a report on each occasion when the site is visited by the EPA, notifying the Project Manager of the purpose and outcome of the EPA visit and of all actions being taken by them in response to the EPA visit. This report shall be submitted to the Project Manager within 5 working days of the EPA site visit.

7.9 Complaints

The Contractors shall, within one (1) working day of receiving a complaint about any environmental issue, including pollution, arising from the work under the Contract, supply a written report to the Project Manager detailing the complaint and immediate action taken to alleviate the problem. A final report with proposed measures to prevent the occurrence of a similar incident shall be submitted to the Project Manager within 5 working days. The Contractors shall verbally notify the Project Manager within two (2) hours of any such complaint.

The Contractors shall keep a register of all such complaints, together with the following records:

- date, time and nature of complaint,
- type of communication (telephone, letter, meeting, etc),
- name, address, contact number of complainant,
- nature of complaint,
- action taken in response, and, any monitoring to confirm that the complaint has been satisfactorily resolved.

7.10 Records of Environmental Activities

The Contractors shall maintain legible records of all environmental control issues and activities required under the Project Specification.

These records shall be held for at least 5 years after the date of issue of the Final Certificate and be accessible to staff of the Project Manager and BCSC and to authorised EPA officers.

7.11 Consequences of Non-compliance

The Project Manager may stop specific part's of the works if the Contractors fail to comply with their environmental obligations under the Contract, including failure to:

- comply with, and to ensure compliance by subcontractors with, any requirements of the Project Specification involving environmental control or rehabilitation; or

- act promptly when environmental controls are observed not to be effective by the Contractor, the Project Manager, or by any Statutory Authority having jurisdiction over the Works.

7.12 Project Environmental Performance

The effectiveness of each Contractor's environmental protection measures shall be evaluated for compliance by them during the Contract, at least once per month. The minimum frequency for performance evaluation may be reduced by the Project Manager when the Contractor submits a risk based review and evidence of consistent compliance. The Contractors shall keep detailed records of the environmental performance evaluations and provide a summary report of the evaluations at intervals of six months or when requested by the Project Manager.

7.13 Environmental Auditing

7.13.1 Audits During Construction

Each Contractor shall undertake compliance auditing of their CEMP against the requirements of the Project Specification while construction is in progress and to verify that the work under the Contract is in compliance with the CEMP. The first audit shall be scheduled within the first three months from the commencement of work on site and then at least every six months. The Project Manager may require more frequent auditing if environmental performance evaluations indicate significant deficiencies with the environmental management of the site. The Contractor shall keep detailed records of these audits and the audit reports.

7.13.2 Post Completion Audit

Within 28 days after the issue of the Certificate of Practical Completion, the Contractors shall carry out an environmental compliance audit, including site inspection and full review of environmental records, to identify any environmental protection measures which have not yet been finalised. The condition of existing environmental protection controls shall be recorded and environmental protection controls which need ongoing management shall be itemised.

An audit report shall be submitted promptly to the Project Manager, together with the Contractor's written response on how all actions and issues raised in the audit will be addressed.

8 Environmental Protection Requirements

8.1 General

The Contractors shall comply with all the environmental protection requirements specified in this Section. These are minimum requirements based on the environmental conditions of approval for the Project. Contractors shall ascertain any additional environmental protection requirements resulting from their operations and incorporate these additional requirements in their CEMP.

Particular measures to protect the environment which are specified may, with the Project Managers approval, be substituted by measures which achieve the same environmental result but which are superior in terms of cost or operational efficiency.

8.2 Legislation

The CEMP shall identify the Contractor's obligations under environmental legislation, which is relevant to the work under the Contract.

8.3 Approvals, Licences and Permits

The Contractors must comply with the terms and conditions of all approvals, licences and permits.

Berrima Cement Works is a Licensed Premises under the EPA Protection of the Environment (Operations) Act and therefore all construction activities must comply with the pollution control regulations which apply to the site. Each Contractor shall comply with the EPA Licence and plan their works to ensure compliance at all times.

8.4 Access and Traffic Management

The Contractors shall identify construction activities and site access requirements which are likely to:

- interfere with traffic flow and pedestrian thoroughfare through and adjacent to the site, and or,
- interfere with access to nearby properties.

The Contractors shall prepare a Traffic Management Plan for approval by the Project Manager and shall implement traffic control measures to minimise disruption to traffic and pedestrians.

8.5 Soil and Water Management

8.5.1 Erosion and Sedimentation Control

The Contractors shall plan and carry out the whole of the Works to avoid erosion and sedimentation of the site, surrounding country, watercourses, water bodies, wetlands and stormwater drainage systems. This shall include careful location of site compounds, access tracks, stockpile sites and temporary work areas.

Procedures for controlling the following activities on or around the site shall also be included in the CEMP, if applicable to work under the Contract:

- waste water discharge from dewatering, surface washing, grit blasting, washing vehicles and plant and washing out of concrete mixers and concrete trucks, and,
- prevention of mud and litter being deposited on trafficked roadways.

8.5.2 Soil Stockpile Management

The CEMP shall detail the measures that will be implemented to protect soil stockpiles from erosion by wind and rain. In addition, temporary sediment control fences shall be installed on the downhill side of stockpile sites and diversion drains on the uphill side of stockpile sites prior to stockpiling material. If necessary, the Contractors shall construct temporary sediment ponds to capture any turbid runoff from these sites.

Stockpiled materials shall not be placed inside vegetated areas or within 5 metres of retained trees.

8.5.3 Water Quality

The Contractors shall comply with the requirements of the POEO Act, requirements of local water authorities and all other relevant laws and by-laws in force from time to time in New South Wales. They shall provide adequate controls to ensure that any water entering the natural watercourse system or stormwater drainage system from areas disturbed by them complies with any water quality criteria nominated by the EPA under the Pollution Licence.

Potentially hazardous activities, including washing out of concrete delivery vehicles, washing down of construction plant, refuelling plant and handling hazardous chemicals are only permitted on site at appropriate locations that have adequate environmental protection measures and are located more than 20 metres away from stormwater drainage systems or natural watercourses. Washing out of concrete delivery vehicles off- site is only permitted at locations approved for that purpose by the appropriate authority.

8.5.4 Water Extraction

The proposed water source(s), which the Contractors intend to use for construction activities (such as dust control, earthworks/pavement compaction, on-site concrete batching and the like) shall be identified in the CEMP.

8.6 Air Quality

The Contractors shall comply with the requirements of the POEO Act and all other relevant laws and by-laws in force from time to time in New South Wales.

The Contractors shall ensure that all its construction facilities erected on the site of the Works are designed and operated to minimise the emission of smoke, dust, cement dust and other substances into the atmosphere. They shall comply with any conditions of licences or approvals in relation to maximum air pollutant levels.

The Contractors shall employ construction methods that will keep the air pollution to a minimum and apply measures including those listed below, as required, to ensure that airborne pollutants from their activities do not cause undue disruption or inconvenience in the vicinity of the Works:

- the spraying of earthwork formations and roads with water or other suitable liquids approved by the Project Manager,
- the removal of mud from the wheels and bodies of haulage equipment before it enters public roads or other sealed pavements by means of facilities such as truck washdowns and wheel washes,
- the removal of mud spilt by construction equipment on to public roads or other sealed pavements,
- the establishment of suitable cover crops or provision of other covering over topsoil stockpiles,
- the erection of dust screens around and/or spraying of stockpiles with suitable stabilising agents,

- cease dust generating activities which cannot be adequately controlled by water or other means, and,

- maintaining dust control equipment so that this equipment is available when required including periods of dust generating activities or high wind speed.

The materials and methods used for effective dust control, including the monitoring arrangements, shall be detailed in the CEMP. If dust control measures are not adequately restricting the generation of dust under the prevailing conditions at any time, the Contractor shall re-programme the work activities, which are causing the dust.

8.7 Noise Control

The Contractors shall make all practical efforts to comply with the requirements of the POEO Act, and, the EPA Noise Control Manual Chapter 171 "Noise Control Guidelines for Construction Site Noise".

Where the guidelines are, or are likely to be exceeded, the Contractors shall apply a practical and economical combination of noise control measures to manage the impacts of construction noise in consultation with, and in accordance with, the requirements stipulated by the EPA.

When construction will involve the use of heavy equipment and significant noise generating activities, the Contractors shall, as much as practicable, prevent noise from being a nuisance to neighbouring residents. They shall prepare a Noise Management Plan as part of the CEMP to show how construction will be carried out to minimise the impact of noise from their operations on adjacent properties. This could include operational controls such as:

- substitution by an alternative process,

- restricting times when noisy work is carried out,

- placement of work compounds, parking areas, equipment and material stockpile sites away from noise-sensitive locations,

- where noise barriers/walls are to be constructed, program this as early as possible to reduce noise impacts from other construction work on neighbouring residents,

- screening or enclosures, and,

- consultation with affected residents.

The Noise Management Plan shall cover all significant noise generating activities.

If an offending process produces noise at adjacent property above specified noise levels, the Project Manager may stop that process until he receives a Non-conformance Report and Revised Noise Management Plan that satisfies him that issue has been resolved.

All construction plant and equipment used on the Works must, in addition to other requirements, be:

- fitted with properly maintained noise suppression devices in accordance with the manufacturer's recommendations,

- maintained in an efficient condition, and,
- operated in a proper and efficient manner.

8.8 Ground Vibration

The Contractors shall take due care in all construction activities to prevent damage to adjacent public utilities, structures and buildings resulting from construction vibration. They shall make all practical efforts to meet the requirements of Chapter 174 'Vibration in Buildings' of the EPA Noise Control Manual. To avoid structural damage, the activities shall be carried out to meet the requirements of BS 7385.

8.9 Vegetation

Contractors shall preserve existing trees, plants, and other vegetation that are to remain within or adjacent to the Works and shall use every precaution necessary to prevent damage or injury thereto. They shall include in the CEMP, and then implement, procedures for monitoring clearing and grubbing operations to ensure that trees and other vegetation are not unnecessarily cleared or otherwise disturbed.

Construction methods must be employed to minimise the spreading or introduction of weeds caused by construction activity on or around the site. Procedures for controlling the spreading or introduction of weeds caused by works under the Contract, including the monitoring arrangements, shall he included in the CEMP.

8.10 Fauna

The Contractors shall include habitat conservation measures in the CEMP. All native wildlife shall be protected. No firearms will be allowed on site except for security purposes permitted by law.

8.11 Fire Precautions

The Contractors shall at all times comply with the requirements of the Rural Fires Act, 1997 and the Local Government Act, 1993. They shall be responsible for any damage to fences, trees, grass, cultivation, buildings or other property caused by fires lit for any purpose in connection with the Contract.

All items of plant used during proclaimed high fire danger periods that could discharge sparks shall be fitted with spark arresters. No cutting, welding, grinding or other activities likely to generate fires shall be undertaken in the open on 'total fire ban' days.

The Project Manager will not allow disposal of cleared and grubbed vegetation by burning off. The Contractors shall utilise recycling or alternative uses of cleared vegetation where practical.

8.12 Herbicides and Other Contaminants

The Contractors shall plan and execute the work so as to minimise the possibility of pollution of areas adjoining the construction area from contaminants such as petroleum products, trade waste, garbage and other noxious substances.

The use and storage of any herbicide or other chemical classified as a Dangerous Goods Class 6 Poison shall be strictly in accordance with the manufacturer's instructions and the relevant Materials Safety Data Sheets (MSDS).

8.13 Spillage Prevention and Containment

Transporting, handling and storage methods that will prevent chemical, fuel and lubricant spillage on or around the site caused by construction activity must be employed. Polluting or permitting pollution of land or waterways by a chemical, fuel or lubricant, or any waste material is not permitted.

Refuelling or maintenance of plant and equipment, mixing of cutting oil with bitumen, or any other activity which may result in the spillage of a chemical, fuel or lubricant on any location with direct drainage to a waterway, is not permitted without appropriate temporary bunding being provided. Refuelling shall not occur in the vicinity of waterways or environmentally sensitive areas. Refuelling operations shall not be left unattended while in progress. Adequate quantities of suitable material to counteract spillage must be kept readily available.

Chemical, fuel and lubricant storage areas must be suitably located and protected to minimise the impact of any spillage or contamination on or around the site. Storage areas shall not be located within 20 metres of natural or built drainage lines, flood prone areas, or on slopes steeper than 1:10.

Impervious bunds of sufficient capacity to contain at least 110% of the stored chemical, fuel and lubricant volume, must be constructed around all chemical, fuel and lubricant storage areas. Drainage of the bunded areas must be provided with lockable gate valves. The gate valves must remain closed and locked at all times except during the controlled removal of stormwater from the bunded area. The valves must be attended to at all times while they are unlocked and/or open. An effective alternative method of draining the bunded area is permitted where the bunded area cannot be drained by gravity.

Before discharging any stormwater from bunded areas, the Contractors shall verify that the water complies with any water quality criteria nominated by the EPA. They shall arrange appropriate treatment if the water quality is not suitable for discharge.

The Contractors shall keep records of all water quality checks, discharges and any remedial actions.

Procedures for controlling and removing chemical and fuel and lubricant spillage on or around the site caused by works under the Contract must be included in the CEMP. Procedures for containing spillage which may be caused by the following activities on or around the site must also be included if applicable to work under the Contract:

- refuelling or maintenance/cleaning of plant and equipment including concrete agitators, and,
- application of liquid membranes, including paint and thermoplastic, resin, emulsion, pre-coat agent and curing compound.

8.14 Contaminated Ground

The Contractors shall promptly notify the Project Manager of any suspected or potentially contaminated ground exposed during construction activities. They shall cease construction activity in the vicinity of the suspected or potentially contaminated ground until it has been assessed and appropriate protection measures determined.

The Contractors shall install any control measures needed to divert surface runoff away from contaminated ground and to treat any surface runoff contaminated by exposure to contaminated ground.

8.15 Waste Management

The CEMP shall include a Waste Management Plan detailing how each Contractor will manage and dispose of any waste generated during execution of the Contract including, but not limited to, green waste, office waste and construction and demolition waste. This shall include compliance with the POEO Act for any non-licensed as well as licensed waste activities which involve the generation, storage and/or disposal of waste, as applicable.

Septic tanks and portable self-contained toilets of suitable capacity may be used subject to acceptable arrangements for disposal of the effluent. Pit toilets are not permitted.

Littering or dumping of unwanted waste or disposal of surplus construction materials including bitumen, asphalt or concrete, or permitting such activities on any land on or around the site, is not permitted unless specifically permitted in the Project Specification.

Appropriate receptacles must be provided for depositing of litter and other waste materials, and their contents disposed off site at a suitable waste disposal station on a regular basis. The disposal of chemical, fuel and lubricant containers, solid and liquid wastes shall be in accordance with the requirements of Wingecarribee Shire Council or the EPA.

The Waste Management Plan shall cover transport and disposal arrangements including suitable facilities for storing waste materials and for monitoring the waste control measures.

A Waste Management Register shall be kept detailing type of waste picked up, amounts, date, time, by whom, and where it was disposed.

8.16 Restoration of Site

Contractors shall reinstate all areas disturbed by their construction operations. Restoration shall include remedying of any ground contaminated by incidents such as oil or fuel spills (particularly in fuel storage areas), appropriate revegetation and any other measures to restore the land.

9. Project Managers Surveillance and Audits

Environmental management audits by the Project Manager may be conducted on a scheduled basis on all aspects of the Contractor's EMP and will be performed in accordance with recognised audit procedures.

The Project Manager shall give each Contractor at least five days notice that an environmental management audit is to be conducted and shall advise the scope of this audit.

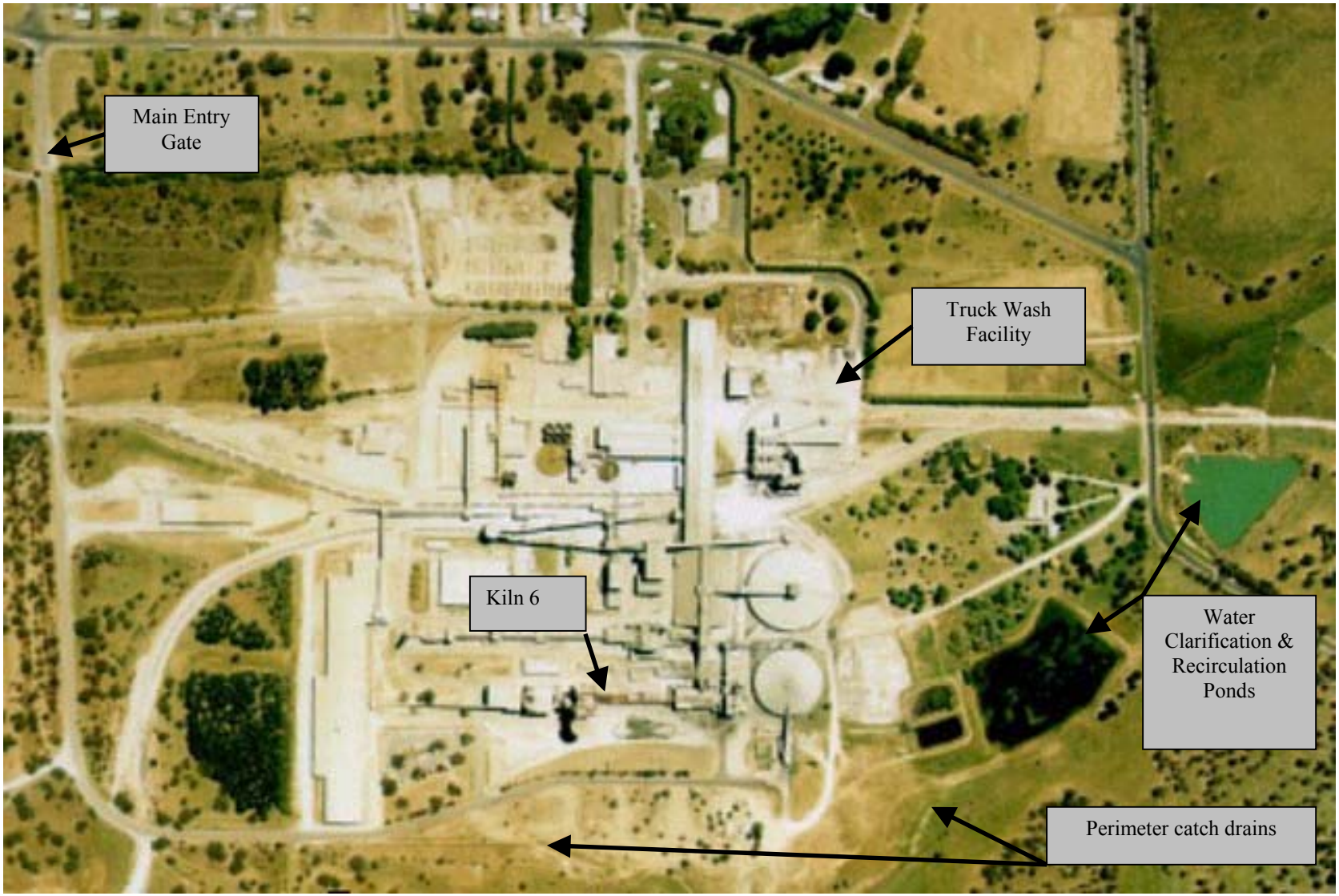
Surveillance and process audits by the Project Manager may be conducted at any time.

The Project Manager may authorise environmental specialists as agents of BCSC to enter the site for the purposes of inspection and liaison with the Project Manager and to attend appropriately convened site meetings to discuss aspects of the work.

If surveillance or an audit indicates a significant non-conformance of environmental requirements, the Project Manager shall be entitled to conduct an environmental management audit at twenty four hours notice to the Contractors.

The Contractors shall make available at the site suitable facilities to accommodate an audit team of three persons. The cost of providing such facilities shall be borne by Contractors.

Appendix A - Site Plan of Environmental Controls



Appendix C

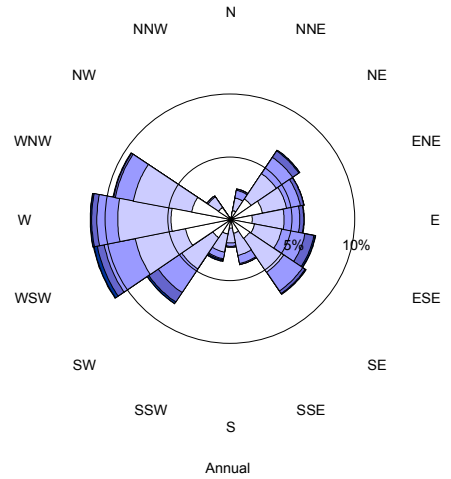
Meteorology Records

Table 1. Climate averages for Station: 068045 MOSS VALE (HOSKINS STREET)

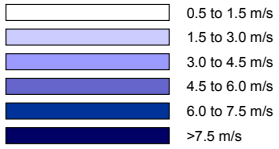
Commenced: 1870; Last record: 2001; Latitude (deg S): -34.5444; Longitude (deg E): 150.3768; State: NSW														
Element	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann.	No. of yrs
Mean daily maximum temperature - deg C	25.8	25.2	23.1	19.2	15.3	12.3	11.8	13.4	16.7	19.9	22.6	25	19.2	63.3
Mean no. of days where Max Temp >= 40.0 deg C	0	0	0	0	0	0	0	0	0	0	0	0	0	13.5
Mean no. of days where Max Temp >= 35.0 deg C	0.8	0.6	0.2	0	0	0	0	0	0	0	0	0.4	2	13.5
Mean no. of days where Max Temp >= 30.0 deg C	4.7	3.5	1.7	0	0	0	0	0	0	0.1	1.6	3.8	15.4	13.5
Highest daily Max Temp - deg C	38.3	38.3	35	27.8	25	18.5	20	23	28.3	30.7	33.3	37.8	38.3	13.5
Mean daily minimum temperature - deg C	12.4	12.6	10.8	7.4	4.3	2.3	1.3	2	4	6.5	8.8	11.1	7	63.9
Mean no. of days where Min Temp <= 2.0 deg C	0	0	0.8	2.2	8.9	12.8	18.1	13.6	8.8	2.9	0.5	0.1	68.6	13.9
Mean no. of days where Min Temp <= 0.0 deg C	0	0	0.1	0.4	3.3	6.4	10.6	6.9	2.9	0.6	0.1	0	31.1	13.9
Lowest daily Min Temp - deg C	4	5	-0.6	-1	-4	-5.6	-6.4	-4	-5.6	-2.8	0	1.1	-6.4	13.9
Mean 9am air temp - deg C	18.5	18.4	16.8	13.1	9.2	6.5	5.5	7.1	10.7	13.7	15.9	18.2	12.7	24.7
Mean 9am wet bulb temp - deg C	15.1	15.5	14.4	11.2	7.8	5.3	4.1	5.2	7.9	10.4	12	14.1	10.2	24.3
Mean 9am dew point - deg C	12.5	13	11.9	9.6	6.2	3.8	2.1	2.9	4.6	7.1	8.4	10.6	7.7	13.7
Mean 9am relative humidity - %	69	74	76	78	81	81	78	73	66	64	61	62	72	24.3
Mean 9am wind speed - km/h	10.6	9.7	10	10.7	11.7	10.7	12.8	13.2	13.5	12.3	12.8	10.5	11.6	13.5
Mean 3pm air temp - deg C	22.8	22.7	20.9	17.9	13.7	11.2	10.6	11.5	14.6	17	19.2	21.5	16.9	13.3
Mean 3pm wet bulb temp - deg C	16.8	16.9	15.7	13.4	10.2	8.1	7	7.5	9.7	11.9	13.7	15.6	12.1	13.1
Mean 3pm dew point - deg C	12.2	12.6	11.5	9.1	6.1	4.2	2.1	2.2	3.7	6.5	8.4	10.8	7.4	13.4
Mean 3pm relative humidity - %	53	55	57	57	61	62	57	54	49	52	51	52	55	13.4
Mean 3pm wind speed - km/h	12.5	10.9	11.4	12	13.7	13.4	15.6	15.5	14.9	13.7	14.4	12.6	13.4	12.1
Mean monthly rainfall – mm	91.8	93.7	92.5	83.8	87.5	101.3	77.5	65.5	61.2	76.1	73	77.5	981.5	130.2
Median (5th decile) monthly rainfall – mm	80.3	70.5	72.6	68.4	55.4	69.3	52.6	39	48	57.6	63.9	60.3	968.9	127
9th decile of monthly rainfall – mm	178.4	185.2	182.5	172	202.2	217.1	171.4	151.2	123	157.8	138.4	163.4	1328.7	127
1st decile of monthly rainfall – mm	25.6	13.8	16.2	15.6	14	12.8	12.4	8.9	13.9	19.5	9.8	14.6	648.3	127
Mean no. of raindays	10.9	10.9	11.1	9.6	10	10.2	9.3	9.2	9.4	10	9.9	10	120.6	115.8
Highest monthly rainfall – mm	268.8	399.1	518.4	464.4	583.8	527	473.6	410.2	260.7	346	266.7	380.5		130.2
Lowest monthly rainfall – mm	3.6	4.3	0.8	0.6	1.8	0	1.1	0.4	3.7	6	0	2.8		130.2
Highest recorded daily rainfall – mm	110.5	199.6	333	196.3	173.2	165.9	204	208	112.8	183.9	102.9	157	333	124.7
Mean no. of clear days	5.7	5.9	5.9	7.9	8.8	7.4	10.4	8.4	10	6.6	6.7	6.4	90	13.9
Mean no. of cloudy days	12.1	11.8	12.6	9.2	10.3	10.2	7.5	9.2	8.8	11.5	11.2	10.9	125.3	13.9

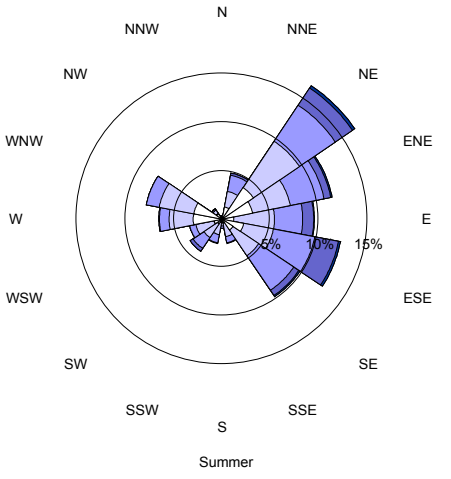
Source: Bureau of Meteorology (http://www.bom.gov.au/climate/averages/).

Annual and Seasonal Windroses for Berrima - January 1999 to November 1999

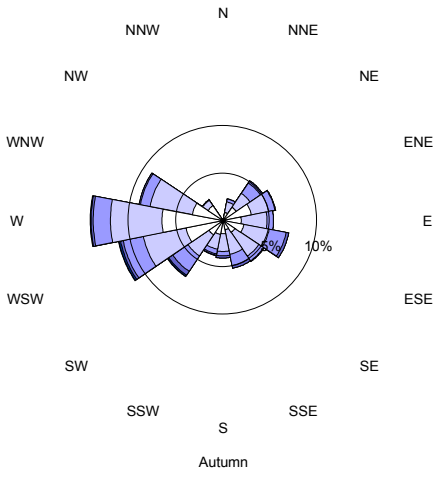


Annual

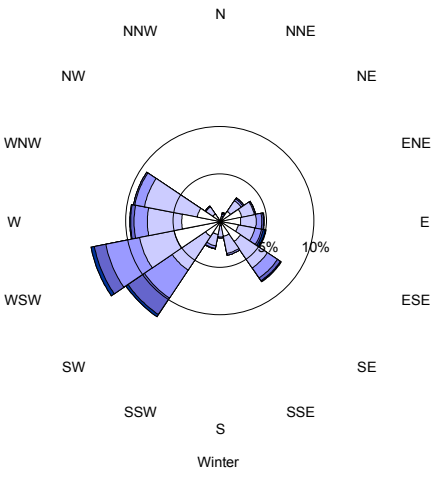




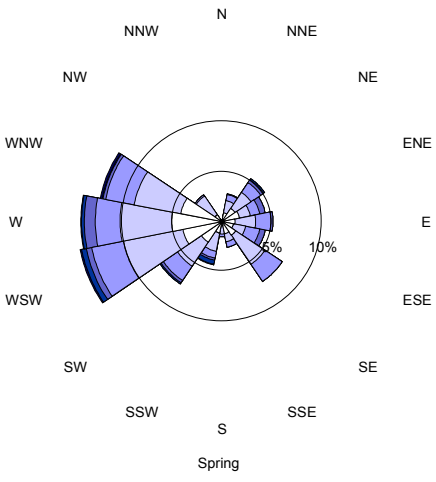
Summer



Autumn



Winter



Spring

Figure 2

Appendix D

Air quality report submitted to the PNSW & EPA

Draft

AIR QUALITY REVIEW
NEW BERRIMA PLANT, NUMBER 6 KILN UPGRADE

16 August 2003

Prepared for
Blue Circle Southern Cement Pty Ltd

by

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CONTENTS

TABLES

FIGURES

(all figures are at the end of the report)

1 INTRODUCTION

This report has been prepared by Holmes Air Sciences. It provides a review of air quality issues associated with an upgrade proposed for the Number 6 Kiln at the Blue Circle Southern Cement (BCSC) Plant near Berrima in the Southern Highlands (see Figure 1).

The methodology used in the assessment follows that set out in the NSW EPA's guidelines titled "Approved Methods and Guidance For the Modelling and Assessment of Air Pollutants in New South Wales" (**NSW EPA, 2001**).

The project involves upgrading a component of an existing plant to achieve a greater production capacity. The assessment is based on using modelling to determine the total impact of the plant for all significant emissions that will arise from the upgraded Kiln. This includes emissions of PM_{10}, TSP and NO_2.

In addition, the assessment provides data on emissions of metals, dioxins (PCDDs), furans (PCDFs) and polycyclic aromatic hydrocarbons (PAHs).

The proposal does not envisage the use of alternative fuels and the assessment does not cover the case where alternative fuels are used.

2 LOCAL SETTING AND PROJECT DESCRIPTION

The existing plant is located approximately 1 km south of Berrima, in the NSW Southern Highlands. The land is gently undulating and open in all directions. There are no significant terrain features in the immediate area of the plant and for modelling purposes the terrain has been considered to be flat.

The raw materials required for cement manufacture are limestone, sand, shale and iron ore. Limestone is brought from Marulan in trains and stored in an enclosed building on site. Sand and iron ore are brought by truck and shale is quarried locally. Currently these materials are stored in small hoppers. Limestone is automatically reclaimed and transported to hoppers, while the other raw materials are proportioned by weigh feeders and transported to the raw mill. The raw mill is a vertical roller mill which grinds the materials to a fine powder. Exhaust gases from the kiln are used to dry and convey this fine material from the mill where they are de-dusted using an electrostatic precipitator. The fine material is then conveyed to the blending silo and fed to the pre-heater/kiln system. The kiln is fired by coal that has been ground and conveyed to the kiln. The dry kiln has a grate cooler. All air used for cooling the clinker is used as combustion air. The gases from the kiln are used for drying and heating the raw meal. These gases pass through a conditioning tower where they can be cooled and exhausted after de-dusting in the precipitator. The cooled clinker is then conveyed to the storage area.

The plant currently operates using two kilns - Kilns 5 and 6. Kilns 5 and 6 have nominal production capacities of 1,400 and 3,600 tpd respectively. Currently Kiln 5 is on standby for much of the time. The project will upgrade Kiln 6; increasing its current production capacity of 3,200 tpd by 34% to 4,300 tpd. On an annual basis the current production capacity of Kiln 6 would be increased by 360,000 tpa from 974,000 tpa to 1,334,000 tpa. This will decrease the need to use Kiln 5. However, Kiln 5 may still be required from time to time to meet peaks in production.

The upgrading for Kiln 6 will involve:

- Installation of a raw mill with a dust collection system
- Installation of a second pre-heater including pre-calciner secondary air duct
- Widening of cooler and upgrade of heat exchanger and cooler
- Modification to clinker conveyor
- Upgrade of mill capacity.

From an air quality perspective the important changes will be the changes to emissions of PM_{10}, TSP and NO_x from the main No. 6 Kiln Stack and the No. 6 Kiln Cooler Stack. Emissions from stacks associated with No. 5 Kiln do not change, but the hours of operation of No. 5 Kiln will be reduced. This will affect the contribution that this stack makes to long-term average concentrations of emissions, but not to the theoretical maximum short-term average concentrations. For assessment purposes the plant has been modelled as if both No. 5 and 6 Kilns are operated at their maximum emission levels (licensed) for the entire year.

3 AIR QUALITY CRITERIA

The important emissions from the upgraded plant will be PM_{10} TSP and NO_2. There are also emissions of SO_x but these are so small that they do not need to be assessed in detail. The NSW EPA has developed assessment criteria of these emissions and these are listed in **Table 1**.

Table 1. Impact assessment criteria for pollutants (for use in modelling)

Pollutant	Averaging period	Concentration	
		pphm	$\mu g/m^3$
NO_2	1-hour 1-year	12 3	246 62
PM_{10}	1-day annual	- -	50 30

In addition, the EPA has specified an annual average ambient air quality goal for TSP of 90 $\mu g/m^3$ and an annual average dust (insoluble solids) deposition goal of 4 g/m^2/month.

4 DISPERSION METEOROLOGY

This section provides a description of dispersion conditions in the Berrima area. **Section 5** provides a brief review of other climate data.

4.1 Wind speed and direction

Meteorological data used for this assessment were taken from the on-site weather station, shown in Figure 1. The data cover the period 1 January 1999 to 31 October 1999. Figure 2 shows the annual and seasonal windroses compiled from the on-site data. On an annual basis winds are generally from the eastern and western quadrants. In summer, winds from the northeast clockwise around to the southeast predominate, while in winter the dominant direction is southwest through to north-northwest. The annual average wind speed is approximately 2.1 m/s.

4.2 Other parameters required for modelling

The dispersion model used in this study requires further information such as atmospheric stability[1] class and mixed-layer height[2]. Because the emissions from the process areas of the plant are heated, temperature data was also required. Temperature is not measured at the on-site weather station, so 3-hourly data from Bowral was used.

Stability class was determined using 3-hourly cloud cover data from Bowral, approximately 10 km northeast of Berrima. The 3-hourly data were interpolated to 1-hourly data then combined with the on-site wind data (this was also done with the temperature measurements from Bowral). Turner's method (**Turner, 1964**) was then used to determine the stability for each hour. As shown in **Table 2**, the percentage of F-Class stability conditions is quite high. These conditions of light winds and stable conditions will mean ground-level sources will disperse slowly for a high proportion of the time.

Table 2 – Frequency of occurrence of stability class

Stability Class	Frequency of occurrence
A	8.2%
B	20.4%
C	14.0%
D	8.0%
E	4.8%
F	44.6%
Total	100%

5 REVIEW OF CLIMATIC ELEMENTS

Climatic statistics from the Bureau of Meteorology's climate station at Moss Vale have been used to describe the conditions in the area. The Bureau's meteorological station is located approximately 5 km to the southeast of the plant and both sites are at approximately the same elevation, between 670 to 680 m (AHD). The data are summarised in **Table 3**, which shows information on temperature, relative humidity, dew point, wind speed, rainfall and cloud cover.

5.1 Temperature

On average January is the warmest month with a mean daily maximum temperature of 25.8 ^{o}C and July the coolest with a mean daily maximum of 11.8 ^{o}C. The highest observed daily maximum (over 13.5 years of record) has been 38.3 ^{o}C, which occurred in January and February. The lowest daily minimum temperature was -6.4 ^{o}C , observed in July.

[1] In dispersion modelling stability class is used to categorise the rate at which a plume will disperse. In the Pasquill-Gifford stability class assignment scheme (as used in this study) there are six stability classes, A through to F. Class A relates to unstable conditions, such as might be found on a sunny day with light winds. In such conditions plumes will spread rapidly. Class F relates to stable conditions, such as occur when the sky is clear, the winds are light and an inversion is present. Plume spreading is slow in these circumstances. The intermediate classes B, C, D and E relate to intermediate dispersion conditions.

[2] The term mixed-layer height, refers to the height above the ground through which ground-based emissions will eventually be dispersed once a plume has been thoroughly mixed. An elevated plume, initially above the mixed-layer height will remain isolated from the ground until such time as the mixed-layer height reaches the height of the plume. In general the mixed-layer height will increase during the day as the sun causes convection to deepen the turbulent layer of the atmosphere close to the ground. Mixed-layer height will also increase if the wind speed increases because higher wind speeds will increase turbulence as the wind blows over the rough ground.

5.2 Relative humidity

Relative humidity, dew point and wet bulb temperature data are presented in **Table 3**. This review focuses on the relative humidity data. Relative humidity observed at 9 am is lowest in November (69%) and highest in May and June (81%). For the 3 pm observations the lowest relative humidity occurs in September (49%) and the highest in June (62%).

5.3 Wind speed

Average wind speeds at 9 am show little variation over the year but are greatest in July (13.5 km/h or 3.8 m/s) and lowest in February (9.7 k/h or 2.7 m/s). The average over the year of the 9 am wind speeds is 11.6 km/h or 3.2 m/s.

Average wind speeds at 3 pm also show little variation over the year. They are greatest in July (15.6 km/h or 4.3 m/s) and lowest in February (10.9 k/h or 3.0 m/s). The average over the year of the 3 am wind speeds is 13.4 km/h or 3.7 m/s.

The average over the year of 9 am and 3 pm wind speeds is 12.5 km/h or 3.5 m/s. This can be compared with the yearly average wind speed recorded by the anemometer operated by BCSC of 7.6 m/s or 2.1 m/s. It should be noted that BCSC on-site wind observations include all night-time hours when winds are likely to be lower.

5.4 Rainfall

Mean annual rainfall over 130 years of data has been 981.5 mm. On average, the wettest month is June (monthly average101.3 mm) and the driest is September (monthly average 61.2 mm).

5.5 Cloud cover

Cloud amounts are greatest in January when on average 12.1 days are classed as cloudy and least in July when the average number of cloudy days is 7.5.

Table 3. Climate averages for Station: 068045 MOSS VALE (HOSKINS STREET)

Commenced: 1870; Last record: 2001; Latitude (deg S): -34.5444; Longitude (deg E): 150.3768; State: NSW														
Element	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann.	No. of yrs
Mean daily maximum temperature - deg C	25.8	25.2	23.1	19.2	15.3	12.3	11.8	13.4	16.7	19.9	22.6	25	19.2	63.3
Mean no. of days where Max Temp >= 40.0 deg C	0	0	0	0	0	0	0	0	0	0	0	0	0	13.5
Mean no. of days where Max Temp >= 35.0 deg C	0.8	0.6	0.2	0	0	0	0	0	0	0	0	0.4	2	13.5
Mean no. of days where Max Temp >= 30.0 deg C	4.7	3.5	1.7	0	0	0	0	0	0	0.1	1.6	3.8	15.4	13.5
Highest daily Max Temp - deg C	38.3	38.3	35	27.8	25	18.5	20	23	28.3	30.7	33.3	37.8	38.3	13.5
Mean daily minimum temperature - deg C	12.4	12.6	10.8	7.4	4.3	2.3	1.3	2	4	6.5	8.8	11.1	7	63.9
Mean no. of days where Min Temp <= 2.0 deg C	0	0	0.8	2.2	8.9	12.8	18.1	13.6	8.8	2.9	0.5	0.1	68.6	13.9
Mean no. of days where Min Temp <= 0.0 deg C	0	0	0.1	0.4	3.3	6.4	10.6	6.9	2.9	0.6	0.1	0	31.1	13.9
Lowest daily Min Temp - deg C	4	5	-0.6	-1	-4	-5.6	-6.4	-4	-5.6	-2.8	0	1.1	-6.4	13.9
Mean 9am air temp - deg C	18.5	18.4	16.8	13.1	9.2	6.5	5.5	7.1	10.7	13.7	15.9	18.2	12.7	24.7
Mean 9am wet bulb temp - deg C	15.1	15.5	14.4	11.2	7.8	5.3	4.1	5.2	7.9	10.4	12	14.1	10.2	24.3
Mean 9am dew point - deg C	12.5	13	11.9	9.6	6.2	3.8	2.1	2.9	4.6	7.1	8.4	10.6	7.7	13.7
Mean 9am relative humidity - %	69	74	76	78	81	81	78	73	66	64	61	62	72	24.3
Mean 9am wind speed - km/h	10.6	9.7	10	10.7	11.7	10.7	12.8	13.2	13.5	12.3	12.8	10.5	11.6	13.5
Mean 3pm air temp - deg C	22.8	22.7	20.9	17.9	13.7	11.2	10.6	11.5	14.6	17	19.2	21.5	16.9	13.3
Mean 3pm wet bulb temp - deg C	16.8	16.9	15.7	13.4	10.2	8.1	7	7.5	9.7	11.9	13.7	15.6	12.1	13.1
Mean 3pm dew point - deg C	12.2	12.6	11.5	9.1	6.1	4.2	2.1	2.2	3.7	6.5	8.4	10.8	7.4	13.4
Mean 3pm relative humidity - %	53	55	57	57	61	62	57	54	49	52	51	52	55	13.4
Mean 3pm wind speed - km/h	12.5	10.9	11.4	12	13.7	13.4	15.6	15.5	14.9	13.7	14.4	12.6	13.4	12.1
Mean monthly rainfall – mm	91.8	93.7	92.5	83.8	87.5	101.3	77.5	65.5	61.2	76.1	73	77.5	981.5	130.2
Median (5th decile) monthly rainfall – mm	80.3	70.5	72.6	68.4	55.4	69.3	52.6	39	48	57.6	63.9	60.3	968.9	127
9th decile of monthly rainfall – mm	178.4	185.2	182.5	172	202.2	217.1	171.4	151.2	123	157.8	138.4	163.4	1328.7	127
1st decile of monthly rainfall – mm	25.6	13.8	16.2	15.6	14	12.8	12.4	8.9	13.9	19.5	9.8	14.6	648.3	127
Mean no. of raindays	10.9	10.9	11.1	9.6	10	10.2	9.3	9.2	9.4	10	9.9	10	120.6	115.8
Highest monthly rainfall – mm	268.8	399.1	518.4	464.4	583.8	527	473.6	410.2	260.7	346	266.7	380.5		130.2
Lowest monthly rainfall – mm	3.6	4.3	0.8	0.6	1.8	0	1.1	0.4	3.7	6	0	2.8		130.2
Highest recorded daily rainfall – mm	110.5	199.6	333	196.3	173.2	165.9	204	208	112.8	183.9	102.9	157	333	124.7
Mean no. of clear days	5.7	5.9	5.9	7.9	8.8	7.4	10.4	8.4	10	6.6	6.7	6.4	90	13.9
Mean no. of cloudy days	12.1	11.8	12.6	9.2	10.3	10.2	7.5	9.2	8.8	11.5	11.2	10.9	125.3	13.9

Source: Bureau of Meteorology (http://www.bom.gov.au/climate/averages/).

6 EXISTING AIR QUALITY

6.1 Dust deposition data

There is a network of dust deposition gauges installed around the BCSC site. Their locations are shown in **Figure 1**. Monitoring began in January 1998 and data is available up to September the present. The data are summarised in **Table 4**.

Table 4 – Dust deposition (insoluble solids) at BCSC 1998-2002 – g/m^2/month

Gauge	G1	G2	G3	G4	G5	G6	G7	G8	G9
Jan-98	2.62	1.2	5.53	5.28	11.03	7.47	3.25	10.59	2.88
Feb-98	1.22	0.99	-	2.9	3.99	3.31	2.24	-	1.32
Mar-98	1.09	1.01	4.65	3.15	2.62	1.72	1.41	1.23	1.83
Apr-98	1.09	1.27	-	3.11	3.63	-	1.92	1.279	2.26
May-98	1.07	2.07	4.26	2.33	3.23	1.47	1.44	-	4.65
Jun-98	0.74	0.74	4.28	1.74	-	1.5	0.97	-	1.44
Jul-98	0.39	1.48	4.15	1.82	2.84	1.12	0.54	0.76	0.58
Aug-98	1.68	1.19	5.66	2.52	4.3	-	0.97	1.54	2.84
Sep-98	0.31	0.32	2.52	1.22	2.57	1.35	0.96	0.4	0.87
Oct-98	0.99	0.56	3.67	-	2.04	0.85	-	0.25	0.89
Nov-98	0.82	0.63	-	-	-	-	-	4.38	2.63
Dec-98	1.35	3.7	3.16	3.49	-	4.69	-	3.07	2.09
Year	1.11	1.26	4.21	2.76	4.03	2.61	1.52	2.61	2.02
Jan-99	-	0.73	4.38	3.84	5.96	3.94	3.93	1.07	3.72
Feb-99	0.83	0.31	1.45	1.1		2.42	2.12	0.96	1.73
Mar-99	0.82	0.85	5.74	1.7	10.93	3.76	1.9	0.96	2.25
Apr-99	-	0.76	-	-	7.73	2.59	1.86	-	1.86
May-99	0.63	0.39	4.27	3.68	3.45	1.69	0.98	0.94	0.61
Jun-99	0.71	0.96	5.12	1.96	2.47	1.25	0.92	1.75	1.6
Jul-99	0.58	1.28	4.38	-	2.31	-	0.69	1.42	1.71
Aug-99	-	1.16	11.32	2.43	1.91	-	-	1.04	1.58
Sep-99	0.63	0.58	5.29	4.1	4.54	-	2.79	3.7	1.58
Oct-99									
Nov-99									
Dec-99									
Year	0.70	0.78	5.24	2.69	4.91	2.61	1.90	1.48	1.85
Jan-00									
Feb-00									
Mar-00									
Apr-00									
May-00									
Jun-00									
Jul-00									
Aug-00									
Sep-00									
Oct-00									
Nov-00									
Dec-00									
Year									

Gauge	G1	G2	G3	G4	G5	G6	G7	G8	G9
Jan-01	0.81	2.02	2.32	5.63	9.07	3.57	3.69	-	3.47
Feb-01	0.1	3.48	2.5	1.62	2.56	1.48	1.58	0.46	1.81
Mar-01	0.24	0.21	1.13	0.97	1.71	0.3	1.67	0.15	
Apr-01	0.89	0.38	3.14	1.12	1.03	0.81	1.96	0.43	1.01
May-01	0.44	0.27	3.69	1.41	1.6	1.24	1.65	0.19	0.92
Jun-01	0.26	0.12	4.53	1.92	1.25	0.97	1.21	0.2	-
Jul-01	0.3	0.11	3.82	1.85	0.96	0.41	1.01	-	0.63
Aug-01	1.17	0.5	3.04	2.29	1.76	0.8	0.99	0.27	-
Sep-01	0.28	97.5	4.19	119.47	2.92	1.27	1.27	0.49	0.71
Oct-01	-	0.47	7.07	5.97	3.6	3.09	1.62	0.39	1.55
Nov-01	-	0.53	5.79	3.09	5.72	2.26	2.5	0.7	2.26
Dec-01	0.84	1.07	6.4	1.5	2.57	2.23	2.54	1.66	1.91
Year	0.53	8.89	3.97	12.24	2.90	1.54	1.81	0.49	1.59
Jan-02	0.65	0.99	2.54	1.62	2.26	1.31	2.77	0.72	0.98
Feb-02	0.07	0.1	1.74	1.95	0.87	1.19	1.25	0.22	-
Mar-02	0.05	0.08	0.74	0.7	0.98	0.17	1.96	0.23	1.84
Apr-02	0.44	0.13	1.46	0.29	0.4	0.33	1.11	0.22	0.81
Year to date	0.30	0.33	1.62	1.14	1.13	0.75	1.77	0.35	1.21

As shown in **Table 4**, most of the gauges record annual average dust deposition levels of less than 4 g/m^2/month. High deposition levels recorded in the past eighteen months have been due to extremely high deposition level recorded in single month rather than generally elevated levels. The reason for the high levels is not known but in the case of G2 in September 2001 it would be unlikely that emissions from BCSC cement was the cause. G4 is an on-site monitor and activities at the plant may have been responsible, but the recorded levels is anomalously high compared with the fallout levels recorded before and after September.

6.2 Particle size distribution data

The particle size distribution of particulate emissions from the stack have been determined from monitoring carried out by EML Air Pty Ltd. These data show the following distribution in particle sizes and these have been used in the dispersion modelling for process emission sources:

- 0 – 2.5 μm → 40.9%
- 2.5 – 10 μm → 32.3%
- 10 – 50 μm → 26.8%

For fugitive emissions, namely wind erosion, the particle size distribution has been assumed to be similar to that from extractive industries such as coal mines and quarries. These proportions are as follows:

- 0 – 2.5 μm → 4.7%
- 2.5 – 10 μm → 34.4%
- 10 – 50 μm → 60.9%

These particle size distributions have been derived from data presented in undertaken on behalf of the **SPCC (1988)** by Dames & Moore. They are the average values over a range of earth moving activities that take place on open cut mines in the Hunter Valley.

7 APPROACH TO ASSESSMENT

The approach to the assessment makes use of the Victorian EPA's AUSPLUME dispersion model to predict ground-level concentrations of emissions of PM_{10} and NO_2 from the upgraded plant. The predicted concentrations have been compared with the NSW EPA's assessment criteria as required in the EPA's modelling guidelines (NSW EPA 2001).

8 EMISSIONS

8.1 Criteria pollutants

There are two main groups of dust emission sources at the BCSC plant, namely controlled/process and fugitive sources. Controlled sources include those from stacks and fugitive sources include emissions from stockpiles and some materials transfer operations.

A new baghouse will be added in parallel to the current kiln precipitators on No. 6 Kiln. The baghouse will reduce emissions concentrations to below 30 mg/Nm^3. The expected volumes through current precipitators will be about 75 Nm^3/s and new baghouse will be 50 Nm^3/s.
The weighted average from the gas from the current precipitators (currently operating at 55 mg/Nm^3) plus 30 mg/Nm^3 from the new bag house will come to approximately 50 mg/Nm^3.

It has been conservatively assumed that all emissions are PM_{10}, that is the PM_{10} and TSP emission rates will be the same.

Emissions from all other stacks, including those from Kiln 5 which will not be upgraded and would be expected to experience a significant reduction in on-time post-upgrade, have been modelled as constant throughout the year and are listed in **Table 5**. Emission rates of TSP and PM_{10} have been estimated assuming that:

- The concentrations of emissions are at the license limits
- That concentrations are at the best estimates of the actual values.

Other controlled sources include Cement Mill 6 and the Coal Mill, but these have been classified as volume sources as they consist of vents from the sides of buildings.

Table 5 – Emission parameters for point sources on upgraded plant

Stack conditions	**Kiln 6**	**Kiln 6 Cooler**	**Kiln 5**	**Kiln 5 Cooler**	**Cement Mill 5**	**Cement Mill 6**
Stack height (m)	87	37.1	61.4	46.3	30.0	30.0
Location (AMG coordinates)	255337 mE 6177753 mN	25542 mE 6177732 mN	255208 mE 6177829 mN	255434 mE 61787804 mN	255385 mE 6177847 mN	255415 mE 6177867 mN
Stack diameter (m)	3.0	2.4	2.4	2.4	0.6	1.5 x 1.5 1.7
Exit Temperature (K)	373	373	473	408	388	363
Exit Velocity (m/s)	31.1	17.0	26.8	7.1	15.0	16
Volumetric flow (Nm^3/s)	149	52	65	20	3	25.6
Emission rate (g/s) – best estimate						
-TSP	7.5	0.026	10.81	10.94	0.083	0.768
-PM_{10}	7.5	0.026	10.81	10.94	0.083	0.768
-NO_x	<149	-	59.8[4]	-	-	-
- SO_2	0.0018[3]	-	-0.0014[5]	-	-	-
- SO_3	0.0007	-	0.0006	-	-	-
Emission rate (g/s) – estimate based on licence limits						
-TSP – licence 250 mg/Nm^3 for No. 6 and 400 mg/Nm^3 for No. 5	37.3	0.026	26.0	2.0	1.2	0.768
-PM_{10} – licence 250 mg/Nm^3 for No. 6 and 400 mg/m^3 for No. 5	37.3	0.026	26.0	2.0	1.2	0.768
-NO_x – licence 2000 mg/Nm^3 for No. 6 and no limit for No. 5	298	-	130	-	-	-

[3] Note the very low emissions rate for SO_2 is a result of very low concentration in the combustion gases. The in-stack concentration is below the annual ambient air quality criteria for SO_2 and so no modelling of the dispersion of SO_2 emissions has been undertaken. The concentrations of SO_3 are also too low to require a detailed assessment.

[4] Based on the assumption that the concentration of 0.022 mg/Nm^3 determined for Kiln 6 will be the same in Kiln 5 and that the flow rate is as above.

[5] Based on the assumption that the concentration of 0.0089 mg/Nm^3 determined for Kiln 6 will be the same in Kiln 5 and that the flow rate is as above.

The other sources of dust from the plant, and perhaps the most significant in terms of off-site impacts, are fugitive sources. These include wind erosion from both exposed dusty surfaces as well as from stockpiles. An emission factor of 0.4 kg/ha/h has been used to calculate the total emissions from all exposed areas and stockpiles. A control factor of 30% has been applied to the stockpiles as they are sheltered to some degree by the roof which covers them. Using this emission factor, and assuming an exposed area of 8 ha and stockpile area of 1 ha, the total emissions are calculated to be approximately 28,032 kg/y for the exposed areas, and 2,453 kg/y for the stockpiles (a 30% reduction from 3,504 kg/y).

8.2 Other emissions including dioxins and furans

The proposed plant will be operated using the same fuels as the existing plant. BCSC undertake a regular program of emissions testing as required by their licence. The most recent tests were conducted by EML Air Pty Ltd in April 2002 (**EML Air Pty Ltd, 2002**). The tests are performed in accordance with NSW EPA Licence No 1698 and include measurements of chloride, chlorine and ammonia and dioxins and furans (PCDDs and PCDFs), polycyclic aromatic hydrocarbons (PAHs), hexavalent chromium and fluoride and a range of organic compounds and metals. The tests include measurements of all stack parameters including stack emission temperatures, volume flow rates etc. The results of the concentration measurements are presented in the tables below.

Table 6 Results of stack testing on Kiln 6 - Chloride, Chlorine and Ammonia

Compound	Concentration – mg/Nm^3
Chloride as HCl	<0.01
Chlorine as Cl_2	0.47
Ammonia as NH_3	0.14

Table 7 Results of stack testing on Kiln 6 - Chromium VI and fluoride

Compound	Concentration – mg/Nm^3
Chromium VI as Cr	<0.004
Fluoride as HF	<0.02

Table 8 Results of stack testing on Kiln 6 - Volatile organic compounds

Compound	Concentration – mg/Nm^3
Ethanol	<6
Benzene	1.2
Volatile organic compounds A*[1]	<3
Volatile organic compounds B*[2]	<0.6

*[1] Compounds include isopropyl alcohol, acetone, pentane and dichloromethane

*[2] Compounds include butan-2-one (MEK), hexane ethyl acetate, chloroform, 1,1,1-trichloroethane, 2-methylhexane, 2,3-dimethylpentane, 3-methylhexane, heptane, trichloroethene, propyl acetate, methylcyclohexane, 4-methyl-2-pentanone (MIBK), toluene, octane, tetrachloroethene, butyl acetate, ethylbenzene, m+p-xylene, o-xylene, nonane, alpha-pinene, propylbenzene, 1,3,5-trimethylbenzene, beta pinene, decane, 1,2,4-trimethylbenzene, limonene, undecane, dodecane, tetradecane.

Table 9 Results of stack testing on Kiln 6 – Metals

Compound	Concentration – mg/Nm^3
Beryllium and beryllium compounds as Be	<0.0009
Chromium and chromium compounds as Cr	<0.003
Copper and copper compounds as Cu	0.0033
Arsenic and arsenic compounds as As	0.00033
Cadmium and cadmium compounds as Cd	0.046
Cobalt and cobalt compounds as Co	<0.002
Lead and lead compounds as Pb	<0.006
Mercury and mercury compounds as Hg	0.0026
Antimony and antimony compounds as Sb	0.00047
Manganese and manganese compounds as Mn	0.019
Nickel and nickel compounds as Ni	<0.002
Selenium and selenium compounds as Se	<0.0009
Tin and tin compounds as Sn	<0.03
Vanadium and vanadium compounds as V	0.0024
Thallium and thallium compounds as Tl	0.0094

Table 10 Results of stack testing on Kiln 6 - Dioxins and Furans (PCDDs and PCDFs)

Compound	Concentrations – ng/Nm^3	
	Maximum	Minimum
Sum of PCDD and PCDF congeners	0.387	0.392
Total I-TEQ	0.00429	0.00617

The total toxic equivalence (I-TEQ) of all PCDDs and PCDFs is less than the 0.1 ng/m^3 figure nominated by the NSW EPA (2002) as an upper limit for concentrations of PCDDs and PCDFs.

Table 11 Results of stack testing on Kiln 6 - Polycyclic Aromatic Hydrocarbons (PAHs)

Compound	Concentrations – ng/min	
	Maximum	Minimum
Total of 16 USEPA priority pollutants PAHs Analysed 3 July 2002	5970000000	5970000000

Minimum – represents the sum of all values excluding detection limit values
Maximum – represents the sum of all values including detection limit values

9 DISPERSION MODELLING RESULTS

Dispersion modelling was carried out for assessing impacts of emissions of TSP, PM_{10} and NO_2. The Victorian EPA's AUSPLUME model was used, incorporating the emissions data outlined under Point 2 of this section. Predictions were made for 24-hour and annual average concentrations for PM_{10} and 1-hour and annual average concentrations for NO_2. It has been assumed that the plant may operate for 24-hours per day, and no consideration has been made for variations in emissions by hour of day. Model runs have been done assuming that all emissions source operate at licence limits. Since these results lead to compliance with the NSW EPA air quality criteria and emissions will in practice be lower than the licence limits (see **Table 5**) further modelling has not been undertaken.

9.1 PM_{10}

Predicted maximum 24-hour average PM_{10} concentrations are shown in **Figure 3**. The EPA's assessment criterion of 50 µg/m^3 is met everywhere. This would be true even after allowing for a reasonable background level. The short-term criterion could be exceeded in the event of unusual conditions such as bushfire or dust storm, but emissions from the plant would not significantly worsen air pollution under these conditions.

Predicted annual average PM_{10} concentrations are shown in **Figure 4**. The EPA's assessment criterion of 30 µg/m^3 is met everywhere. This would be true even after allowing for a reasonable background level.

Note, in each of these cases it has been assumed that the plant emits at licensed limits for PM continuously 24 hours per day 365 days per year and that both Kiln 5 and 6 are in continuous use. Actual emissions will be lower.

9.2 NO_2

Predicted maximum 1-hour average NO_2 concentrations assuming that all NO_x has been converted to NO_2 are shown in **Figure 5**. The EPA's assessment criterion of 246 µg/m^3 is met everywhere. This would be true even after allowing for a reasonable background level.

Predicted annual average NO_2 concentrations again assuming that all NO_x is NO_2 are shown in **Figure 6**. The EPA's assessment criterion of 62 µg/m^3 is met everywhere. This would be true even after allowing for a reasonable background level.

Note, in each of these cases it has been assumed that the plant emits at licensed limits for NO_2 continuously 24 hours per day 365 days per year. Further it has been assumed that both Kiln 5 and 6 are operated continuously and that all NO_x emissions are in the form of NO_2. Typically only 20% will have been converted to NO_2 by the time the plume has dispersed to the areas where the higher concentrations are found.

10 CONSTRUCTION

The Construction Workforce will be typically 50 for General Construction Works rising to 100 during shutdown periods.

Construction will occur from February 03 to March 04. General Construction will occur from 6 am to 6 pm, 7 days per week at all times during this period.

During Shutdowns, construction will occur 24 hours per day, over 7 days per week. There will be 2 x 12 hour shifts during shutdowns between 6 am and 6 pm and 6 am.

Two shutdown periods are planned for 2 weeks in March 2003 and 4 weeks in February 2002.

Vehicles required for construction are listed below.

1. Semi trailers delivering materials. These will be typically one per day with a maximum of 4 per day. Some days there will be none.
2. Mobile Crane 4 small
3. Fixed Crane 1 large
4. Excavator 2 fitted with hydraulic rock breakers. The excavators will be on/off site as required and will be on site for a total of 3 months during construction.
5. Light trucks 3 typical with 6 maximum.
6. Concrete Agitators 2 on site at any one time for 3 months of the construction period.
7. Hand tools as required

The workforce will be transported to work in a combination of mini-buses and owner vehicles. When there are 50 people on site during General Construction the vehicles required to transport the workforce to and from work will be typically 1 bus and 20 vehicles. During shutdowns it is likely to be the same numbers, but occurring twice each day to cover both shifts.

No major earthworks will be required for the development and emissions to the air will comprise minor quantities of dust due to use of the rock breaker and excavators and from vehicle movements. There will also be emissions from the diesel engines. Given the size of the area of land owned by the plant and the distance to nearby residences it is very unlikely that any air quality impacts will arise as a result of construction.

11 CONCLUSIONS

The following conclusions have been drawn from the analysis contained in this report:

1. The plant will meet all ambient air quality standards set by the EPA
2. Emissions due to construction activities are expected to be minor and should cause no air quality impact on nearby residential areas.

12 REFERENCES

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NSW EPA (2001)
"Approved Methods and Guidance For the Modelling and Assessment of Air Pollutants in New South Wales" New South Wales EPA 59-61 Goulburn Street, Sydney, NSW 2000. (Available www.epa.nsw.gov.au/air/amgmaap.pdf/).

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"A diffusion model of an urban area", Journal of Applied Meteorology, **3**, 83-91.

APPENDIX A
JOINT WIND SPEED, WIND DIRECTION STABILTY STATISTICS

STATISTICS FOR FILE: C:\Blue Circle Berrima02\MetData\BC99_2.AUS

PASQUILL STABILITY CLASS 'A'

Wind Speed Class (m/s)

WIND SECTOR	0.51 TO 1.50	1.51 TO 3.00	3.01 TO 4.50	4.51 TO 6.00	6.01 TO 7.50	7.51 TO 9.00	9.01 TO 10.50	GREATER THAN 10.50	TOTAL
NNE	0.000274	0.000685	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000960
NE	0.001097	0.002467	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.003564
ENE	0.001782	0.002056	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.003838
E	0.002467	0.001782	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.004249
ESE	0.002467	0.003153	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.005620
SE	0.002879	0.004249	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.007128
SSE	0.001508	0.002193	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.003701
S	0.000685	0.001371	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.002056
SSW	0.002193	0.002467	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.004661
SW	0.002605	0.004935	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.007539
WSW	0.003838	0.005346	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.009184
W	0.004798	0.005620	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.010418
WNW	0.001782	0.006306	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.008088
NW	0.000548	0.000137	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000685
NNW	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
N	0.000137	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000137
CALM									0.010144
TOTAL	0.029061	0.042769	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.081974

MEAN WIND SPEED (m/s) = 1.57
NUMBER OF OBSERVATIONS = 598

PASQUILL STABILITY CLASS 'B'

Wind Speed Class (m/s)

WIND SECTOR	0.51 TO 1.50	1.51 TO 3.00	3.01 TO 4.50	4.51 TO 6.00	6.01 TO 7.50	7.51 TO 9.00	9.01 TO 10.50	GREATER THAN 10.50	TOTAL
NNE	0.000000	0.001782	0.000548	0.000000	0.000000	0.000000	0.000000	0.000000	0.002330
NE	0.002193	0.006169	0.005209	0.000274	0.000000	0.000000	0.000000	0.000000	0.013845
ENE	0.001782	0.003975	0.003564	0.000000	0.000000	0.000000	0.000000	0.000000	0.009321
E	0.001508	0.005757	0.004387	0.000137	0.000000	0.000000	0.000000	0.000000	0.011789
ESE	0.003290	0.004935	0.003975	0.000822	0.000000	0.000000	0.000000	0.000000	0.013023
SE	0.003290	0.010281	0.005483	0.000274	0.000000	0.000000	0.000000	0.000000	0.019328
SSE	0.003016	0.004387	0.002467	0.000137	0.000000	0.000000	0.000000	0.000000	0.010007
S	0.001919	0.002605	0.000685	0.000000	0.000000	0.000000	0.000000	0.000000	0.005209
SSW	0.002467	0.004524	0.002467	0.000137	0.000000	0.000000	0.000000	0.000000	0.009596
SW	0.002879	0.007539	0.010007	0.000548	0.000000	0.000000	0.000000	0.000000	0.020973
WSW	0.008088	0.011241	0.012200	0.000548	0.000000	0.000000	0.000000	0.000000	0.032077
W	0.007951	0.010281	0.006443	0.000274	0.000000	0.000000	0.000000	0.000000	0.024949
WNW	0.003564	0.011515	0.006580	0.000274	0.000000	0.000000	0.000000	0.000000	0.021933
NW	0.000685	0.000685	0.000137	0.000000	0.000000	0.000000	0.000000	0.000000	0.001508
NNW	0.000274	0.000274	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000548
N	0.000000	0.000137	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000137
CALM									0.008088
TOTAL	0.042906	0.086086	0.064154	0.003427	0.000000	0.000000	0.000000	0.000000	0.204661

MEAN WIND SPEED (m/s) = 2.43
NUMBER OF OBSERVATIONS = 1493

PASQUILL STABILITY CLASS 'C'

Wind Speed Class (m/s)

WIND SECTOR	0.51 TO 1.50	1.51 TO 3.00	3.01 TO 4.50	4.51 TO 6.00	6.01 TO 7.50	7.51 TO 9.00	9.01 TO 10.50	GREATER THAN 10.50	TOTAL
NNE	0.001097	0.001645	0.001234	0.000548	0.000000	0.000000	0.000000	0.000000	0.004524
NE	0.002193	0.002742	0.002467	0.003427	0.000548	0.000000	0.000000	0.000000	0.011378
ENE	0.003016	0.002605	0.001782	0.000685	0.000137	0.000000	0.000000	0.000000	0.008225
E	0.003701	0.004112	0.002330	0.001508	0.000000	0.000000	0.000000	0.000000	0.011652
ESE	0.001371	0.003016	0.003838	0.003290	0.000137	0.000137	0.000000	0.000000	0.011789
SE	0.002605	0.004249	0.002605	0.000822	0.000137	0.000000	0.000000	0.000000	0.010418
SSE	0.001371	0.001234	0.000960	0.000685	0.000000	0.000000	0.000000	0.000000	0.004249
S	0.000685	0.000822	0.000960	0.000411	0.000000	0.000000	0.000000	0.000000	0.002879
SSW	0.001508	0.001234	0.000685	0.000274	0.000137	0.000137	0.000000	0.000000	0.003975
SW	0.002742	0.003701	0.003564	0.004661	0.000274	0.000000	0.000000	0.000000	0.014942
WSW	0.004798	0.004935	0.003975	0.002742	0.000960	0.000137	0.000000	0.000000	0.017546
W	0.005346	0.003016	0.002605	0.001371	0.000822	0.000137	0.000000	0.000000	0.013297
WNW	0.003153	0.003975	0.003290	0.000411	0.000000	0.000000	0.000000	0.000000	0.010829
NW	0.001097	0.000685	0.000137	0.000000	0.000000	0.000000	0.000000	0.000000	0.001919
NNW	0.000137	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000137
N	0.000137	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000137
CALM									0.012337
TOTAL	0.034955	0.037971	0.030432	0.020836	0.003153	0.000548	0.000000	0.000000	0.140233

MEAN WIND SPEED (m/s) = 2.70
NUMBER OF OBSERVATIONS = 1023

PASQUILL STABILITY CLASS 'D'

Wind Speed Class (m/s)

WIND SECTOR	0.51 TO 1.50	1.51 TO 3.00	3.01 TO 4.50	4.51 TO 6.00	6.01 TO 7.50	7.51 TO 9.00	9.01 TO 10.50	GREATER THAN 10.50	TOTAL
NNE	0.000000	0.001782	0.001508	0.000274	0.000137	0.000000	0.000000	0.000000	0.003701
NE	0.000000	0.002879	0.003290	0.002056	0.000274	0.000000	0.000000	0.000000	0.008499
ENE	0.000000	0.001371	0.002742	0.001097	0.000137	0.000000	0.000000	0.000000	0.005346
E	0.000000	0.003701	0.001782	0.000822	0.000137	0.000274	0.000000	0.000000	0.006717
ESE	0.000000	0.002193	0.002467	0.001919	0.000960	0.000137	0.000000	0.000000	0.007676
SE	0.000000	0.002879	0.002056	0.000822	0.000411	0.000137	0.000137	0.000000	0.006443
SSE	0.000000	0.001234	0.000548	0.000000	0.000000	0.000000	0.000137	0.000000	0.001919
S	0.000000	0.001371	0.000548	0.000000	0.000000	0.000000	0.000000	0.000000	0.001919
SSW	0.000000	0.001234	0.000548	0.000274	0.000822	0.000000	0.000000	0.000137	0.003016
SW	0.000000	0.002467	0.002742	0.002605	0.001234	0.000137	0.000000	0.000000	0.009184
WSW	0.000000	0.003701	0.002879	0.001234	0.001645	0.000274	0.000000	0.000000	0.009733
W	0.000000	0.004112	0.002056	0.001371	0.000137	0.000137	0.000000	0.000000	0.007814
WNW	0.000000	0.003701	0.000960	0.000411	0.000137	0.000411	0.000000	0.000000	0.005620
NW	0.000000	0.000960	0.000137	0.000000	0.000000	0.000000	0.000000	0.000000	0.001097
NNW	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
N	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CALM									0.000000
TOTAL	0.000000	0.033585	0.024263	0.012886	0.006032	0.001508	0.000274	0.000137	0.078684

MEAN WIND SPEED (m/s) = 3.73
NUMBER OF OBSERVATIONS = 574

PASQUILL STABILITY CLASS 'E'

Wind Speed Class (m/s)

WIND SECTOR	0.51 TO 1.50	1.51 TO 3.00	3.01 TO 4.50	4.51 TO 6.00	6.01 TO 7.50	7.51 TO 9.00	9.01 TO 10.50	GREATER THAN 10.50	TOTAL
NNE	0.000000	0.000000	0.001782	0.000137	0.000000	0.000000	0.000000	0.000000	0.001919
NE	0.000000	0.000000	0.003427	0.000274	0.000000	0.000000	0.000000	0.000000	0.003701
ENE	0.000000	0.000000	0.002193	0.000960	0.000000	0.000000	0.000000	0.000000	0.003153
E	0.000000	0.000000	0.002879	0.000685	0.000000	0.000000	0.000000	0.000000	0.003564
ESE	0.000000	0.000000	0.006854	0.001234	0.000000	0.000000	0.000000	0.000000	0.008088
SE	0.000000	0.000000	0.004798	0.000548	0.000000	0.000000	0.000000	0.000000	0.005346
SSE	0.000000	0.000000	0.001234	0.000000	0.000000	0.000000	0.000000	0.000000	0.001234
S	0.000000	0.000000	0.000137	0.000274	0.000000	0.000000	0.000000	0.000000	0.000411
SSW	0.000000	0.000000	0.001234	0.000274	0.000000	0.000000	0.000000	0.000000	0.001508
SW	0.000000	0.000000	0.004661	0.001234	0.000000	0.000000	0.000000	0.000000	0.005894
WSW	0.000000	0.000000	0.004524	0.001097	0.000000	0.000000	0.000000	0.000000	0.005620
W	0.000000	0.000000	0.003153	0.001097	0.000000	0.000000	0.000000	0.000000	0.004249
WNW	0.000000	0.000000	0.002330	0.000274	0.000000	0.000000	0.000000	0.000000	0.002605
NW	0.000000	0.000000	0.000274	0.000000	0.000000	0.000000	0.000000	0.000000	0.000274
NNW	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
N	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CALM									0.000000
TOTAL	0.000000	0.000000	0.039479	0.008088	0.000000	0.000000	0.000000	0.000000	0.047567

MEAN WIND SPEED (m/s) = 4.06
NUMBER OF OBSERVATIONS = 347

PASQUILL STABILITY CLASS 'F'

Wind Speed Class (m/s)

WIND SECTOR	0.51 TO 1.50	1.51 TO 3.00	3.01 TO 4.50	4.51 TO 6.00	6.01 TO 7.50	7.51 TO 9.00	9.01 TO 10.50	GREATER THAN 10.50	TOTAL
NNE	0.005894	0.004387	0.001097	0.000000	0.000000	0.000000	0.000000	0.000000	0.011378
NE	0.014119	0.010144	0.001234	0.000000	0.000000	0.000000	0.000000	0.000000	0.025497
ENE	0.019191	0.009596	0.000822	0.000000	0.000000	0.000000	0.000000	0.000000	0.029609
E	0.009459	0.010007	0.001097	0.000000	0.000000	0.000000	0.000000	0.000000	0.020562
ESE	0.012063	0.008773	0.001782	0.000000	0.000000	0.000000	0.000000	0.000000	0.022618
SE	0.009321	0.010966	0.003153	0.000000	0.000000	0.000000	0.000000	0.000000	0.023441
SSE	0.005209	0.008910	0.001371	0.000000	0.000000	0.000000	0.000000	0.000000	0.015490
S	0.003564	0.005620	0.000274	0.000000	0.000000	0.000000	0.000000	0.000000	0.009459
SSW	0.005620	0.005209	0.000411	0.000000	0.000000	0.000000	0.000000	0.000000	0.011241
SW	0.009047	0.011378	0.001645	0.000000	0.000000	0.000000	0.000000	0.000000	0.022070
WSW	0.020014	0.015627	0.001645	0.000000	0.000000	0.000000	0.000000	0.000000	0.037286
W	0.029472	0.019465	0.002330	0.000000	0.000000	0.000000	0.000000	0.000000	0.051268
WNW	0.023167	0.021796	0.001508	0.000000	0.000000	0.000000	0.000000	0.000000	0.046470
NW	0.009321	0.007676	0.000274	0.000000	0.000000	0.000000	0.000000	0.000000	0.017272
NNW	0.000548	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000548
N	0.000411	0.000274	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000685
CALM									0.101988
TOTAL	0.176422	0.149829	0.018643	0.000000	0.000000	0.000000	0.000000	0.000000	0.446881

MEAN WIND SPEED (m/s) = 1.40
NUMBER OF OBSERVATIONS = 3260

ALL PASQUILL STABILITY CLASSES

Wind Speed Class (m/s)

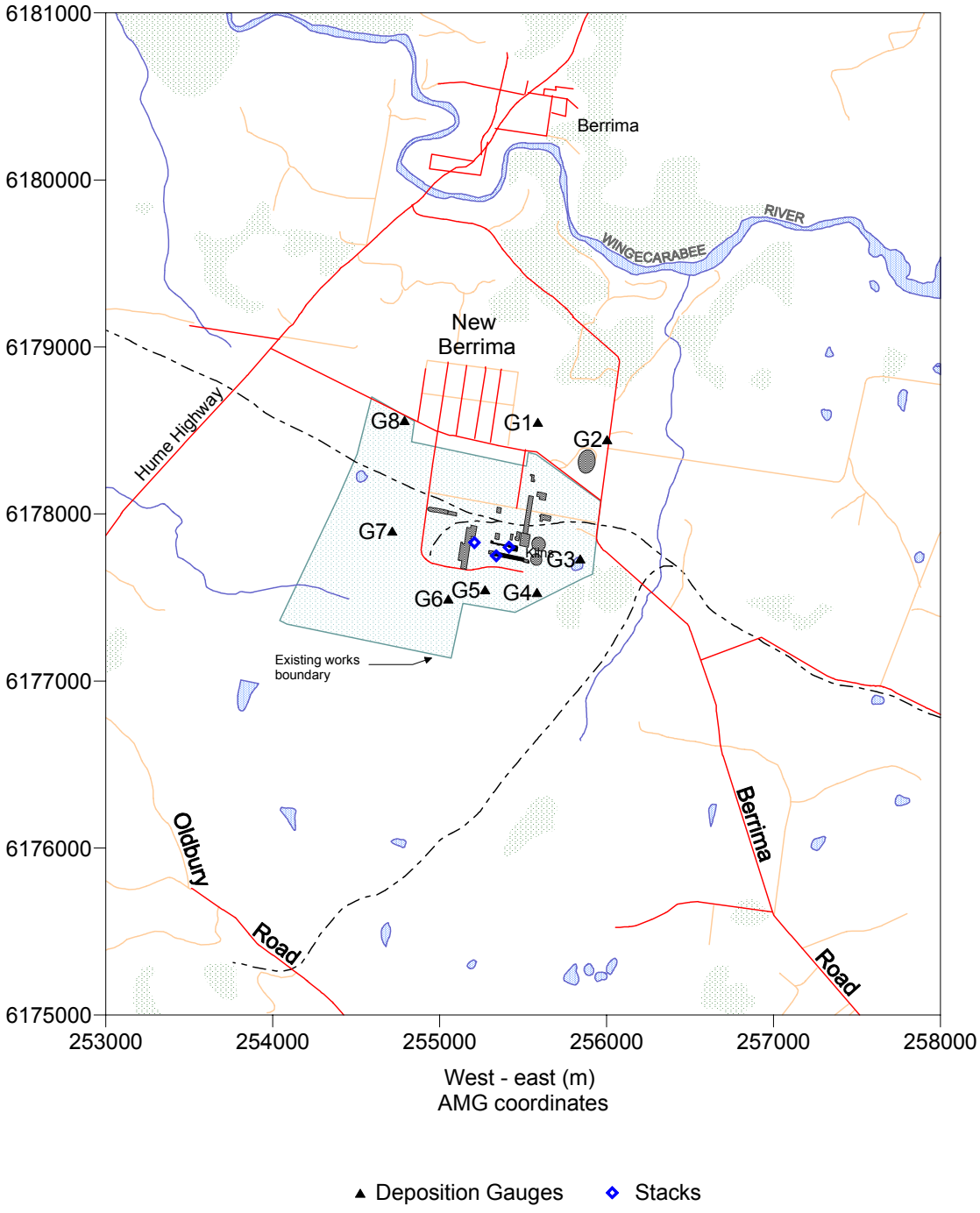
WIND SECTOR	0.51 TO 1.50	1.51 TO 3.00	3.01 TO 4.50	4.51 TO 6.00	6.01 TO 7.50	7.51 TO 9.00	9.01 TO 10.50	GREATER THAN 10.50	TOTAL
NNE	0.007265	0.010281	0.006169	0.000960	0.000137	0.000000	0.000000	0.000000	0.024812
NE	0.019602	0.024400	0.015627	0.006032	0.000822	0.000000	0.000000	0.000000	0.066484
ENE	0.025771	0.019602	0.011103	0.002742	0.000274	0.000000	0.000000	0.000000	0.059493
E	0.017135	0.025360	0.012474	0.003153	0.000137	0.000274	0.000000	0.000000	0.058533
ESE	0.019191	0.022070	0.018917	0.007265	0.001097	0.000274	0.000000	0.000000	0.068814
SE	0.018095	0.032625	0.018095	0.002467	0.000548	0.000137	0.000137	0.000000	0.072104
SSE	0.011103	0.017958	0.006580	0.000822	0.000000	0.000000	0.000137	0.000000	0.036600
S	0.006854	0.011789	0.002605	0.000685	0.000000	0.000000	0.000000	0.000000	0.021933
SSW	0.011789	0.014668	0.005346	0.000960	0.000960	0.000137	0.000000	0.000137	0.033996
SW	0.017272	0.030021	0.022618	0.009047	0.001508	0.000137	0.000000	0.000000	0.080603
WSW	0.036737	0.040850	0.025223	0.005620	0.002605	0.000411	0.000000	0.000000	0.111446
W	0.047567	0.042495	0.016587	0.004112	0.000960	0.000274	0.000000	0.000000	0.111995
WNW	0.031666	0.047293	0.014668	0.001371	0.000137	0.000411	0.000000	0.000000	0.095545
NW	0.011652	0.010144	0.000960	0.000000	0.000000	0.000000	0.000000	0.000000	0.022755
NNW	0.000960	0.000274	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.001234
N	0.000685	0.000411	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.001097
CALM									0.132557
TOTAL	0.283345	0.350240	0.176971	0.045236	0.009184	0.002056	0.000274	0.000137	1.000000

MEAN WIND SPEED (m/s) = 2.12
NUMBER OF OBSERVATIONS = 7295

FREQUENCY OF OCCURENCE OF STABILITY CLASSES

A : 8.2%
B : 20.5%
C : 14.0%
D : 7.9%
E : 4.8%
F : 44.7%

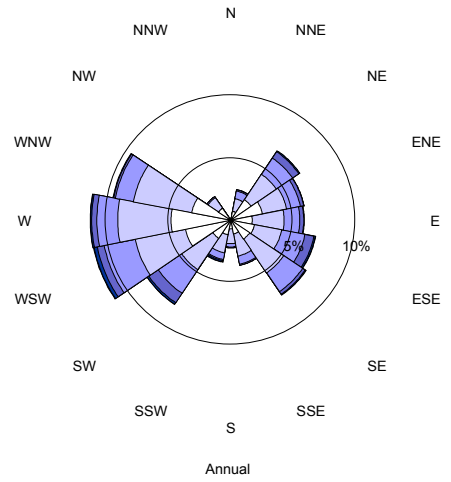
FIGURES



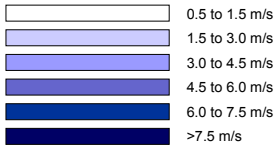
Location of study area

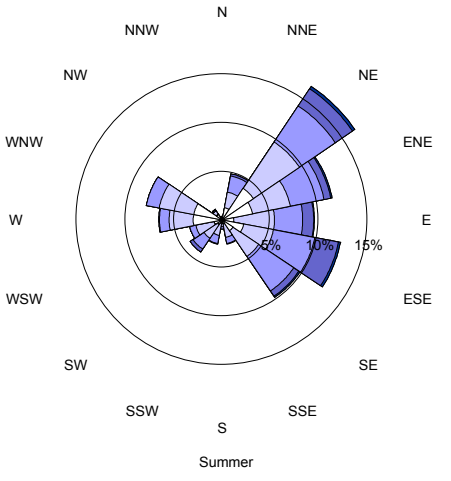
Figure 1

Annual and Seasonal Windroses for Berrima - January 1999 to November 1999

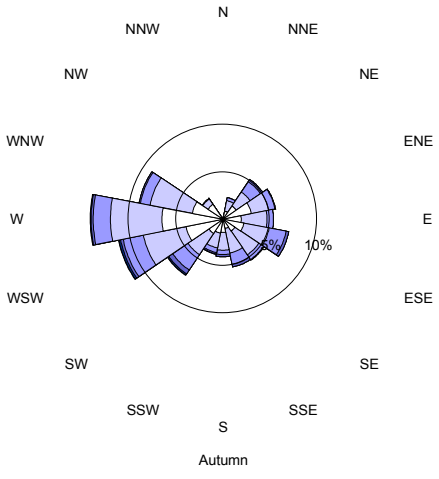


Annual

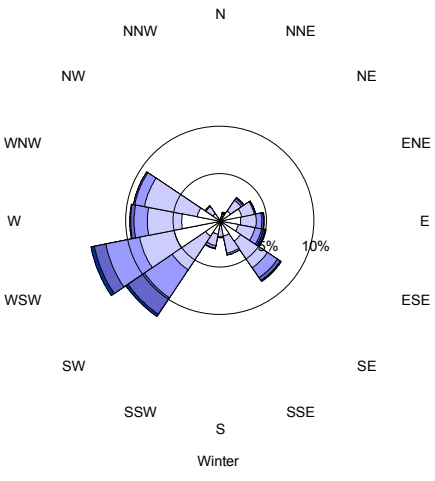




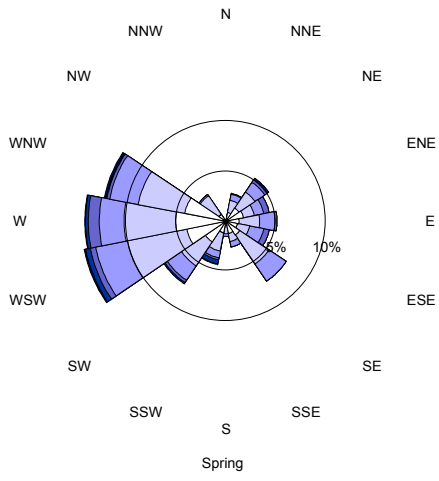
Summer



Autumn

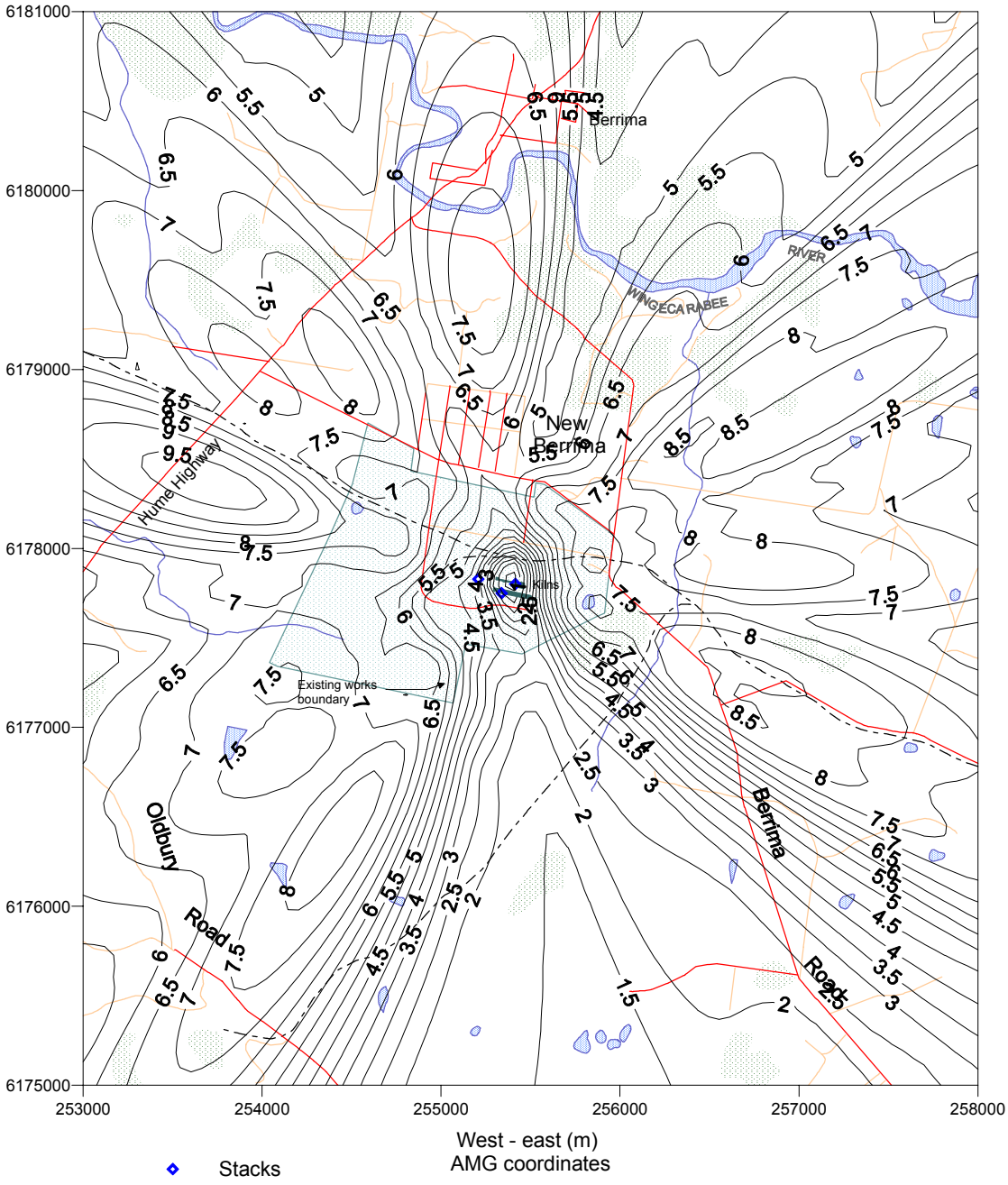


Winter



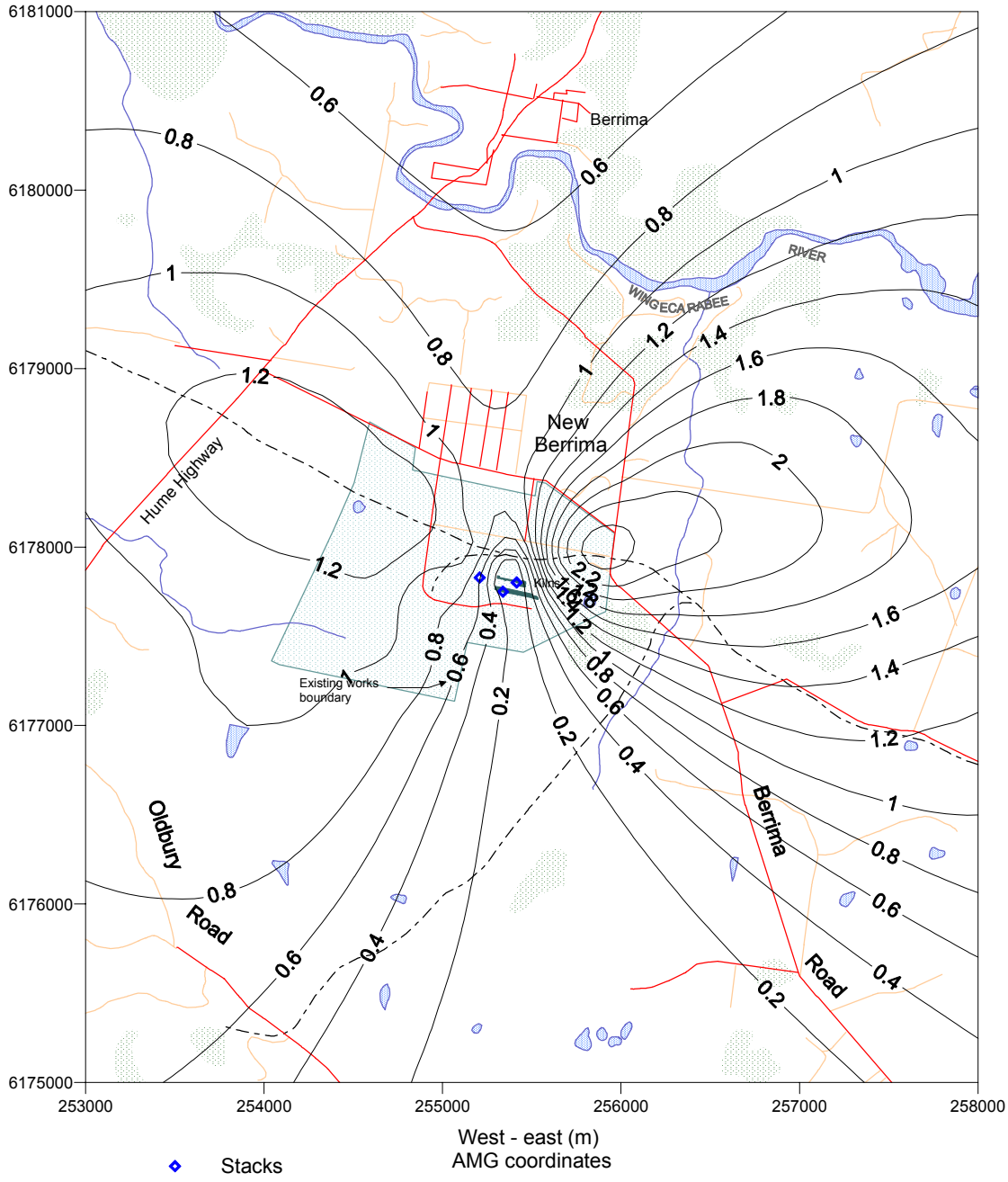
Spring

Figure 2



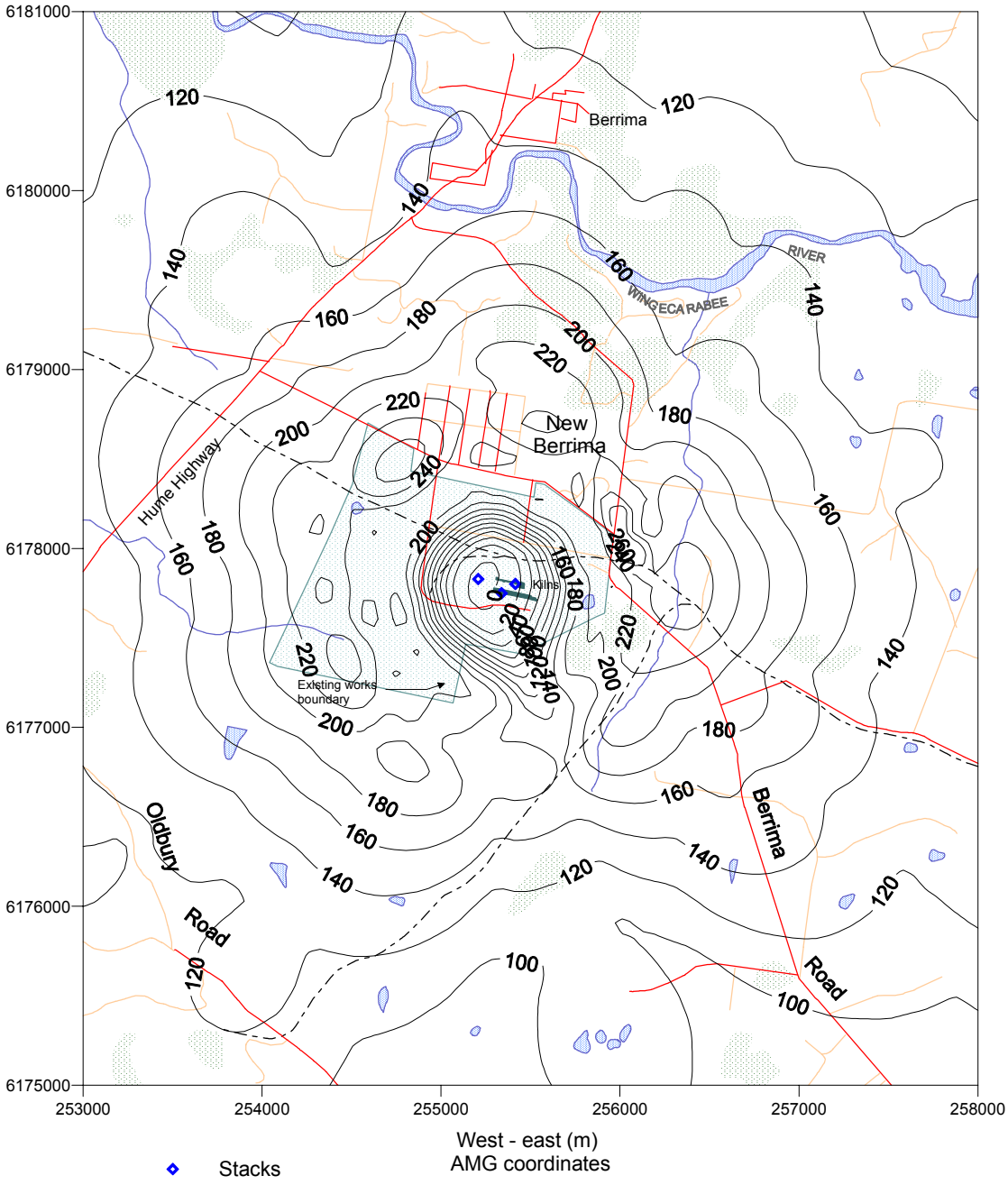
Predicted maximum 24-hour PM_{10} concentrations due to emissions from the upgraded Kiln No. 6 main stack and other PM_{10} sources - micrograms/cubic metre

Figure 3



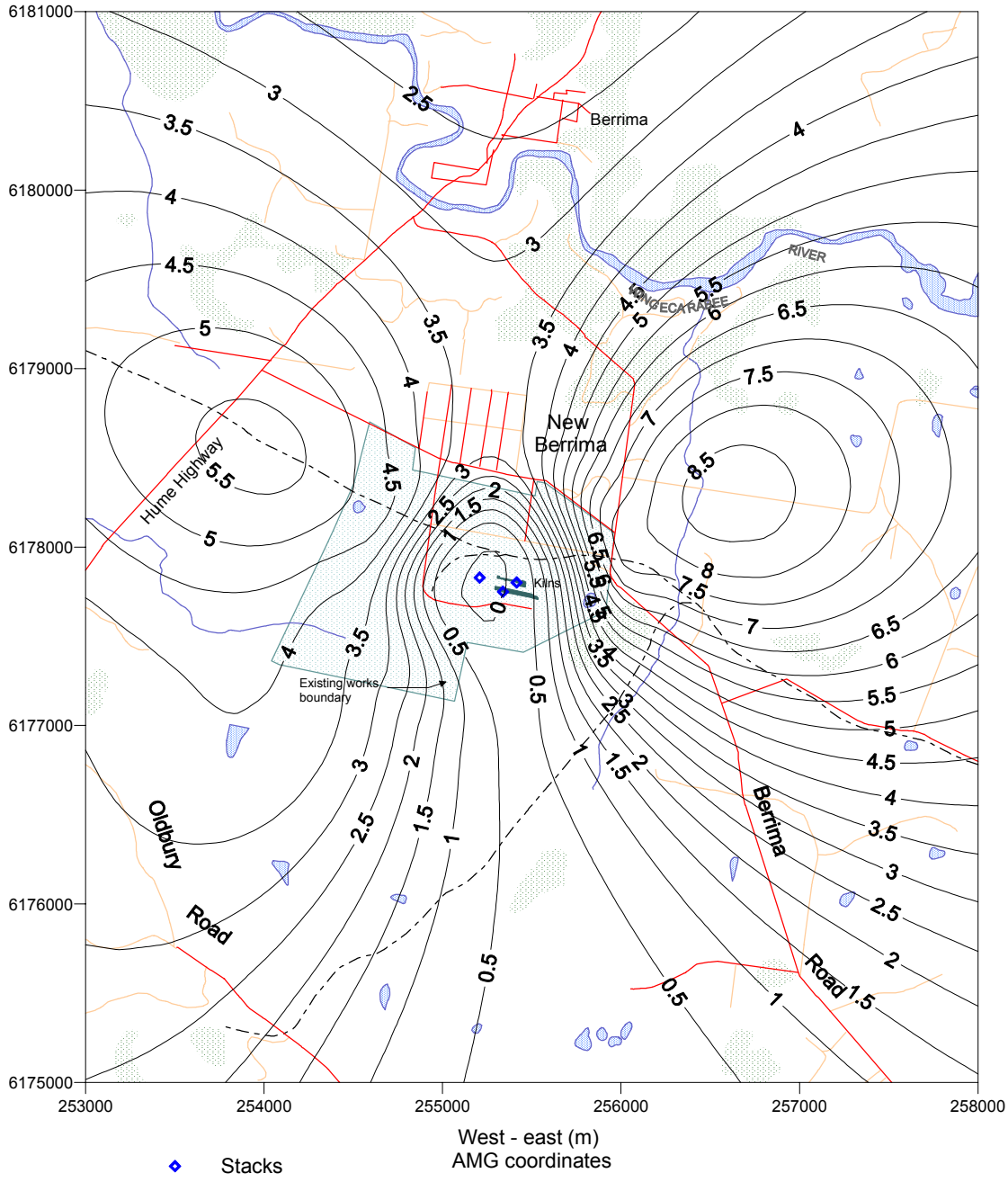
Predicted annual average PM $_{10}$ concentrations due to emissions from the upgraded Kiln No. 6 main stack and other PM $_{10}$ sources - micrograms/cubic metre

Figure 4



Predicted maximum 1-hour NO_2 concentrations due to emissions from the upgraded Kiln No. 6 main stack and Kiln No. 5 main stack - micrograms/cubic metre

Figure 5



Predicted annual average $_2$ concentrations due to emissions from the upgraded Kiln No. 6 main stack and Kiln No. 5 main stack - micrograms/cubic metre

Figure 6

Appendix E

Health and Safety Management Plan

BLUE CIRCLE SOUTHERN CEMENT

NO. 6 KILN UPGRADE PROJECT

Safety and Health Management Plan

H-BCSC-Berrima

APPROVALS				
	NAME	**POSITION**	**SIGNED**	**DATE**
ORIGINATOR	D M. Wilson	Project Health & Safety Adviser		
CHECKED	G Gal	Construction Manager		
APPROVED	K Partridge	Project Manager		
APPROVED	I Unsworth	Plant Manager (BCSC)		

REV	DATE	REVISION DESCRIPTION	BY	CHK	APPD	HC DEV
DRAFT 1C	20/02/03	Issued for Review	DW			

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1 ORGANISATIONAL REQUIREMENTS

KEY REFERENCE DOCUMENTS
New South Wales Occupational Health & Safety Act 2000
New South Wales Occupational Health & Safety Regulations 2001

1.1 Background

This Safety and Health Management Plan (S&HMP) has been prepared in conjunction with the Boral/Blue Circle Southern Cement Safety, Health, and Environment Management System on BCSC No. 6 Kiln Upgrade (Project). A dedicated team from Hatch Associates (Hatch) & Boral/Blue Circle Southern Cement under the leadership of the Project Manager will undertake a program of design management, supply, construction and commissioning with the project starting in July 2002 and the expected project duration being twenty months.

This S&HMP and associated Contracts, Legislation, Codes of Practice, Guidelines, Recognised Standards, Standard Operating Procedures and References identify and encompass the working behaviours and safe work practices that will be expected of all BCSC No. 6 Kiln Upgrade Project Management Team members, Vendors and Contractors, Subcontractors and Visitors engaged on the Project by the Project Management Team.

Within this plan, the word safety is taken to include occupational health, workplace safety, environment management and plant integrity.

It is the intention of the Project Management Team to have this S&HMP endorsed by the Project Steering committee. The S&HMP will also be made available as part of specifications and tender documents distributed to all vendors and contractors, and its intent and procedures shall form part of their contract.

Boral/Blue Circle Southern Cement intends through the project to increase the production and capabilities of the kiln and cement processing through the implementation of and modification of the following:

Modification and upgrade of the raw materials handling system.

Installation of a new bag house & bag house fan with interconnecting ductwork to the new raw mill and existing pre-heater tower.

Installation of a new pre-heater fan and gas-conditioning tower with interconnecting ductwork to the new raw mill and new pre-heater tower.

Modification of ductwork and cyclones in the existing pre-heater tower.

Installation of a new pre-heater tower, cyclones and ductwork with interconnecting ductwork to the existing pre-heater tower and new gas-conditioning tower.

Modification of the raw meal transfer system

Modification and upgrade of the existing clinker cooler with the addition of a new tertiary air duct.

Modification and upgrade of the existing cooler heat exchanger, bag house cooler fan and switch room.

Modification and upgrade of the existing coal mill and electrical switch room.

Installation of a new high voltage switch room.

Installation of a new clinker conveyor.

Boral/ Blue Circle Southern Cement has appointed a dedicated team of personnel to oversee construction and upgrade of the kiln with the team dedicated to creating a "safety" culture from the outset of the Project. Construction activities will be undertaken by a number of different contractors operating under contracts of varying scope and duration. The *New South Wales Health and Safety Act 2000 and Regulations 2001* will apply at all times. BCSC is named as the Principal Contractor of the upgrade project with Hatch & Associates acting as Project Managers.

The principal contractor and sub-contractors have specific responsibilities under the legislation and regulations including, inductions, training, record keeping, OHS plans, safe work method statements, hazardous substances and risk controls.

1.2 Purpose and Scope

This S&HMP describes the strategies that will be used by the Project Management Team, to implement the Project Safety and Health Policy for all works associated with the Project.

Listed at the start of some sections of this S&HMP are key references that the Project Management Team will use in the control of work activities on the Project.

To achieve the goals set by this S&HMP all parties associated with the project must be committed to and take an active role in the provision of safe, healthy and clean working environment and plant.

1.3 Objectives

The objectives of the S&HMP are:

- To describe the overall approach to safety that is to be taken by the Project Management Team on the Project;
- To set the performance requirements of the Project Management Team for safety management on the project;
- To establish the relationship between this S&HMP, the contract documents, project procedures and the Project Contractors'/Vendor's Safety and Health Management Plans;
- To establish actions and responsibilities that will ensure implementation of the strategies.

1.4 Relationship between Project Safety and Health Documents

As mentioned previously, this S&HMP describes the strategies that together with the contract documents will be used by the Project Management Team, to implement the Project Safety and Health Policy for all works associated with the Project.

Vendors and contractors will be required to prepare their own Safety and Health Management plans for carrying out their particular work packages on the project.

Prior to any work activities commencing, the Project Management Team and the Contractor/Vendor will meet in a pre-start safety review. The purpose of this review will be to compare the contents of the Contractor/Vendor S&HMP and the Project S&HMP and agree on a common approach to safety on the project.

1.5 Project Safety and Health Policy

The Project Management Team highly value the health and safety of employees, customers and communities. This Safety and Health Policy establishes principles to protect and advance the Projects essential safety interests and to fulfil the Projects commitment to the safety and health of people.

Draft Project Safety and Health Vision

Our objective is that everybody working on the BCSC No.6 Kiln Upgrade Project will do so safely and healthily, will feel proud of what they have achieved and will realise that their personal effort has made a difference and this has been clearly recognised and acknowledged.

This requires a dedicated and disciplined approach to safe work by everyone so that all employees on site, contractors, visitors and suppliers, will not be injured, nor their health impaired as a result of working at or visiting our site.

Our Stands:

- To sustain a culture where OH&S is a prime part of the way we do work that is not compromised
- To provide a healthy and safe workplace
- To strive for zero accidents, near misses, injuries and occupational illnesses.
- To design and construct clean, safe, sustainable facilities

BCSC Kiln Upgrade Project performance will be driven by all of us being insistent, persistent and consistent in the application of the following principles:

SAFEWORK by safe people

- Selecting contractors who can demonstrate a shared commitment to our aim
- Recruiting against clear competencies (including safe work behaviours)
- Inducting for safe work awareness
- Effective and directed training which optimises safe work performance
- Develop personal safe work habits consistent with training and standards
- Understanding and ownership by all people on this site and their personal safe work performance

SAFEWORK by safe design

- Manage OH&S risks by implementing design systems to identify, assess, analyse and control hazards in both construction and operations
- Design, implement, provide and enforce safe systems of work on the project

SAFEWORK in a safe environment

- Controlled by establishing a safety management system and safe workplace standards
- Identifying, then eliminating or controlling hazards in the workplace
- Reporting in a timely way all workplace hazards and incidents followed up with remedial action
- Good housekeeping for a clean, tidy and healthy workplace

SAFEWORK using safe equipment

- Using plant and equipment, consistent with standards, and fit for purpose
- Maintaining all plant and equipment consistent with standards to be fit for purpose
- Users identifying and reporting defects or hazards and eliminating or controlling as required

SAFEWORK applying safe processes

- Controlled through our safety management system and operating procedures and those of the Contractors working on the project
- Appropriately equipped for tasks
- Identifying, analysing and controlling risks within processes and procedures
- Investigating incidents, focusing on 'what' not 'who'
- Enacting learning's from audits, inspections or investigations

SAFEWORK by assignment responsibility

- Every BCSC No. 6 Kiln Upgrade Project Management Team member is directly accountable for the implementation of this policy on the project
- Equally, all employees have a responsibility to work safety using the training, technological resources and safety equipment provided

SAFEWORK reinforced by

- Rigorous safety auditing
- Monitoring, and
- Measurement

SAFEWORK
will be sustained by all of us providing recognition and support for the safe work of others

Boral/BCSC General Manager, Operations	**Keith Partridge** *Project Manager*	**Russell Anstey** *Project Sponsor*	**Gerry Gal** *Construction Manager*

1.6 Safety and Health Program Elements

The S&HMP is made up of the following key elements that will be implemented on the Project:

Leadership and Commitment	**Occupational Health and Hygiene**
Performance Measurement and Reporting	**Safe Systems of Work**
Involvement, Communication and Motivation	**Incident, Reporting, Investigation and Management**
Contractor Alignment	**Site Management**
Induction, Training and Competency	**The Environment**
Hazard and Risk Management	

The following sections outline each of the elements.

2 LEADERSHIP AND COMMITMENT

KEY REFERENCE DOCUMENTS
New South Wales Occupational Health Safety Act 2000
New South Wales Occupational Health & Safety Regulation 2001
Boral/Blue Circle Southern Cement Safety Standards
Project Safety Goals and Objectives – Section C

All project participants shall provide strong, visible leadership and commitment, and ensure that this commitment is translated into the necessary resources, to develop, operate and maintain the Health and Safety Management System and to attain the policy and strategic objectives. Management shall ensure that full account is taken of Health and Safety policy requirements and shall provide support for all actions taken to protect health and safety.

All project leaders will create and sustain a project culture that supports the Health and Safety Management System based on:

- Giving Health and Safety prevailing status over other primary project objectives. Management through effective leadership shall visibly recognise and reward when and where this is successfully applied. Clear guidelines and supporting behaviours shall be established to enable management to act without hesitation in support of this strategy;
- Belief in the management desire to improve health and safety performance. Targets shall be set for improvement in all areas of Health and Safety. These targets will necessarily include both input (lead) indicators and output (lag) indicators. Some characteristics of the effective performance indicators that fully support and guide the implementation of the project Health and Safety System are, ‘measurability’, ‘trendability’ and ‘targetability’;

- Acceptance of individual responsibility and accountability for health and safety performance. Health and safety performance shall be included as a factor in the appraisal. Expected health and safety performance and behaviours for individuals shall be established. The consequences of success or failure to achieve these performance and behaviour expectations shall be clearly defined and the application of these outcomes demonstrated;
- Participation and involvement at all levels in the health and safety process development. Employees of both the project and its contractors will be involved in the creation and maintenance of such supportive culture.

2.1 Demonstrated Leadership

All project leaders shall pursue effective leadership through:

- Ownership;
- Planning of tasks and resources within the framework of policy and objectives.
- Resource allocation;
- Assignment of responsibilities, authority and accountability (standards, job descriptions);
- Support for innovation (praise and edification for innovation);
- Ensuring that decisions are followed through and performance assessed against predetermined criteria's outlined in the Projects Goal setting section of this document.
- Determining the effectiveness of the project's management system (management review – progress reports);
- Identifying, planning and implementing opportunities for improvement (audit schedule, action plans);
- Communication of the project values and policies unambiguously throughout the organisation and ensuring understanding and acceptance of these (letters and workshops);
- Ensuring all work is done safely; being prepared to delay or stop activities where controls are not in place to manage identified hazards or unsafe conditions exist where there is a danger to the person concerned or others.
- Conducting audits of safety behaviours;
- Ensuring that employees consider hazards and plan work before commencement to ensure it is carried out safely.

2.2 Legislative Compliance

The *Occupational Health & Safety Act 2000 and* Occupational Health & Safety Regulations 2001(the "Regulation") impose safety and health obligations on entities and persons who by the nature of their business and activities may affect the safety or health of others at the workplace. The legislation imposes duty of care type obligation on various entities and persons. It specifically provides that obligation holders may only discharge their obligations by adhering to the regulation or following a recognised standard or by following another way that achieves a level of risk that is equal to or better than a recognised standard. In the absence of a regulation or recognised standard, the regulation expects that reasonable precaution(s) are taken and proper diligence is exercised.

2.2.1 Need for Formal Hazard Identification and Assessment

Hazards that will be faced by personnel during the construction phase, whilst the plant in operation will be distinct to those faced during the Shutdown construction phase of the project.

Therefore, prior to the commencement of construction activities at Blue Circle Southern Cement- Berrima site an assessment and analysis of activities and the (generic) major risks associated with the construction phase will be conducted.

This study will provide the basis for a categorisation of potential safety, health and environment risk events. The outcome of this study will provide a hierarchy of risks ranging from insignificant through to catastrophic.

2.2.2 Requirements of the Safety and Health Management System

The Act requires that the Project management team and Project manager develops a safety and health management system as outlined in this suite of documents.

2.2.3 Employee Consultation

The legislation requires corporations to develop communications and consultation process concerning Health & Safety in the workplace. To ensure compliance with this section of the legislation the project team has developed a Project Safety Committee and communications process to ensure dissemination of Health and Safety information and involvement of the workforce involved in the project.

2.2.4 Risk Assessments

To ensure that all identified risk are controlled to the lowest level the project team has developed a series of Hazard Identification and Risk management processes to ensure that Identified hazards are controlled to 'As low as Reasonably Practical and Possible' (ALARPP), levels.

2.2.5 Emergency Response Capability

The project and Plant owner have developed Emergency response procedures in conjunction with the Local Hospitals, Ambulance Service and accredited Rescue provider.

2.2.6 Requirements for Critical Procedures

In order for an acceptable level of risk to be achieved for a hazard occurring during the construction, the legislation requires the safety and health management system to include Critical Procedures. The Critical Procedures used during the construction phase of the project will be developed in consultation with Project Team, Contractors, Plant Owner and appropriate plant Operational and Maintenance personnel.

2.2.7 Implementation of Legislative Requirements

This S&HMP has been written to ensure compliance with the above obligations of the legislation. The Project manager will implement this S&HMP to meet these obligations.

2.3 Roles, Responsibilities and Accountability

2.3.1 Project Management Team

The Project Manager is responsible and accountable to Boral/BCSC for the successful and safe completion of the Project.

Each person in the Project Management Team has responsibilities for the management of safety. Safety advisers and coordinators have supporting roles to assist managers and supervisors fulfil their responsibilities and accountabilities.

2.3.2 Project Manager

The Project Manager will be responsible for the management of safety on the site.

- The Project manager, has the following obligations,

  Overall responsible for Project Safety and Environment targets and outcomes
- Prepares a Safety Management Plan for the project.
- Establishes and maintains a Site Hazard Register.
- Ensures that the work methodologies developed for the project give appropriate consideration to safety and environment.
- Ensure safety responsibility is an integral part of all management systems and processes.
- Ensure that adequate safety and environmental evaluations are made of all modification designs, plant and equipment purchases.
- Ensure systems are in place to guarantee the safety of employees, contractors and visitors.
- Ensure competent and trained, responsible engineers and supervisors exist to manage contractors on the project and work packages.

- Records and reports the Safety Performance of the project to Boral/BCSC and Hatch.
- Reports significant incidents to Boral/BCSC and Hatch
- Review education and training needs for all employees and provide the education and training as required.

- Ensure risk is at an acceptable level.
- Ensure risk from plant or substance provided is at an acceptable level.
- Develop and implement a safety and health management system.
- Develop and maintain a management structure.
- Train workers to be competent.
- Provide for:
  - Planning, organisation, leadership and control;
  - Particular technical competencies for critical work;
  - Supervision and control on each shift;
  - Regular monitoring and assessment;
  - Workplace inspections.

2.3.3 Engineering Manger

- Ensures that the design specifications and standards meet the requirements of The National Standard for Plant and Equipment and appropriate Australian and Company standards.
- Overviews the overall process design, equipment design, construction and commissioning procedures to ensure a technically safe operating system which can be safely maintained and meets specified environmental standards.
- Ensure management systems are in place and understood to give safe design and operation.
  - Ensure hazards and risks are identified for all plant and major equipment. and designs are fit for purpose and safe to implement.
  - Ensure a safe workplace is provided for engineering staff.
  - Ensure all engineering staff are inducted and have received the required training to enable safe access to site.
  - Provide Engineering support as required to assist in the implementation and compliance of this Health, Safety and Environment Plan.

2.3.4 Construction Manager

- Overall responsible for the site safety and environment
- Ensures that a high level of safety awareness is maintained on site.
- Ensures that contractors are aligned and committed to the project objectives and targets.
- Ensures that all site personnel are aligned and committed to the project objectives and targets.
- Ensures that all site personnel are appropriately inducted, trained and qualified.
- Ensures that appropriate risk assessments are carried out for the construction work.
- Implements and maintains a system of recording, investigating, correcting and reporting of all incidents.
- Implements a system for safe site access, evacuation and emergency procedures.
- Ensure that management systems are in place and understood to provide a safe construction workplace.
- Arrange construction pre-start-hazard-analysis studies for all “at risk” operations.
- Participate in safety inspections and serious incident investigations.
- Ensure competent and trained, responsible engineers and supervisors exist to manage contractors on the works.

2.3.5 Safety Adviser

A Project Safety Advisor will be called on to advice the Project Management team on matters such as:

- Statutory and regulatory site requirements and construction safety matters.
- Workplace Health and Safety matters.
- Provide resource material on safety management.
- Promote the involvement of all project team employees, contractor, and contractor employees in achieving the project Safety, health and Environmental targets.
- Focus on the elimination of unsafe acts, behaviours, and rectify unsafe conditions quickly through the implementation of the site environmental, health and safety management plan.

- Conduct safety audits to evaluate compliance with safety management plans and systems as per the audit / inspection schedule.
- Identify hazards and risks through analysis and inspection, including personnel, plant and environment.
- Maintain a relationship with Company and Client (s) management on safety issues.

2.3.6 Project Engineer

Add words from both Gerry's and Keith's documents

Inspection and testing

- Incoming Materials

Incoming materials, products and equipment that may affect health and safety will be raised as a topic for review in the Construction Safety Review and specific procedures for control of these materials will be developed where required. The method of disposal of non-conforming materials and substances will also be documented.

2.3.7 Engineering Personnel

- Personnel involved in the engineering and documentation responsibilities are to include:
- Ensuring that all design complies with the relevant project and statutory requirements.
- Participating in hazard studies throughout the design phase.
- Considering the impact on workplace health and safety of all aspects of the design.
- Assisting Improvement Plan personnel with "in-process" work aspects.

2.3.8 Area Engineers

- Ensure hazards and risks are identified in design stage.
- Ensure that management systems are followed to give safe designs.
- Ensure self and others safety awareness at all times.
- Be aware of hazards and risks in the plant area of activity.
- Participate in and contribute to the Project management team safety plan.

2.3.9 Site Supervisors

- Promote a culture in which safety is the prime concern and will never be compromised.
- Define and document safe systems of work and, through consultation, ensure they are applied.
- Ensure that the Safety Committee functions effectively.
- Ensure that all incidents are thoroughly investigated to avoid re-occurrence.
- Ensure safe management of contractors on the site.
- Ensure competent and trained, responsible engineers and supervisors exist to manage contractors on the works.
- Know that contractors and employees understand the hazards associated with performing tasks.
- Promote the involvement of all employees in improving safety.
- Focus on the elimination of unsafe acts, and rectify unsafe conditions quickly.
- Conducting safety inspections, monitoring safety behaviour on site and participating in audits.
- Ensuring that all involved personnel prior to commencement of any work complete Job Safety Analyses (JSA). Then, by a review process, verifying that the JSA development process is appropriate, communicated and understood by the users and subsequently adhered to during the work package or task.
- Notifying of incidents and addressing unsafe acts, behaviours and conditions in accordance with this Health, Safety and Environment Plan and following-up to ensure corrective and preventative actions are timely and effective.
- By their actions, demonstrating to contractors at all times the commitment of The Project Team to the highest standards of safety management.
- Participation in accident /incident investigations.
- Focus on the elimination of unsafe acts, and rectify unsafe conditions quickly.

2.3.10 Operations Representatives

2.3.11 All Personnel

- In addition to the specific responsibilities outlined above, each individual on the Project is expected to commit to the following responsibilities;
- Perform their duties in a manner, which does not create situations where they can cause injury to themselves, to others or to equipment.
- Co-operate with others to ensure that all parties are able to fulfil their safety responsibilities.
- Abide by all of the Projects Safety Rules outlined in this Plan.
- Intervene immediately to correct any unsafe acts or conditions they observe, but wait until it is safe to do so. They should look after themselves and their fellow workers.

- Report all actual or potential safety issues.
- Complete safety audits and inspections as scheduled.

2.3.12 Contractors'/Vendors' Management

Contractors'/Vendors' Management personnel are responsible and accountable to the Project team for safety performance and have the following key responsibilities for safety management, which will be defined in the Contractor's "Safety and Health Management Plan":

- Preparation, implementation and maintenance of a Safety and Health Management Plan specific to their area of work and responsibility;
- Participate in a pre-start safety review with the Project Management Team;
- Ensure that all members of the Contractor's/Vendor's workforce have clearly defined responsibilities for safety, and that the responsibilities are clearly communicated to them, understood and fulfilled by them;
- Ensure that all Contractor's/Vendor's activities comply with the requirements of their S&HMP and relevant statutory and contractual requirements;
- Establishing an ongoing system for training and assessment of skills and competence;
- Provision of safety statistics to the Project Management Team and Safety Adviser.
- Hazard identification and management program.

This includes:

- Jointly responsible for site safety and environment.
- Ensures the implementation and maintenance of safe systems of work performed by his employees, suppliers and sub-contractors.
- Works with the construction manager and other site contractors to achieve the project objectives and targets.

2.3.13 Contractor's Workforce

The personnel of Contractors involved in the site work accept the following responsibilities:

- Comply with all Safety Procedures and Statutory Requirements.
- Ensure that they are familiar with and take an active role in the development of the JSA's for the work to be undertaken and verifying that each JSA is appropriate, thorough and followed.
- pro-active in identifying potential hazards and report all incidents, unsafe acts and conditions.

2.4 Project Goals

Specific Project goals and objectives are:

OHS & ENVIRONMENTAL TARGETS		
Key Project Safety Objectives	Key Measurement of Success	Strategies
Develop and improve Emphasis on Safety Culture	Zero Injures and fatalities	Develop and implement a series of policies, procedure and mentoring program along with a project specific safety management plan
Prevent Incidents and Injuries Targets LTI = 0 MTI = 0	Zero medical and lost time injuries Increased reporting of hazards and near miss events	Provide education and training in the project safety Value and beliefs, Policies, procedures and provide positive mentoring and fostering to project team
Provide a safe and environmentally friendly construction site	Zero reportable environmental incidents, zero injuries to plant operators, project staff and visitors Zero reportable incidents to the EPA, WorkCover Nsw or other enforcement agency	Provide project team with site specific induction and ongoing information regarding changes to the site, Provide and implement an audit process that reviews and improves the site, methods of management and communication to ensure compliance attainment of project safety objectives, values and beliefs Review of all hazard reports, incidents and near misses to prevent safety occurrences and share lessons learned Development of a communication process to ensure that information and lessons learned are communicated in a timely manner
No Environmental incidents or unplanned releases to the environment	Meeting or exceeding guidelines set forth by the EPA, or local government, or the Water Board	Compliance with project approval and other direction from Authorities
Minimal Industrial conflicts	No unnecessary and unplanned withdraw of labour or operators from the site due to safety or environmental issues	Develop close working relationship with union officials. In addition, share information openly and honestly regarding perceived and real safety and environmental concerns proactively.

3 PERFORMANCE MEASUREMENT AND REPORTING

KEY REFERENCE DOCUMENTS
Project Safety Program - Safety Observations and Audits
Project Safety and Health Standard - Performance Measurement & Reporting

For the Project Management Team to achieve a workplace free of all safety incidents through continual improvement, it is recognized that typical performance indicators are not sufficient and positive performance indicators are required to enable a true indication of safety performance to be recognised. Safety observations and audits will be the method used for performance measurement and improvement.

3.1 Positive Performance Indicators

The Project Management Team will develop and implement a set of positive performance indicators for the evaluation of the safety performance of the Project overall and the individual performance the Project Team and all Project Contractor's and Vendor's.

The positive performance indicators include:

- The effectiveness of the communication and consultative process to identify and resolve health and safety issue
- The effectiveness of the implementation of specific plans and programs
- The percentage of safe to unsafe observations made during safety observations
- The effective completion of corrective and improvement actions
- Progress with audit schedule
- Awareness of critical procedures and their importance
    - What Procedures are in place
    - What critical procedure must you follow to avoid a fatal incident
    - What one need to do to ensure they have and are using the correct procedure

3.2 Safety Audits

The Project Management Team will provide for two levels of ongoing evaluation of safety program effectiveness:

1. Safety audits and;
2. Management review.

In order to answer the question '…how safe are you…?' we will implement a policy to: observe; talk about safety; be specific; take action; give feedback immediately; be positive; get people involved; remove barriers to safe practices; and track progress. These behavioural audits will be documented and any trends identified and managed.

3.2.1 Safety Audits

Safety audits are meant to be non confrontational and provide positive interaction between management and the workplace. If in carrying out an audit, a situation is discovered which requires immediate attention or could result in injury or breaching of a cardinal rule, then the activity **must be stopped** and the incident investigated by those involved with their supervisor or manager.

Upon completion of the Investigation, the incident report will be forwarded to the Construction Manager for review and comment. Where disciplinary action is required, the action will follow the Disciplinary guidelines and policy. .

Safety audits are meant to have a specific purpose or focus. It is expected that each member of the project team and contractor's site management/supervision team will conduct one formal documented audit per week.

One focus for an audit is the (Safety Observation Audit). This involves, observation, coaching and feed back techniques paying particular attention to safe and unsafe work practices, conditions, situation and standards. This observation could take the form of a site walk, or in the case of office bound staff, consist of a discussion with another staff member regarding health and safety in the office or a procedure that impacts their work place or task they undertake during the day.

Another focus for an audit is on critical Procedures. Critical procedures are those procedures used to prevent a fatality or serious injury. A number of critical procedures apply to this project and auditing these procedures are high on the priority list for the project team.

Other (focused) audits may review JSA(s), and their applications, critical lift studies, or any specific safety matter that the project team, or contractor feels requires attention.

3.2.2 Safety and Health Management Plan Audit and Review

The level of implementation of this S&HMP will be audited by external management review. The first review will be in July 2003, with subsequent reviews to be scheduled during the life of the project.

3.2.3 Contractors and Vendors

All Contractors and Vendors will be included in the safety audit program.

3.2.4 External Assessment

Senior managers from Hatch & Associates and Boral /Blue Circle Southern Cement will be asked to conduct an external assessment of the Project Safety Program.

This assessment will be based on a recognised Safety System Review tool such as Safety Map or similar. This review will be conducted three times during the life of the project, with the first review being conducted July 2003 with the second review being conducted at October 2003 and a final review during the Shutdown Jan 2004 of the construction phase of the project.

3.3 Reporting

Formal project reports will include:

- Progress towards establishing program and implementation of program;
- Progress towards achievement of specific targets;
- Significant issues and steps being taken to overcome them;
- Projects positive performance indicators' trends and associated action taken;
- Safety and health incidents and outcomes.

Safety Performance Summary forms shall be completed for each month and submitted to the Project Safety Adviser no later than the 5th day of the following month. Monthly Safety Performance Summary forms are to be completed by the Project Team and all Project Contractors/Vendors. *(Reporting form found in Section (F))*

4 INVOLVEMENT, COMMUNICATION AND MOTIVATION

REFERENCE DOCUMENTS
Training & Inductions
Emergency Management Planning
Hazard Identification & Control
Hatch- Employee Consultation Agreement
New Wales OHS Legislation 2000 & Regulations 2001
New South Wales Code of Practice for Consultation

Communication on safety management matters is one of the key elements in fostering a safe working environment on the Project site. Regular structured meetings are required to ensure that effective communications occur between management and the Project workforce.

A number of different types of meetings are to be utilised on the Project, including those specifically dealing with safety, those that are part of a wider safety process, and those in which safety is an important agenda item.

The meetings will involve personnel from all levels and groups on the project. Depending on their purpose, meetings are to be held on a daily, weekly or monthly basis, and continue for the duration of the project.

The key programs for involvement, communication and motivation on the Project will include elements of the following table and are described in the following sub sections:

Safety Meetings	**Behaviour- Focused**	**Information and Learning**
Project Steering Committee	Safety audits and coaching	Site Rules
Contractors' Toolbox Meeting	Behavioural Improvement and Discipline Program	Safety Alerts
Project Progress Meetings		Significant Safety Occurrences
Site Safety Committee		Critical Procedures

4.1 Safety Meetings

4.1.1 Site Safety Committee

The Site Safety Committee is a group representing the safety interests of the workforce throughout the project site. These teams are sometimes legislated as 'Safety Committees'. The team will include the most senior person from each contractor along with an employee representative from each contractor.

Employee representatives are normally elected workplace safety representatives. The team meets Bi-weekly and deals with overall site safety management issues and procedures. Any day-to-day safety management issues should be addressed immediately through the site leadership structure. The committee is an advisory body and assists and works constructively with site management.

The Project and Contractor's management shall ensure that team representatives afford sufficient time to devote to matters related to the team's activities. Minutes of the meetings of the Project Safety Team are distributed to all participants and non-represented Contractors involved in the Project for communication throughout the Project Site.

4.1.2 Contractor's Toolbox Meetings

Each contractor is to hold toolbox meetings at daily intervals or more frequently if necessary. All site personnel are involved in these meetings where the issues arising at other management and safety meetings are communicated. Toolbox meetings must focus discussion on hazards specific to the relevant area of the Project as well as any recent incidents in the workplace. Meetings are to be minuted and should,

- Brief and to the point;
- Held at the beginning of each shift or at other appropriate times;
- Everyone in the work team attends;
- There are no interruptions;
- The supervisor's role is that of a coach and must be positive;
- Pro-active dialogue about safety on the job about to be done is the objective;
- Positive reinforcement rules the process and comes from everyone.
- Members of the Project team are to periodically attend contractor's toolbox meetings to reinforce commitment to safety, provide an opportunity for direct contact with personnel and monitor that the quality of the meetings is adequate.

4.2 Behaviour- Focused Coaching & Mentoring

4.2.1 Safety Audits and Coaching

Formal Safety audits are to be done weekly by members of the Project Management team and contractor's site management/supervision. It is preferable that the safety audit team be comprised of a number people and are made up of representatives of all levels of the project.

The basics of a safety audit are,

- Attend an area of the project where work is being undertaken;
- Stop and look carefully at the people doing the work as much as possible;
- Introduce yourself and talk to the people doing (Where safe to do so) the work about the observation process;

- Thoroughly observe the situation - asking, “What is the potential for injury here?”, and seek for an understanding of the hazard controls.
- Give verbal feedback - praise safe acts and conditions and correct at risk behaviour and conditions - on the spot;
- Complete the audit form and file a copy in the Audit file.

4.2.2 Behaviour Improvement and Discipline

All Safety rules and policies are to be well communicated to all personnel as the means by which we keep ourselves safe. The positive aspects of these rules and policies are to be discussed and emphasized during the Site Induction.

The Project’s Behaviour Improvement and Discipline Procedure is both a supporting approach and tool for all Project Participants that will provide both clear outcomes and behavioural improvement plans for safety breaches. There will be serious consequences for defined breaches and these will provide a guide to other undefined serious breaches.

The following are examples of serious safety breaches (Cardinal Rules):

- Smoking and unauthorized ignition sources in an ignition risk area.
- Unauthorized removal of Personal Danger Tags or unauthorised removal of an Isolation of any type
- Unauthorized removal or tampering with critical emergency response equipment.
- Unauthorized bypassing of Critical Procedures.
- Blatant or continual breaches of the Project or Contractor/Vendor Safety & Health Polices and Procedures
- Working where there is a potential to fall without wearing an approved safety harness attached to a fixed point.
- Removal of floor plate, walkways, or opening a wall without proper authority or permit.
- Entering a “Danger” Barricaded work are with out proper authority.

4.3 Information and Learning

4.3.1 Site Rules

Site safety rules will be progressively fine tunned in consultation with the Steering Committee, Project Team and Site Safety Committee and will be communicated in the Site Rules and at the time of induction.

Safety Alerts and Significant Safety Occurrences will be the official notification to site personnel for communicating incidents or accidents and on site activities that have the potential to affect health and safety on site.

Safety Alerts shall be displayed on all safety notice boards and distributed electronically as required.

5 CONTRACTOR ALIGNMENT

KEY REFERENCE DOCUMENTS
Contractor Pre-qualification OH&S Performance Questionnaire Form
Contract Safety Requirements

Effective alignment of the Project's and Contractors/Vendors safety values and goals will be an integral part of the Project's safety management program. The Contractor's S&HMP will incorporate the spirit of intent of this S&HMP and will focus on key hazards and systems, as well as how they will be monitored and reviewed during implementation.

The alignment process managed by the Project Management team will cover the following stages in the project:

- Pre-assessment of contractors;
- Pre-contract considerations;
- Tender;
- Tender evaluation;
- Pre-award alignment;
- Award;
- Pre-mobilisation alignment;
- Mobilisation;
- On-site;
- Review and close out.

The extent and level of detail to be considered will be contract specific and will depend on:

- The services being contracted;
- The size and complexity of the job;
- The number and experience of the workforce;
- The risks and hazards associated with the works;
- The safety program, record and commitment of the contractor.

Safety and health requirements will be an integral part of the overall process of arranging and managing contracted work.

5.1 Pre-qualification of Contractors

- Potential tenderers will be screened to confirm that they have the necessary expertise, experience and capability to undertake the required role and that they are prepared to commit to the Project S&HMP;
- Screening will include:
  - Contractor Pre-assessment OH&S Performance Questionnaire
  - Evaluation of previous experience of potential tenderer
  - Commitment of management
  - Assessment of potential tenderer's general reputation for management of safety of their work, within industry
  - Safety policy and systems evaluation
  - A site visit to verify, particularly for new contractors.

5.2 Pre-contract Considerations

Contractual implications of safety issues are to be considered prior to drawing up contract documents.

Set the criteria that will be used to evaluate tender responses for the lead contractor and Sub-Contractors including:

- Safety performance record including any previous prosecution;
- Contractor safety management systems and structures;
- Demonstration of contractor senior management commitment to safety;
- Specific client requirements;
- Specific project requirements.
- Workers Compensation Premium,
- Review of return to work process,

NB: Sub-contractors will be required to submit a Safety Management plan in line with Subby Pack.

5.3 Tender

The tender documents will include safety and health expectations and requirements. This will include as a minimum:

- Framework and procedures to deal with safety and health on the project;
- Safety controls, monitoring, audits and inspection;
- Project organisation and interfaces;
- Statement of the Project S&HMP policy;
- Statement of the safety targets for the project and the contract;
- Instruction for the contractor to submit a draft safety management plan specifically for this contract;
- Reference to the projects minimum standards, regulations and procedures;
- Instruction for the contractor to submit method statements that address specific and critical hazards, if not already included in another tender schedule;
- Coordinated tenderers' site visit and inspection shall include pinpointing of potential hazards identified by the Project Team in preliminary hazard workshops.

The objectives of the contractors draft safety management plan will be to identify:

- The safety risks and how these will be eliminated or mitigated;
- How the contractor will comply with the project safety management plan;
- How nominated safety objectives will be met;
- How the contractor will meet the spirit of intent of the contract and work in with the project site culture;
- The Contractor's safety management structure;
- The detail required in draft safety management plans will be dependent on the size, complexity and relative risk of the contract works;

5.3.1 Tender Evaluation;

The primary purpose of the tender assessment process is to achieve:

- Confirmation that the tenderer has recognised the safety programs and expectations of the project;
- A thorough evaluation of each tenderer's safety plans to ensure they achieve at least the minimum acceptable standards defined in the contract documentation;
- An evaluation and comparison of the safety aspects in competing bids;
- A checklist of the items to be clarified by the tenderer;
- Pre-award Alignment;
- Meetings with tenderers' during the tender evaluation period shall include clarification of Site Safety Programs;
- Award;
- The contract shall include all of the Site Safety Programs for the works and pre-award agreements. These must be available before mobilisation of the contractor;

5.3.2 Pre- mobilization.

A pre-mobilisation safety review will be held with contractors. The contractor's proposed safety management plan shall be reviewed in detail and any special requirements not covered highlighted for action. This meeting will also review how the contractor is to carry out the work. Hazards at each phase of the job should be identified and methods to reduce the associated risk(s) documented. Some phases of the work will require detailed risk analysis at a time closer to implementation of the job.

5.4 On Site

The Project Team will ensure that safety management plans and programs are implemented, monitored, reviewed and improved. The primary aim is for all parties to work together as a team and provide a working environment in which project site activities can proceed in a safe manner.

Everybody will complete the Project's safety induction program before they start. The site emergency procedures will be detailed and the site security and access control procedures will be explained.

5.5 Review and Close Out

The safety performance of all contractors shall be subject to an on-going review. On contract completion, a safety performance close out statement will be prepared.

6 INDUCTION, TRAINING AND COMPETENCY

KEY REFERENCE DOCUMENTS
Site Inductions
Contracts

Under the Act and Regulation, the Principal Contractor and Project Manager is responsible for ensuring that the Project personnel have the necessary skills and knowledge and are competent to perform the tasks for which they have been employed.

The Contractors are responsible for and will be required to document and furnish proof by way of licences, permits, certificates or by recognition of prior learning (RPL) or by written certification by a qualified assessor of their skills, competencies and knowledge of their work tasks.

The Principal Contractor's and Project Manager is also responsible for,

- Ensuring that contractors establish a training programs;
- Ensuring contractors identify resources and carry out training, training verification, testing and skills assessment;
- Ensuring contractors provide training for workers elected to be safety and health representatives.

In establishing these training needs, recognition will be made of the following:

- A workers current competencies and prior learning;
- Designating tasks that may only be carried out by a worker who has been assessed as competent to carry out the tasks.

Contractors' training programs will include coverage of the following; to the extent, the matters are relevant to the duties of the person undergoing the training:

A record of safety, health and environment training undertaken by each employee will be documented and retained permanently by the contractor and where required, a copy forwarded to the Project Safety Adviser for review and storage.

6.1 Inductions

All personnel involved on the Project, except occasional visitors, will be expected to comply with the following induction program.

6.1.1 Blue Circle Southern Cement General Induction of Contractors

All personal working on the site and project will be required to complete the above induction.

6.1.2 Project & Site Induction

All personnel must complete the Project Site Induction prior to working on the site. The purpose will be to ensure that all personnel are made aware of and are conversant with the requirements of this S&HMP, site rules, environmental requirements and community relations.

6.1.3 Job Specific Induction

All personnel shall complete specific inductions for the specific tasks before commencing work where there are specialised hazards.

6.1.4 Visitors

A visitor's safety induction will be established explaining the site, the conditions applicable to their entry onto site and the necessary PPE they will be required to wear.

7 HAZARD IDENTIFICATION AND RISK MANAGEMENT

KEY REFERENCE DOCUMENTS
Project Hazard Register
Project Safety Program – Top 5 Hazard Elimination
Project Change Management Procedure

The Project Management Team will arrange hazard and risk assessments throughout the project. Outcomes from these assessments will be incorporated into the Hazard Register. The hazard and risk assessments will be scheduled as appropriate for a particular work package or area of work and may include some or all of the methods covered in this section.

7.1 Hazard and Risk Hold Points

Hazard and risk hold points will be established for the Project and included in the Project Schedule. Hold points may include some, or all of, the following hazard and risk management methods.

7.2 Preliminary Hazard Analysis (Project and Work Packages)

The Project Management Team will conduct a Preliminary Hazard Analysis (PHA) prior to issuing tender packages for design and/or construction. Hazard analysis should include, where practicable, Engineering, Construction and Operation's personnel.

7.3 Review of Operational & Process Hazards

A hazard review of the operational and process hazards will be performed on any work that has the potential to affect or create a principal hazard. A principal hazard is associated with catastrophic risk and has the potential to cause multiple fatalities, or significant environmental damage or to adversely affect the plant operation.

7.4 Hazard Assessment during Design

Project design is to meet or exceed the Project's safety design criteria and the requirements of the New South Wales Occupational Health & Safety Act and Regulations 2001 in regards to plant. . Hazard analysis and risk assessment methods will be integrated into the design engineering stages. Actions will be taken so that risks of injury or damage are at an acceptable level.

Safety in design will be achieved through the application of the following concepts, actions and activities:

- Design criteria;
- Desktop safety reviews;
- Identification of safety and risk critical elements;
- Hazard identification and risk assessments;
- Ergonomic reviews;
- HAZOP(s)
- HAZAN(s)
- Constructability studies of certain special construction activities (eg, erection of large equipment, complex assemblies) to investigate whether design changes could make construction safer.

The Project Management Team will require Contractors/Vendors to incorporate an appropriate and agreed level of hazard and risk management during the engineering design phase. The principal steps will include:

- Preliminary hazard identification and assessment;
- A design management plan that incorporates safety and health design criteria and suitable hazard studies and reviews;
- Updated hazard identification and assessment;
- Design safety verification.

7.5 Hazard Register

An important output of the hazard identification stages will be the production of a Hazard Register that will be continuously updated as a live document throughout the project. This document will serve as the basis for hazard management and will act as a 'road map' for all hazard assessments carried out in the course of the project. Any information considered relevant to the operational stage of the Project is to be carried forward the Hazard Register. The Hazard Register is an integral part of the Project Safety Management System.

7.6 Management of Change

All requests for changes will be reviewed and approved to ensure that all modifications are analysed systematically and implemented in a manner that does not present an unacceptable risk to health, safety or the environment. The change management process will be done in accordance with the Project Change Management Procedure.

7.7 Pre-Construction Hazard Analysis

The Project Management Team will ensure that a formal Pre Construction Hazard Analysis is performed on any work activity that is classified as hazardous and prior to any hazardous material being introduced into the project construction area.

The Pre-Construction Hazard Analysis shall be a hold point on any hazardous activity.

7.8 Pre-Commissioning Safety Review

The Project Management will ensure that a formal Pre-Commissioning Safety Review is performed prior to start up of the plant.

The pre-commissioning review provides a final checkpoint for the new plant, and is part of the process for ensuring that all necessary actions have been completed. The elements to be considered include:

- Construction and equipment is in accordance with design specifications;
- Formal hazard analyses have been appropriately documented and communicated and are available to all personnel;
- Recommendations have been addressed and actions necessary for start-up have been completed;
- Documentation relevant to the modification has been created/updated;
- Safety, operating, maintenance and emergency procedures are in place;
- Training of operating and maintenance employees has been completed;
- Mechanical integrity systems are in place (eg. equipment tests and inspections of critical equipment, quality control procedures, and reliability engineering analysis);
- Safety and health considerations are checked off.

7.9 Hazardous Areas

The Project Management team shall ensure that any hazardous areas are defined within the site such as “Restricted Plant Areas” or “Ignition Risk Areas”

Any tasks, which are required to be carried out within these areas, shall clearly identify what hazards they introduce. These hazards shall then be managed by using the appropriate procedure from the S&HMP and risk assessment to identify those risks and implement control measures to eliminate or reduce those risks to as low as reasonably possible.

7.10 Hierarchy of Risk Control

Following hazard assessment, possible remedial measures must be defined for situations of excessive risk. A hierarchy of control measures to eliminate or minimize the risk should be followed in the following order of priority:

Firstly, try to **eliminate the hazard**

If this is not possible, **prevent or minimise exposure to the risk** by one or a combination of:

- *Substituting* a less hazardous material, process or equipment;
- *Redesigning* equipment or work processes;
- *Isolating* the hazard.

(Note: These measures may include engineering methods)

As a last resort, **when exposure to the risk is not (or can not be) minimised by other means:**

- Introduce *administrative* controls;
- Use appropriate *personal protective equipment.*

7.11 Hazard Reporting

All Contractors/Vendors will be expected to have in place a Hazard Reporting Procedure in place and will forward copies of the hazards to the Project Safety Advisor for annotation on the Hazard Register.

7.12 Communication of Reported Hazards

The Project Manager shall ensure that all Project Management team members discuss all hazards that are reported and the remedial action taken at the next management team meetings, toolbox meetings or other appropriate forums.

7.12.1 Top 5 Hazard Elimination Program

It is well known that on most construction projects the majority of safety incidents are the result of a few common hazards. The aim of the 'Top 5 Hazard Elimination Program' will be to eliminate or tightly control the most common hazards.

The program will have the following elements:

1. Objectives, Critical Procedures, measures and targets;
2. Management leadership and employee participation;
3. Hazard identification, risk assessment, action planning and actions;
4. Evaluation of program effectiveness;
5. Accountability and reporting.

7.12.2 Tool Box Meetings

The site contractor's and subcontractor's workforce will, through their supervision, safety notice boards, toolbox meetings and daily pre-start meetings be kept aware of safety related matters.

Toolbox meetings are a two-way forum for the workforce to raise safety concerns they have encountered or foresee which did not require immediate action by themselves or their supervisors. These meetings will typically be held daily and as required (E.g., Incidents, Change in work process or procedures).

By using this methodology, safety issues and concerns become a focus point and control measures can be initiated to reduce the risk. Safety and health matters that should be discussed include the following: -

Toolbox meeting minutes and actions arising.	Problems identified and remedied during the period.	Problems identified with remedial action yet to be completed.
Reasons for rectification being incomplete along with a progress report.	Accidents, incidents or near misses occurring during the period.	First aid treatments and safety statistics
Rehabilitation.	Training programs.	Work progress (short term and overall).
Job Safety Analyses.	Safety audits and inspections	

All toolbox meetings shall be recorded, names and signatures of all participants and list the following as a minimum:

- Crew
- Supervisor
- Meeting Run By
- General Business & Issues

7.12.3 Job Safety Analysis

Work team Job Safety Analysis (JSA) will be the cornerstone of the Project's workplace hazard management program. JSA's will be required for all activities and will normally form the basis for consultative development of Contractors' Standard Operating Procedures and Work Instructions.

During the construction phase of the project there will be two (2) types of JSA(s) used to identify and communicate the hazards and controls used for a specific task.

7.12.3.1 Verbal JSA

The intention of the verbal JSA is an informal hazard review just before the commencement of a simple task

7.12.3.2 Written JSA

This type of JSA is formal and documents the task at hand; the hazards associated with the task, the risk and the control methods to manage the hazard to an acceptable level of risk.

8 OCCUPATIONAL HEALTH AND HYGIENE

8.1 Injury Management

Workplace Injury Management including Return to Work, will be a managed process involving immediate provision of necessary and reasonable service. It includes suitable duties, when practicable, to ensure the worker's earliest possible return to work, or if return to work is precluded, to maximise the worker's independent functioning.

Injury Management on the Project will meet the requirements of the Injury Management & Workers Compensation Act and associated regulations.

Injury Management and will include:

- Prevention;
- Early Intervention;
- Early Return to Work;
- Consultation.

Contractors will need to have sufficient systems in place to comply with the Legislation and that focus on returning people to the workplace as soon as safe and practicable to do so.

Contractors will be expected to have systems in place to monitor employee(s) absence to ensure that those persons missing from work are not missing work because of a non-reported injury or illness from a previous shift or workday.

8.2 Health Promotion Program

Safety, Health and hygiene topics will be posted on notice boards to provide information on a range of health, safety and hygiene topics.

8.3 Fitness for Work

As part of their health and safety commitment to their employees, the Blue Circle Southern Cement have implemented a random alcohol testing program and a Zero Tolerance program in regards to working under the influence, or effected being effected by alcohol whilst at work.

As such, a random sampling program has been implemented for their employees and the contractors working on their site.

Staff who are affected by Alcohol, will be provided safe transportation to their accommodation, or home.

Contractors will be required to establish a process and procedure to ensue the safe transportation of the effected person from the site to their accommodation, or home.

A self-testing station is provided for site personal and is located near the entrance of the Blue Circle Plant Control Centre entrance.

To address this issue the project Team will provide information on

- The consumption of alcohol and it effect;
- General level of personal fitness and medical conditions;
- The effect of drugs (prescription, pharmaceutical or illicit);
- Fatigue;
- Stress.

9 SAFE SYSTEMS OF WORK & CRITICAL SAFETY REQUIREMENTS

KEY REFERENCE DOCUMENTS
Critical Procedures – Permits to Work
Development and Approval of Critical Procedures

Safe systems of work on the Project will be established and updated throughout the project. Continuous review by the Project Management Team and Contractor's/Vendor's teams will address existing safety systems with a view to improvement of task specific activities.

9.1.1 Authority to Work (ATW) Permit Process

Authority to Work permit will be required for all work under the control of the project team and undertaken on the site. The following designated hazardous activities will require additional permits along with the ATW.

- Hot work in designated hazardous areas;
- Entry into confined spaces;
- Excavations and penetrations;
- Work associated with all hazardous energy;

- Abrasive blasting, high pressure, chemical and mechanical cleaning;
- Using hazardous and/or dangerous substances;
- Erecting scaffolds.

9.2 Critical Procedures (Cp's)

The Project Management Team has identified hazardous activities that will be controlled by site wide mandatory CP's. Table 3 Project Critical Procedures gives examples of procedures that are to be used site wide. *A complete and controlled list of the Project Critical Procedures is included in Section (I).*

Table 1 Project Critical Procedure(s)

Hazardous Activity/Control Standard
Incident Reporting, Investigation and Management
Hazardous substances management
Vehicles on Site
Emergency Response
Permits to Work
Isolation, Lock Out/Tag Out
Occupational health hazard exposure monitoring
Abrasive blasting, high pressure, chemical and mechanical cleaning
Working at Height
Cranes and lifting equipment
Dangerous goods transport and storage
Mobile plant and equipment
Pressure vessels
Scaffold safety
Excavation Safety
Medical and First Aid

9.3 Project Safety and Health Programs

Site safety and health programs will be established to implement this management plan. Table 5 gives examples site safety programs that will be used to focus and improve site safety during the construction phase of the project.

Table 5 Project Safety and Health Programs

Examples of Project Safety Programs
Top 5 Hazard Elimination Program
Safety Observation & Audit Program
Test Before You Touch Program

10 INCIDENT REPORTING, INVESTIGATION AND MANAGEMENT

KEY REFERENCE DOCUMENTS
Critical Procedure– Incident Management

All Contractors/Vendors will be responsible for reporting, investigating and implementing remedial actions in accordance with the Project Critical Procedure-Incident Management.

The Project will maintain a database of all incidents and Contractors/Vendors will provide copies of all incident reports and investigation documentation for entry into the database and audit and review purposes.

The following incidents must be reported and investigated as minimum:

- Any incident which has or could have resulted in injury, illness, damage to property and/or the environment;
- WorkCover reportable Incidents,
- All fires

10.1 Incident Reporting & Investigation

All incident investigations are to focus on identifying the causes of the incident so that appropriate control measures can be identified and implemented.

All incidents will be reported using the BCSC Incident Reporting form and forwarded to the Project Safety Adviser for review, comment and dissemination to the management team. Upon completion of the investigation, the findings and recommendations shall be distributed to the relevant crews for discussion at a toolbox meeting.

All incidents and the results of the subsequent investigation are to be tabled and reviewed at the next Project Safety Team meeting.

10.1.1 WorkCover Incident Reports

Prior to the transmittal of WorkCover Incident Report forms, Contractors will need to review these forms with the Construction Manager and Project Safety Adviser prior to transmitting the form the Authority. The purpose of the review is to ensure that the information provided is correct and the corrective actions are appropriate and prevent a reoccurrence.

11 SITE MANAGEMENT

KEY REFERENCE DOCUMENTS
BCSC – Site Traffic Management
BCSC – Site Security and Access Control Procedure
BCSC– Emergency Response plan

11.1.1 Inspection Release

Before issuing plant, equipment or materials for use on the Project, the following checks will be made by Inspectors:

- Item received is as specified in the Purchase Order and its attachments;
- Plant, equipment and materials conform to relevant statutory, standards and/or codes of practice;
- Test certificates or certificates of conformance as appropriate are obtained from the supplier to confirm that the item complies with project and legislative requirements;
- Ensure Manufacturers Installation and Operation Manual accompany equipment.

11.1.2 Speed Limit

Contractors and their employees who have permission to drive vehicles on the site shall at all times drive at a safe speed; they shall not exceed the maximum speed permitted on the Site.

11.1.3 Car Parking

Contractors shall ensure that his employees park private vehicles in the Contractors car park.

11.1.4 Recognized Walkways

When walking through the plant/site or to personal work areas recognized walkways are to be used.

11.2 Site Security

Access to the site will be through the works main entrance only off Taylor Road.

11.3 Commissioning

All Project Management Team members and Contractors/Vendors are required to follow the project commissioning guidelines. The guidelines require that hazards are identified and actions are taken to minimize any risks from the hazards. They also provide the process for communication of commissioning activities.

Additionally, the project management team will ensure that there is a formal hand over to Operations and Maintenance personnel and others who will be impacted by hazards

that have been identified during project activities. This will involve communication of changes to the process hazards, procedures and operating philosophy.

11.4 Emergency Preparedness and Response

Emergency Response Plans will be prepared for construction and commissioning phases of the project and will be in line with the Blue Circle Southern Cement- Berrima Plant Emergency Plan.

The Project Emergency Response Plans will:

- Describe how the emergency response is initiated and how the emergency teams are activated;
- Specify command, control and communications arrangements;
- Identify the roles and responsibilities of all personnel likely to be at the site of the emergency or involved in the response;
- Include a person nominated as the site Emergency Control Officer and;
- Identify emergency equipment available and personnel trained in its use.

Contractors and Vendors must ensure that all persons under their control understand the instruction of the Emergency Pans and act accordingly.

11.5 Public and Company Personnel Safety

Public safety shall be considered and remedial actions identified and implemented when developing all JSA's. Unauthorised persons will be prevented entry to the work site by appropriately securing all work sites at all times.

Where practical signage and/barricading shall be placed at all entrances to work sites advising all unauthorised personnel to report to the site office or barricade owner before entering the site.

11.6 Mobile Plant and Equipment

All mobile plant brought to site, or hired in for use on the site will need to fit for its intended use. All equipment supplied by hire companies will need to be inspected prior to arriving on site and presented with an inspection report.

Any equipment brought to site, or hired, that has not been inspected will need to be inspected prior to use and in the case of hire equipment, must either be inspected on site by the hire company, or removed form site and replaced with an inspected piece of equipment.

Mobile Plant Interface

To minimize the interaction and possibility of injury, mobile pant operation and materials movements will need to be done in consultation with the BCSC Operations personal.

Set down & Lay down Areas

Defined set down and lay down areas will be identified and marked on the site map and ground to assist the contractors and operations personal where they can and can not place items for short term and long term lay down.

Appendix F

Hazardous Substances Register

Product Name	UN NO.	Quantity	Description	MSDS
Jarylec C101			Colourless liquid with a slightly aromatic odour	Yes
WIA Austarc 16TC		10 Cartons – Then as required	Twin flux coated, basic, low hydrogen welding rod. Flux coating coloured grey with bronze tip	Yes
Low Sulfur Diesel		In vechiles, cranes and EWP's. 400 Litre tank in rear of Izuzu truck	Light brown oil, with a slight characteristic odour	Yes
Shell Alvania Grease		1 carton – Then as required		Yes
Tellus Oil 68		Hydraulic Tank of cranes and EWP's – only brought to site if required	Clear and bright oily liquid. Mineral oil odour	
Shell Rimula X Oil		Vechiles, cranes, EWP's. 20 Litres in storage – Then as required	Clear and bright oily liquid. Mineral oil odour	Yes
Oxygen (compressed)	UN 1072 D.G. 2.2 5.1	1 Pack of Bottles	Colourless, odourless and tasteless. Dangerous Good (an oxidizing gas)	Yes
Acetylene (compressed dissolved fuel gas)	UN 1001 D.G. 2.1	1 Pack of Bottles	Colourless with a slight 'garlic' odour. Dangerous Good (flammable gas)	Yes
Galmet Cold Galvanising (Paint)	UN 1263 D.G.3	12 tins (carton)	Viscous grey liquid with hydrocarbon odour. Dangerous Good (flammable liquid)	Yes

Appendix G

NSW WorkCover Authority - CHAIR Safety in Design Tool 2001

WorkCover
NEW SOUTH WALES

CHAIR

SAFETY IN DESIGN TOOL

TOOL 2001
WorkCover NSW Safety in Design Tool

WorkCover. **Watching out for you.**

NOHSC
National Occupational Health & Safety Commission
COMMONWEALTH OF AUSTRALIA

BP

CONSTRUCTION
SAFETY KIT

preamble

CHAIR (Construction Hazard Assessment Implication Review) is a tool to assist designers, constructors, clients and other key stakeholders to come together to reduce construction, maintenance, repair and demolition safety risks associated with design.

CHAIR was developed in support of the Construction Memorandum of Understanding (MOU). The MOU was signed in 1998 between the NSW Government and the Chief Executive Officers of the principal contractors and major industry associations in the NSW construction industry.

The signatories to the MOU have worked in partnership to implement measures to improve the construction industry's OHS and injury management performance.

CHAIR was developed in close consultation with contractors and design professionals. It was prepared by Mr David Franklin and was sponsored by BHP Engineering, Bovis Lend Lease and Transfield Pty Ltd. The assistance of Mr Franklin and these organisations is gratefully acknowledged.

The Australian Council of Building Design Professions (BDP) and the Royal Australian Institute of Architects (RAIA) support the use of CHAIR. The BDP believes that along with the quality and amenity of the built environment, its safety is also determined at the design stage. "CHAIR is a tool that will enable better safety awareness and solutions for improving safety and construction through identifying potential hazards by a coordinated approach by all stakeholders.

The RAIA also believes the value of CHAIR arises from its common sense approach and practicality in drawing key stakeholders together to co-operatively plan for safety.

Other products developed under the auspices of the Construction MOU include:

Subby Pack: OHS Contractor Management Tool

Hazard Profile: Identification Tool for Metal Roofing
Identification Tool for Electrical Hazards on-site
Identification Tool for Bricklaying
Identification Tool for Formwork
Identification Tool for Aluminium Mobile Scaffolds
Identification Tool for Steel Reinforcement Fixing
Identification Tool for Concrete Placement
Identification Tool for Demolition

Supervisor Manual: OHS Training Tool

Safety Meter: Positive Performance Measurement Tool

Another valuable tool to assist small and medium-sized businesses to systematically manage safety is WorkCover's Workplace Safety Kit.

More information about each of these products can be obtained by contacting WorkCover NSW on 131050 or at www.workcover.nsw.gov.au.

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1. introduction

Consideration of occupational health and safety (OHS) issues in the design stage of a construction project has been identified as essential for improved OHS outcomes. A United Kingdom study found that nearly two thirds of the injuries and fatalities on construction sites could be traced to design decisions and lack of planning in this key element of a project (Churcher & Alwani Starr, 1996).

CHAIR, an acronym for Construction Hazard Assessment and Implication Review, is a tool that has been developed to bring together all the key stakeholders involved in design to help identify and eliminate (or minimise) inherent risks in a structured and systematic way. The name CHAIR was also selected because a function of both a chair and a design review is to provide an opportunity to sit down, pause and reflect on possible problems.

CHAIR provides a rigorous framework for a facilitated discussion that is stimulated by guidewords or prompts. These prompts assist the key stakeholders to collectively identify and reduce construction, maintenance repair and demolition safety risks associated with a design. Those risks are then formally listed for action by the appropriate stakeholders.

CHAIR recognises that a design involves key considerations such as operability, aesthetics and economics with the elements of safety. It also acknowledges that a design process may be determined by many different stakeholders and/or influences. The CHAIR methodology aims to involve these elements and influences.

It is intended to be applied to projects where the design or construction is unique, unusual, or of sufficient inherent hazard that a formal detailed assessment is warranted.

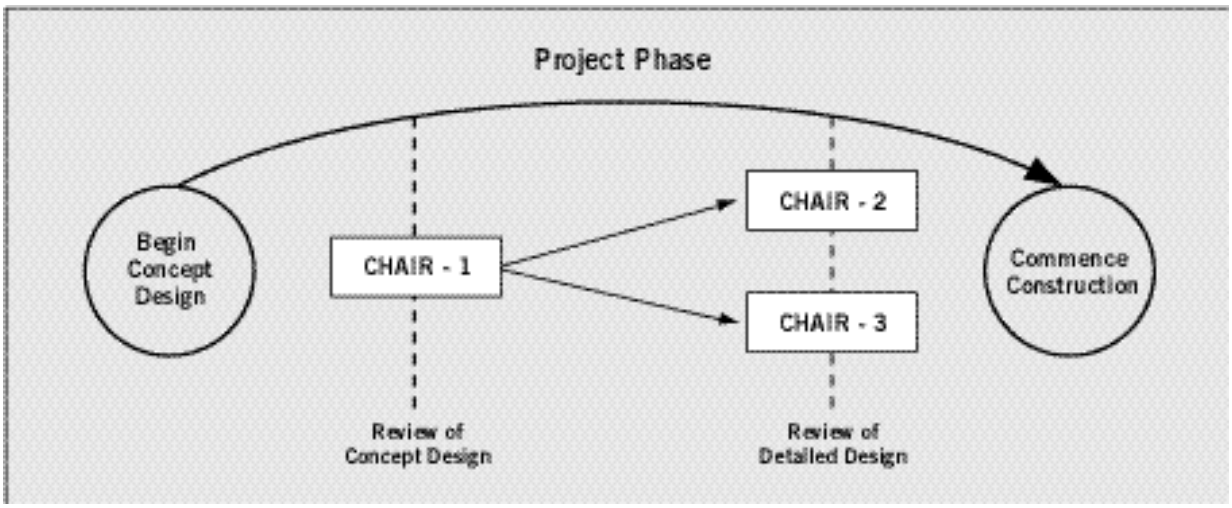
The primary aim of a CHAIR is to identify and eliminate or minimise risks in a design as soon as possible in the life of a project. There are three phases of CHAIR:

CHAIR ONE is performed at the conceptual stage of a design, which is the best opportunity to make fundamental change, even though much of the design is still to be determined.

CHAIR TWO focuses on construction and demolition issues and is performed just prior to construction, when the full detailed design is known.

CHAIR THREE focuses on maintenance and repair issues and is performed at the same time as the CHAIR 2 study.

This is illustrated in the following diagram :



For example, a CHAIR study could be used during the design stage to improve safety during the construction process by:

- designing multistorey buildings so the exterior wall covering (precast panels etc.) can be installed as soon as the framework is in place and most trades begin work on floor;
- eliminating the need for installing temporary barriers by designing higher parapet walls or an integrated guardrail system along all roof edges;
- minimising the use of temporary scaffolding by designing permanent stairways and walkways to be constructed first (Hinze 1996).

By proactively considering construction, maintenance, repair and demolition issues, the CHAIR framework should not only help reduce the number of construction industry incidents, but also assist in improving constructability and reducing the life cycle costs associated with building and civil design projects.

2. the importance of safe design

The design process involves a range of participants and stakeholders. It includes designers, specialist consultants, clients, users, approval authorities and (at times) project managers and constructors. The art of design involves consideration of a range of issues such as aesthetics, function, safety and environment. Such considerations can arise due to experience, legislation, codes and standards, expertise, logic, checklists and any other means.

Previous experience greatly assists with identification of safety risks associated with a design. However, to learn from previous experience requires an incident to have occurred, be adequately documented and the information made available to the relevant parties involved in the design process.

Codes and standards tend to address the obvious risks and are less effective in identifying previously unforeseen hazards. When a design is no longer simple or straightforward, or involves unique, unusual or potentially hazardous design, there may not exist sufficient experience or codes of practice to adequately consider all safety issues (Kletz, 1990).

There is a balance of responsibilities between a designer, a constructor and other relevant stakeholders, such as clients or specialist consultants. It is important that all participants [WC1] highlight unusual safety risks associated with a design and required construction. As outlined by Churcher & Alwani-Starr (1996), those involved in the design process should:

- **identify** the hazards presented by potential design solutions and consider the risks these hazards will generate for construction workers and others who may be affected by the construction work (e.g. members of the public);
- **include** health and safety considerations amongst the design options so that they can avoid the hazards, reduce their impact or introduce control measures to protect those at risk where it is reasonably practicable;
- **forewarn** the contractor of the residual hazards that have been identified within the design and will need to be managed during the construction work.

Eliminating the hazard is the first risk control that should obviously be considered. If the hazard cannot be eliminated (for example eliminating risks associated with maintenance by using aluminium/stainless steel, which requires no regular painting), risk can be minimised by using a series of steps known as the hierarchy of risk control. Including:

- **substituting** the system of work or plant with something safer (e.g. pre-assembled equipment at ground level rather than height);
- **modifying** the system of work or plant to make it safer (e.g. ensure attachment points for lifting, window cleaning, safety lines, etc.);
- **isolating** the hazard (e.g. introduce restricted areas);

- **introducing** engineering controls (e.g. prevent falls from buildings during construction/maintenance by increasing wall/edge height).

Only when the above risk control options have been exhausted should consideration (and more importantly reliance) be given to personal protective equipment (e.g. safety harnesses) or adopting administrative controls such as hazard warning signs.

Design is the process of considering options. In developing and understanding these options, there is also the ability to improve safety and reduce costs. For example, the costs associated with assembling large scale scaffolding may far exceed the costs associated with alternate design and/or construction materials. Similarly, an emphasis placed on achieving a design that would be safe and efficient to erect, rather than the traditional approach of minimising steel tonnage, did result in lower project costs (Holland & WorkCover, 1997).

Essentially, given the opportunity to consider the design in a formal and systematic way, a smarter design results - and a smarter design invariably leads to a safer design.

3. the CHAIR process

A CHAIR study is intended to help identify that a design needs to consider operability, aesthetics, economics, with the elements of safety in constructability and maintainability that together form the final design. A CHAIR provides a structured forum to ensure there is opportunity to forsee construction, maintenance, repair and demolition safety issues, so they can be eliminated or modified as part of the design process.

The process for CHAIR is as follows:

1. Assemble a CHAIR study team (include all stakeholders).

2. Define the objectives and the scope of the study.

3. Agree on a set of guidewords / prompts to assist brainstorming process.

4. Partition the design (CHAIR-1, CHAIR-3) or construction process (CHAIR-2) into logical blocks of appropriate size.

5. For each logical block, use various guidewords to assist with the identification of safety aspects/issues.

6. Discuss associated risks and determine if the safety risk can be eliminated.

7. If the safety risk cannot be eliminated, determine how it might be reduced.

8. Assess whether the proposed risk controls (i.e. expected safeguards, etc.) are appropriate (is the risk as low as reasonably practicable).

9. Document comments, actions and recommendations - determine appropriate method for design issues still to be resolved.

(Based on Wells 1996)

The Facilitator

The success of a CHAIR study is dependent on the ability of a facilitator to select and use the experience and expertise of the study team to critically evaluate the design. Therefore, the selection of a facilitator is critical.

The facilitator should be sufficiently removed from the design process that he or she does not take the questions or suggestions coming from workshop participants as personal criticism, nor feel the need to defend the design concept. As the whole purpose of a workshop is to test the design concept from a safety-in-construction standpoint, the role of the facilitator is to encourage workshop participants to constructively challenge the design and explore whether issues have been overlooked or sufficiently thought through.

It is recommended that the facilitator should have the following attributes:

- an understanding of the principles of safety in construction;
- the respect, or potential to quickly gain the respect, of workshop participants;
- as a minimum, a broad understanding of the project;
- the ability to bring out the views of a diverse range of people participating in the workshop to constructively challenge the design concept;
- the ability to put forward their own views and thus provoke thought, but without dominating the workshop;
- the ability to keep the workshop on track and moving along (issues that can't be resolved relatively quickly should be listed for action outside the workshop).

3.1 CHAIR-1 study: conceptual design review

Introduction

The purpose of the CHAIR-1 study is to review the conceptual design and identify the significant construction, maintenance, repair and demolition safety risks associated with a project. By identifying and understanding these risks very early in the project phase, risk controls can be established to ensure that, if these risks cannot be eliminated, they are at least managed so they are as low as is reasonably practicable.

Organisations typically perform feasibility or conceptual operational design assessments which cover the various function and elements of a design, including safety. The focus of these assessments is at a fundamental level, where it is still possible to radically change the design concept and significantly improve safety and operability. The effectiveness of such studies is diminished when time is spent on less significant issues, which are more appropriately addressed as part of detailed design.

Those involved in the design process should have an informed view of the overall "constructability" and "maintainability" of the design, as not only do they influence safety, they also influence project and operability costs. Such influences may not necessarily be mutually exclusive.

Only what is reasonable to foresee at the time a concept design is reviewed can be expected from any design review. It may be possible for risks which cannot be foreseen or addressed at the CHAIR-1 stage to be considered at the CHAIR-2 and CHAIR-3 stages.

CHAIR-1 Study Team

A designer should be well informed but is not expected to know everything, especially with regard to detailed construction techniques. Therefore, the designer, or a single third party, in isolation should not perform a CHAIR-1 study. What is required is essentially a systematic and formalised "brainstorming" workshop, which involves the appropriate stakeholders (designers, construction, maintenance, safety representatives, etc.), and is led by a facilitator who is a "third party" to the design (but could belong to one of the stakeholder organisations).

As the CHAIR-1 study is undertaken at the conceptual stage of the design process, it is difficult to indicate who should attend a CHAIR-1 meeting. The appropriate participants will depend on the type of project being considered. Participants may include: architect, design manager, construction manager, safety specialist, client, construction foreperson, project managers, engineers and service consultants. A CHAIR-1 study provides an opportunity for people to contribute to improving safety using their specialised knowledge. By using a diverse group of people and a systematic methodology, the chance of overlooking a major problem is significantly reduced.

CHAIR-1 Guidewords

A CHAIR-1 study is a form of safety analysis similar to a technique used in the petrochemical industry called Hazard and Operability (HAZOP) study.

HAZOP has been detailed extensively in literature, as well as in NSW government

publications (DUAP (1996) and MRD (1997)). One of the main elements of a HAZOP is the use of guidewords, applied to various sections of the design, to stimulate discussion and risk identification. Similarly, the methodology of a CHAIR-1 study is to divide the proposed design into logic blocks and consider the implications of the guidewords for that element.

It is critical that the guidewords provided be used as a prompt to promote discussion of issues and not as a checklist of issues to be considered.

A full list of CHAIR-1 keywords is provided at the beginning of the Chair 1 section. The development of the CHAIR-1 guidewords was based on the assumption that the CHAIR-1 study would be structured on the design (and not a proposed construction method) being divided into logical blocks.

As occurs in all such methods, there is a tendency for the number of guidewords to be increased, until eventually the method begins to lose its value (Wells, 1996). Therefore, non-specific guidewords have been selected to provide prompts to the discussions.

The guidewords have been organised into two types: "generic" (applicable in most cases regardless of the type of design to each element) and "overview" (used at the end of a CHAIR-1 study to review issues that relate to the whole design concept).

A CHAIR-1 facilitator should review the applicability of guidewords (including additional words that may be required) as part of the preparation for the CHAIR-1 workshop. If additional guidewords are suggested during a CHAIR-1 meeting, then they should be used (and recorded).

CHAIR-1 Procedure

There is a tendency with any design to keep along the same process path as first envisaged by the designer. The other difficulty is that there remains a tendency to use "add-on" safety measures as the first solution. The object of a CHAIR-1 study is to promote a full exchange of ideas in an enthusiastic environment.

A CHAIR-1 methodology follows that of most safety analysis (Harms-Ringdahl, 1993) in that:

- the design is divided into logical components for analysis;
- for each component of the design, sources of risks or other factors related to the risks of accidents are identified;
- an assessment is carried out as to the appropriateness of the risk and its controls.

As outlined by Wells (1996), the critical examination of a system requires careful chairing to stop the meeting getting bogged down or rambling too widely. Given good guidance and common sense, it is possible to obtain sensible and useful results.

CHAIR-1 Documentation

It is obviously important to document the findings, attendees, methodology, guidewords and findings of a CHAIR-1 study. A layout for recording the minutes of a CHAIR-1 meeting is provided in the Chair 1 section, "Sample - Chair 1- Minute Recording Sheet". A major component of an effective CHAIR-1 study is the recording of the meeting minutes. These are best recorded by someone who has a good understanding of the project, to ensure records are taken accurately and efficiently.

The minutes typically only recorded those identified risks that require action or follow up, or to justify where, after a detailed decision is made by the CHAIR-1 team, the existing design element is retained.

3.2 CHAIR-2 study: detailed design construction or demolition review

Introduction

A CHAIR-2 study is performed as the detailed design is approaching completion, but well before commencement of construction. In many cases, it may be possible to identify the constructor who would actually be performing the work to assist in performing the study.

CHAIR-2 is a specific type of study, in that it is focused on ways in which a design can be modified to eliminate or reduce construction and/or demolition hazards. It does not replace Job Safety Analysis or Safework Method Statements which are performed by the construction organisation and outline all the safety controls to be employed to control the risk. The primary focus of a CHAIR-2 study is to ensure that, from a design perspective, as much as can reasonably be considered practical has been contemplated and incorporated into the design to minimise construction or demolition hazards.

CHAIR-2 Study Team

As with a CHAIR-1 study, a CHAIR-2 study is performed by a group of people who are involved in the design and construction of the project, the composition of the team being dependent on the scope and nature of the design under examination. The critical elements being an appropriate CHAIR-2 facilitator, appropriate selection of CHAIR-2 workshop attendees, application of specific CHAIR-2 guidewords, and clear recording and follow-up of the minutes from the CHAIR-2 meeting.

CHAIR-2 Guidewords

A critical difference between CHAIR-1 and CHAIR-2 studies is that analysis for a CHAIR-2 study is structured towards the proposed construction (or demolition) sequence, rather than using a logical breakdown of the specific design. The reason for this is that at the detailed design stage, there is less opportunity to fundamentally change the design. However, there would exist the possibility to modify the design with regard to the intended construction or demolition method, the details of which would not have been available at a CHAIR-1 study stage. It also provides a different assessment perspective from a CHAIR-1 study for identifying safety risks.

Therefore, the guidewords to be used for a CHAIR-2 study are different to reflect the task oriented approach of the construction sequence. The aim of a CHAIR-2 methodology is to acknowledge that the basic design will be built, but also to identify design modifications that would result in safer construction or demolition techniques.

As the number of construction sequences may be large, the number of guidewords available is limited to ensure that a CHAIR-2 study does not become laborious. A list of the CHAIR 2 guidewords is provided the Chair 2 section -"SUMMARY-CHAIR 2-GUIDEWORDS".

The guidewords have been based on the approach of Critical Examination of System Safety (Wells, 1996) and are applied in the

sequence presented. Thus the first aim is to eliminate or substitute a dangerous construction or demolition step or the main causes of accidents (Davies & Tomasin, 1990). In some cases, it might be best to combine certain construction processes to make them safer. To avoid is a less stringent action and means that it may be possible to evade certain conditions or actions deemed to be undesirable. The final guideword contains some basic suggestions that might prompt other construction or demolition safety issues.

CHAIR-2 Procedure

The purpose of the CHAIR-2 study is not to identify every single construction or demolition step or risk, for a large proportion of them should be well known to competent constructors. However, it is likely that there will exist some risks which would not normally be expected in the context of the normal construction, and these are intended to be identified and assessed.

It should be noted that as part of the input prior to a CHAIR-2 meeting, it is expected that the design team would provide documentation, in broad terms, as to how it is expected the particular design would be constructed.

A CHAIR-2 methodology involves:

- the construction sequence divided into defined logical steps for analysis;
- each construction step, sources of risks or other factors related to the risks of accidents being identified;
- an assessment carried out as to the appropriateness of the risk and its controls to improve the design and clarify a preferred construction method and sequence.

CHAIR-2 Documentation

As with a CHAIR-1 study, it is important to adequately document the findings, attendees, methodology, guidewords and findings of a CHAIR-2 Study. A layout for recording the minutes of a CHAIR-2 meeting is provided in the CHAIR-2 section "Sample - Chair 2 - Minute Recording Sheet".

3.3 CHAIR-3 study: detailed design maintenance & repair review

A CHAIR-3 study is performed as the detailed design is approaching completion, but well before construction commences. It is essentially performed at the same time as a CHAIR-2. In some cases, it may be possible to identify the owner's maintenance and repair personnel who could contribute information to the study.

Depending on the size and complexity of a design, a CHAIR-3 could be performed by a single person or a small team, provided they have:

- a knowledge of hazard identification techniques and an understanding of how to rate the importance (risk or level of danger) of the problems identified;
- a thorough knowledge of the current design to the extent of understanding the function of every plant and equipment item and knowledge of the way/s each item can fail (the failure modes);
- extensive practical experience.

A CHAIR-3 study is more a document that demonstrates the appropriateness of maintenance and repair of items and plant and equipment. It would be expected that the format of the study could be flexible, with an example format provided in CHAIR-3 section, "Chair-3 Worksheet".

4. CHAIR-1 EXAMPLE ONLY

Project: Overtaking Lane for Forest Ridge Road **Element: Complete system** **Date: 29 / 02 / 00**

Drawing(s): Schematic FR-111 **Revision: A**

No.	Guideword	Risk Issue	Causes	Consequences	Safeguards	Action	Person Resp.
			GENERIC				
1.	Size	No significant risk identified					
2.1	Heights / Depths	Construction of drains	Construction / access to drain is possible confined space	Confined space injury	Designated confined space procedure	Drain design should avoid where possible the need to be classed as a confined space	D.F.
2.2	Heights / Depths	Interference with power lines	Plant equipment in contact with power lines	Injury/fatality	Safe management procedures	Designer to indicate position and height of all power lines to assist with site safety procedure	C.F.
3.	Position / Location	Poor visibility from heavy foliage	Tree type grows and needs to be maintained	Injury/fatality to road maintenance worker	Standard PPE, barriers, etc.	Flora species should be specified that will be low in height growth to avoid sight obstructions and low maintenance	B.R.
4.	Poor Ergonomics	Tripping hazard with cut trees	Trees cut but not removed	Trips, falls during construction	None	Trees to be removed should be dug out completely to avoid leaving trip hazards in road reserve	J.R
5.	Movement / Direction	No significant risk identified					
6.	Load / Force	No significant risk identified					
7.	Energy	No significant risk identified					

No.	Guideword	Risk Issue	Causes	Consequences	Safeguards	Action	Person Resp.
8.	Timing	Holiday Long weekend period greatly impact construction	Confusion, heavy traffic flow restricts construction possibilities	Injury to construction worker / member of the public	None	Commence construction phase day after holiday (recommendation to constructor from design team)	D.F.
9.	Egress/Access	Insufficient turning space for construction equipment	Insufficient area set aside by design for laydown and equipment operations	Traffic accident resulting in worker/public injury	Traffic marshals	Ensure design has sufficient turning space for construction equipment	L.D.
				OVERVIEW			
10.	Environmental Conditions	Strong UV radiation	Unprotected outdoor environment	Impact to workers	PPE, hats, etc	Temporary office site location should be planned so that some suitable shade trees are retained to provide UV protection during breaks	
11.	External Safety Interfaces	No significant risk identified					
12.	Toxicity	No significant risk identified					
13.	Fire/Explosion identified	No significant risk					
14.	Environmental Impact	Need to maintain flora along roadside	Wattle and other species likely to create a need for on-going maintenance	Restricted vision results	None	Ensure flora species low in height growth and low in maintenance	A.P.
15.	Utilities and Services	No significant risk identified					
...	...	...					
19.	Inspection and Testing	No significant risk identified					

No.	Guideword	Risk Issue	Causes	Consequences	Safeguards	Action	Person Resp.
20.	Maintenance	Minimising maintenance requirements generally means minimising OHS risks	Need to regularly maintain equipment	Injury - Maintenance worker hit by vehicle	PPE	Guideposts, signs and markings are to be selected with consideration of future OHS risks in carrying out repairs and replacement	
21.	Documentation	Final documentation to contain audit of completed actions in all design safety risk reports	Design safety action not acted upon	Design does not achieve safety risks levels which are as low as reasonably practicable	N/A	Produce completed audit report one month prior to agreed construction date	R.T.
22.	Quality Control	No significant risk identified					

5. CHAIR-3 EXAMPLE ONLY

DETAILED MAINTENANCE / REPAIR SAFETY IN DETAILED DESIGN (CHAIR-3) STUDY				Reference:
System: ROADWAY	**Sub-System:**		**Item/Component:**	DRAIN

Maintainability Aspect	Assessment	(Good, Fair, Poor, N/A) and WHY	Recommendation/Comment	Who/Date
POSTURE / MANUAL HANDLING	GOOD	Drain cover will have handles and should be lightweight	Satisfactory	—
SIZE / WIDTH	POOR	Construction vehicle may have limited shoulder space to stop on road	Widen shoulder width to allow for safe stopping during maintenance work	D.F.
ACCESS / EGRESS	POOR	Current drain design is that it is a confined space, and that confined space procedures need to be prepared	Drain design should avoid where possible the need to be classed as a confined space	D.F.
HEIGHTS / DROPPED OBJECTS	N/A	—	—	—
WEIGHT	FAIR	Drain cover could be too heavy	Ensure drain cover design such that it can be easily lifted	P.B.
DISCOMFORT / STRESS	FAIR	Do not expect long term drain maintenance	Satisfactory	—
PERSONNEL PROT. EQUIPMENT	N/A	—	—	—
VISIBILITY	N/A	—	—	—
SLIPS, TRIPS, FALLS	N/A	—	—	—
ROTATING / MOVING EQUIPMENT	N/A	—	—	—
IS REPAIR DIFFERENT?	NO	—	—	—
OTHERS THAT MAY APPLY (list below)				
None identified				

6. case study 1 kilpatrick green

Kilpatrick Green Pty Ltd agreed to pilot the resource CHAIR - the Construction Hazard Assessment Implication Review when they renovated seven of Sydney's churches. Their expectations were far exceeded when they undertook the process which brought together the key design stakeholders to systematically address the OHS issues and workshopped safety solutions for the contractors carrying out the renovations works, for the end user and in relation to ongoing maintenance.

Kilpatrick Green is a leading multi-discipline company offering a significant range of services within the construction and engineering industry. The organisation is committed to providing a high standard of service delivery in all projects with which it is associated.

Safety is one of the company's top priority areas incorporating consistent safety promotion, safety induction and training, hazard and risk management, good communication of issues, workplace inspections, auditing of the safety system and support for safety initiatives.

In 1999, Kilpatrick Green was commissioned by the Commonwealth to insulate seven churches against aircraft noise, some of these churches were heritage listed buildings. A new safety initiative being piloted at the time was "CHAIR - the Construction Hazard Assessment Implication Review", a methodology developed to eliminate or minimise potential occupational health and safety hazards and risks at the conceptual design phase.

"We volunteered to pilot CHAIR, but with stringent safety management policy and practices already in place, expectations of the ability of the CHAIR process to raise OHS standards further weren't really all that high", said Charles Diamond, Director of Public Buildings, who was responsible for implementing the CHAIR process.

Charles was assisted by the author of CHAIR, Mr David F. Franklin, originally a senior project manager with BHP, now CH2MHILL.

The Preparation

Prior to the workshop, Charles familiarised himself with the church plans and CHAIR Guidewords, worked out the most effective way to implement the process, a method to record and delegate outcomes was prepared and compiled folders with background information for each of the participants. Both he and David agreed that the Chair-1 Study and Chair-2 Study Guidewords were relevant to this project and a method to record and delegate outcomes was prepared.

To ensure that OHS was addressed for all aspects of the renovations, each of the plans were divided into seven areas: church operations, roof, general building works, windows/doors, mechanical services, electrical services and the site.

The Chair Workshop - Keeping Up the Momentum

The key design stakeholders attending the workshops included the concept designers, architects, mechanical engineer, electrical

engineer, structural engineer and project manager. Each of the churches also appointed its own representative (in some cases this was a consultant) to participate in the process. Charles was appointed as the facilitator.

David attended the first workshop, the CHAIR-1 study, and gave his input into how the workshops should proceed, particularly in relation to keeping up the momentum.

The Chair Workshops

The first hour was spent on introductions and giving an overview of the CHAIR process and document. The group then generally visited the church sites before commencing the CHAIR workshop. One workshop was actually held in the relevant church.

After workshopping OHS issues on three churches and going through the guidewords seven times for each, it became evident that this would be "too laborious and drawn out" and the process was simplified into three areas: above the roof, below the roof and underground. A common set of OHS risks had emerged by about the fourth church.

Solutions

OHS risks and hazards for contractors carrying out the renovations, end user and maintenance of the facility were addressed, prompted by the Guidewords. Some of the solutions determined in the workshops included:

- Construction on renovations to be carried out around church operating times when services were held on Sundays and Wednesdays.
- Two churches had to address public access and safety as the church was situated in the grounds of primary schools.
- Safety harnesses were to be worn by builders on roofs until insulation mesh was put in place - to prevent any falls through the ceiling.
- Overhead wiring was to be assessed to ensure the safe use of the cherry picker at all sites.
- Negotiations with owners were made for the placement of the main switchboards to the safest location to optimise a safe maintenance environment.
- Suitable checks were arranged for any toxicity problems under floors and dust arising from works.

Approximately thirty similar issues were identified.

The process took up to approximately three and a half hours for each church.

CHAIR-2 study workshops were also conducted and OHS issues were addressed by the CHAIR-2 study Guidewords. The minutes recorded in the CHAIR-1 workshop were also reviewed to ensure that no issues had been overlooked. Due to the intensive work undertaken in the first workshop, this process took only an hour.

Closure

"By eighty percent of the completion of Documentation process, all issues in either CHAIR 1 or CHAIR 2 were formally closed off. That is, they were either confirmed as included in the documents or reasons given as to why not included", Charles said.

The CHAIR Conclusion

"It was a real benefit having all the key players come together for this process. CHAIR made you think outside your own square and

everyone could contribute to the outcomes and recommendations. This Process certainly far exceeded our expectations. The owners were enthusiastic about the process as it increased their awareness of the issues and gave them confidence that the work on their churches were being properly planned and managed".

6. case study 2 john holland

When John Holland Construction and Engineering Pty Ltd were recently awarded a contract to construct a multimillion dollar construction project, they chose to apply the CHAIR principle to identify, eliminate and minimise OH&S hazards in the concept design stage of the project. By undertaking this systematic process involving all the key stakeholders, they were able to eliminate or minimise potential hazards through improved design before construction. The result was an overall "better" design for contractors building the project, the end user and maintenance of the facility.

Introduction

John Holland is one of Australia's leading construction and engineering organisations. Their field of specialisation ranges from marine and harbour works, Mining infrastructure, petrochemical, treatment plants to sports stadiums, highways, bridges, laboratories, railways and more.

Establishing and maintaining a high standard of occupational health and safety has always been a top priority for the company and accordingly, risk assessments and safety management practices are initiated for all John Holland projects.

In one of their more recent projects, the company chose to use the "Construction Hazard Assessment Implication Review (CHAIR)" tool, developed for the Construction MOU, to bring together key design stakeholders. The tool was used to facilitate a brainstorming workshop to review the project conceptual design and identify potential OHS hazards for the construction process, end users and ongoing maintenance and repairs.

The facilitator - the key

The company's Occupational Health, Safety and Rehabilitation Manager, Sean Welsh was appointed to co-ordinate the CHAIR principle workshop. Sean said, "The key to a successful CHAIR workshop was in the selection of the facilitator. It is essential that the facilitator has a background of building and construction and a very thorough knowledge of OH&S, maintenance and repair issues so that potential problems can be immediately identified and altered to result in an improved design".

Ross Trethewy, an expert in OHS for Building and Construction from the University of New South Wales School of Safety Science, was selected as the facilitator.

Preparing for the Workshop

Sean and Ross undertook a half day preparation for the workshop which included key design aspects of the project. During this time they familiarised themselves with the plans, drawings and specifications, selected the CHAIR techniques (i.e. a CHAIR 1, 2 or 3) that were relevant to the requirements and compiled a method of recording and reporting the workshop outcomes and issues to be resolved.

Both agreed that the most effective way for them was to address potential OH&S hazards was to assess one element at a time continually posing the question - why?

For example, if a door was designed in the plan, the group workshop participants had to decide why it was there, if it was the right size/position/height/width, if it opened the right way, in if it was in the right place for it's intended purpose and so on. If a risk was identified, the group then brainstormed solutions using the theory of the hierarchy of risk control, but at the same time keeping as close as possible to the original design as possible where practicable.

The workshop process analysed elements, i.e. major and minor, using this criteria, one floor level at a time.

They devised a minute recording as follows:

No.	Hazard Issue/s	Causes / Identified Hazards (position / location / size / weight etc.)	Why ? (the reason for it being this way)	Alternatives / Suggestions / Issues	By Who Comments	Implications	+/- ($)	Benefits Who O/M/C
1.0	Element being Assessed: Production Hall - Artificial and Natural Light							
1.1	Maintaining service at or above truss level; Changing and servicing light fittings; Inspection/Test of fire detectors (monthly	Access required at > 10m falls, falling objects Access required over process plant/people Interface, disruption, damage to process equipment Truss arrangement Restricted access due to truss depth of approx. 2.5m	Lights have to above Gantry Crane Gantry required at height to gain appropriate clearances for materials handling in production hall Fire detector required at highest point of roof structure Truss design light weight, architectural	Provide independent access gantry for maintaining lights and ceiling mounted services. (winch / platform); or Side mount lights and reflect with mirrors; or Drop down lights Scissor / work-platform mounted on gantry to gain access Set position of lights and detectors Use scaffold Use Elevated Work Platform	Design Engineer	Gantry Mounted Scissor must provide access to all areas of the ceiling that require servicing - relocating services to achieve this maybe required. Scissor and Crane must comply with AS2550 and AS1481	-/+	Operators Maintenance
1.2	Cleaning Sky Lights Glass Insects Dust	Access at > 12.5m Falls / falling objects Trusses restrict access Crushing Access required over process plant/people Interface, disruption, damage to process equipment	Skylights are fixed; Artificial light is needed	Do not clean windows, insects, dust; Reversible windows and clean from external roof from fixed static line; Use scissor mounted on Gantry as above	Design Engineer Architect	Obtain appropriate level of weather seal; Maintain seal for HVAC system	-/+	Operators Maintainers

The Key Stakeholders

The group attending the workshop comprised of fourteen people. This included the client, the project manager, the people operating the plant, their safety people, the designers, architects and engineers- structural, mechanical and electrical, the company's builder's OH&S and Rehabilitation manager and the facilitator.

To prepare, each participant was requested to read through and familiarise themselves with their relevant design contributions and the CHAIR Guidewords. These guidewords list potential hazard risks and hazards at the construction phase and for ongoing maintenance and repairs - a CHAIR 1 & 3.

The Chair Study Workshop

Sean had also identified that there was a need to break down the conception that the CHAIR process was not going to change the design but rather to improve the design.

At the start of the workshop, he used the example "if the architect has designed a rounded roof, then we need to look at all the options so we can keep that design but at the same time ensure that it is workable from an occupational health and safety point of view. This may mean altering the design of the gutters, or designing out the gutters, so OH&S risks are eliminated/minimised when it comes to future maintenance and repairs".

The actual workshop was conducted at the conceptual design stage and took a total of ten "intensive" hours.

To be effective, it "was important to maintain the group's interest and momentum by moving through the relevant issues and not becoming enveloped in single side issues. This was why the choice of facilitator was so important".

By going through this process they were actually able to identify over one hundred hazards ranging from medium to high risk that could possibly have been overlooked.

Some of the results included: widening of corridors, replacement of standard single doors with an additional 1/4 door for ease of access with furniture and equipment, repositioning lights so that they could become more accessible for maintenance, some windows were redesigned so that they could flip over and be maintained and cleaned from the inside, the air conditioner was moved down a level although the duct remained in the same position, again for easier maintenance, and an elevated work platform was included for maintenance repairs.

Often the "Rolls Royce choice" of equipment was selected for lifecycle and long term safety considerations. Cost benefits were realised when these ongoing maintenance issues were addressed. All the risks and solutions that were identified in the workshop were recorded and distributed for to the relevant parties to nominated to action them further.

Other end user related issues also emerged throughout the process and included the client's realisation that there had been no consideration for rubbish storage and disposal, another, identified a significant manual handling hazard associated with the use of the structure.

The Benefits of Chair

According to Sean "significant benefits emerged from the process. In particular participants were forced to think outside their own sphere of expertise and how their design decisions impacted on other stakeholders. Participants were unanimous in their praise of the benefits of the process as the day evolved.

It is reassuring that the culture of organisations is changing. Ten years ago a builder would erect and then remove a scaffold. Now where appropriate planning has occurred in the design stage they are most likely to build in permanent access structures to not only utilize in the construction process but to provide for safety in maintenance and repairs. Systematic processes, such as CHAIR, assist in integrating OHS in the planning and design stages of a project. The CHAIR study highlighted that benefits can be cost effective and may even provide substantial savings over the life of a project whilst at the same time provide for better safety for contractors, end users and maintenance workers through creating a "safe place of work" rather than being reliant on the "safe person at work".

It certainly is a value added process for the client and the builder."

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8. the guidewords

CHAIR introduction

CHAIR

PHASES 1, 2 & 3

"CONSTRUCTION HAZARD ASSESSMENT AND IMPLICATION REVIEW"

MOU 2000: SAFETY IN DESIGN FRAMEWORK FOR MAJOR BUILDING & CIVIL PROJECTS

Construction, Maintenance, Repair and Demolition

What is a CHAIR?

- A Construction Hazard Assessment and Implication Review is a detailed and systematic examination of the construction, maintenance, repair and demolition safety issues associated with a design.
- It considers how design features have been incorporated to eliminate or mitigate potential construction hazards.
- the assessment assumes a certain level of safety management to exist at the construction site - it is a supplement to, and not a replacement of, site specific construction safety reviews.

CHAIR-1 STUDY

CHAIR-1 is a conceptual design review that examines the various elements of a design using two types of guidewords:

- Generic (applicable to each element in most cases regardless of the type of design) and
- Overview (used when considering issues that relate to the whole process)

CHAIR-2 STUDY

CHAIR-2 is a construction or demolition review performed when the detailed design is essentially complete but before the commencement of construction.

A set of guidewords (with sub-prompts) are used to assess the proposed main construction steps (rather than the design elements).

CHAIR-3 STUDY

CHAIR-3 is a maintenance and repair review performed when the detailed design is essentially complete.

A set of guidewords are applied to each element of the proposed design to ensure that maintenance and repair issues have been thoroughly considered.

Why do a CHAIR?

- A SMARTER DESIGN IS ALSO A SAFER DESIGN
- improved "constructability"
- less re-work during construction
- improved "maintainability"
- better understanding of the design by client, designer and constructor and owner

How are CHAIR's performed?

- By systematically considering in turn each element of design (CHAIR-1, CHAIR-3) or each step of the proposed construction task (CHAIR-2)
- By using a series of different CHAIR-1, CHAIR-2 and CHAIR-3 guidewords to prompt discussions by the CHAIR study team

Use of Guidewords

For each element of the design, each guideword is systematically considered and the following questions should be asked:

- (How) can it happen?
- If so, how ?
- So what?
- What do we need to do?

CHAIR Study Rules

- allow each person to be heard (respect the individual)
- focus only on the design component at hand
- no "witch hunts" or "barrow pushing"
- if issue cannot be resolved in 5 minutes, document and assign to someone for follow-up after the meeting

CHAIR 1

Summary of CHAIR-1 Study Guidewords - Generic

Summary of CHAIR-1 Study Guidewords - Overview

Sample CHAIR-1 Minute Recording Sheet

CHAIR-1 Study Guidewords - Generic

CHAIR-1 Study Guidewords - Overview

SUMMARY - CHAIR 1 - STUDY GUIDEWORDS - GENERIC

CARD NUMBER	GUIDEWORD	SUB-PROMPTS	CARD NUMBER	GUIDEWORD	SUB-PROMPTS
Chair 1. Generic 2	SIZE	Too large Too small Too long Too short Too wide Too narrow	Chair 1. Generic 7	LOAD / FORCE	High / Excess Low insufficient Additional loads (construction) Dynamics Temporary Weakness
Chair 1. Generic 3	HEIGHTS / DEPTHS	Working at heights Falls / struck by falling objects Scaffolding (shape, space to fit) Confined space Access / egress	Chair 1. Generic 8	ENERGY	Low / high energy Tension / compression Potential / kinetic Inertia / moment
Chair 1. Generic 4	POSITION / LOCATION	Too high Too low Too far Misaligned Wrong position	Chair 1. Generic 9	TIMING	Too late, too early Too short, too long Incorrect sequence Extended delays
Chair 1. Generic 5	POOR ERGONOMICS	Posture / manual handling RSI / discomfort / fatigue / stress Effect on PPE Visibility (lighting slightlines) Slips, trips, falls	Chair 1. Generic 10	EGRESS / ACCESS	No. of exit points Emergency egress, size Obstructions, lighting Entry / exit points External Impacts Maintenance People and Equipment Movements
Chair 1. Generic 6	MOVEMENT / DIRECTION	Stability Compression Physical damage Vibration Friction / slip Rotation Upwards / Downwards Reverse Expansion / Tension Rollover	Chair 1. Generic 11	MAINTENANCE / REPAIR	Posture / Manual Handling Size / Width Access / Egress Heights / Dropped Objects Weight Discomfort / Stress / PPE Visibility / Slips / Trips Rotating Equipment Other

SUMMARY - CHAIR 1 - STUDY GUIDEWORDS - OVERVIEW

CARD NUMBER	GUIDEWORD	SUB-PROMPTS	CARD NUMBER	GUIDEWORD	SUB-PROMPTS
Chair 1. Overview 2	ENVIRONMENTAL CONDITIONS	Extreme Weather Temperature Ground Noise Water	Chair 1. Overview 9	SAFETY EQUIPMENT	Personnel Protection Safety Showers Barriers / Guards
Chair 1. Overview 3	EXTERNAL SAFETY INTERFACES	Members of the public Traffic Adjacent Property Power / services External fire / plans Day / night / weekend	Chair 1. Overview 10	NATURAL HAZARDS	Earthquake Flooding Thunderstorm (lightning protection) High Winds
Chair 1. Overview 4	TOXICITY	Lead / Asbestos Handling Precautions Ventilation	Chair 1. Overview 11	INSPECTION / TESTING	Eliminating Isolation Access
Chair 1. Overview 5	FIRE / EXPLOSION	Prevention / detection Fire protection Emergency procedures	Chair 1. Overview 12	DEMOLITION	Ease Issues Documentation
Chair 1. Overview 6	ENVIRONMENTAL IMPACT	Vapour / dust Effluent / Noise Seepage / Waste	Chair 1. Overview 13	DOCUMENTATION	Operations Maintenance Inspection /Testing Sequence Emergency Records / Reports
Chair 1. Overview 7	UTILITIES & SERVICES	Lighting Air / Water Fuel / Electricity Oxygen / Water	Chair 1. Overview 14	QUALITY CONTROL	Inspection / Testing Quality Assurance
Chair 1. Overview 8	COMMISSION / STARTUP / SHUTDOWN	Requirements Sequence	Chair 1. Overview 15	CONSTRUCTION EQUIPMENT	Sequence Timing, Access

SAMPLE - CHAIR-1 - MINUTE RECORDING SHEET

Project: **Design Element:** **Date:**

Drawing(s)/Reference(s): **Revision:**

No.	Guideword	Risk Issue(s)	Causes	Consequences	Safeguards	Action(s)	Res. Person & Date Due

CHAIR-1 STUDY GUIDEWORDS

Generic

"Generic" guidewords should apply to most designs being considered – they represent the core guidewords for the CHAIR-1 study framework.

The guidewords are applied to the individual elements of the design, the focus being on how the guideword may apply to the element during the construction process.

SIZE

- TOO LARGE
- TOO SMALL
- TOO LONG
- TOO WIDE
- TOO SHORT
- TOO NARROW

HEIGHTS / DEPTHS

- WORKING AT HEIGHTS
- FALLS / STRUCK BY FALLING OBJECTS
- SCAFFOLDING (SHAPE, SPACE TO FIT, etc.)
- CONFINED SPACE
- ACCESS/EGRESS

POSITION / LOCATION

- TOO HIGH
- TOO LOW
- TOO FAR
- MISALIGNED
- WRONG POSITION

POOR ERGONOMICS

- Posture / manual handling injuries
- Repetitive Strain Injury / discomfort / fatigue / stress
- Effect of Personal Protective Equipment
- Visibility (lighting, sightlines, blind spots)
- Slips, trips, falls

MOVEMENT / DIRECTION

- STABILITY COMPRESSION
- PHYSICAL DAMAGE
- VIBRATION
- FRICTION / SLIP
- ROTATION
- UPWARDS
- DOWNWARDS
- REVERSE
- EXPANSION / TENSION
- ROLL OVER

LOAD / FORCE

- HIGH / EXCESS
- LOW / INSUFFICIENT
- ADDITIONAL LOADS DURING CONSTRUCTION, COMMISSIONING, DEMOLITION
- DYNAMICS
- TEMPORARY WEAKNESS (insufficient propping)

ENERGY

- LOW / HIGH ENERGY
- TENSION / COMPRESSION
- POTENTIAL / KINETIC
- INERTIA / MOMENT

TIMING

- TOO LATE, TOO EARLY
- TOO SHORT, TOO LONG
- INCORRECT SEQUENCE
- EXTENDED DELAYS
  (e.g. capping partial designs)

EGRESS / ACCESS

- NO. OF EXIT POINTS
- EMERGENCY EGRESS
- SIZE - WIDTH, HEIGHT, LENGTH
- OBSTRUCTIONS
- LIGHTING
- PEOPLE AND EQUIPMENT MOVEMENTS
- ENTRY/EXIT POINTS
  - LOCATION
  - ARRANGEMENT
- EXTERNAL IMPACTS
- MAINTENANCE

MAINTENANCE / REPAIR

- POSTURE / MANUAL HANDLING
- SIZE / WIDTH
- ACCESS / EGRESS HEIGHTS /
- DROPPED OBJECTS
- WEIGHT
- DISCOMFORT / STRESS / PPE (Protective Equipment)
- VISIBILITY / SLIPS / TRIPS
- ROTATING EQUIPMENT
- OTHER?

CHAIR-1 STUDY GUIDEWORDS

Overview

The purpose of the "Overview" guidewords is to consider the proposed design as a whole and determine whether there are any particular issues that need to be addressed.

ENVIRONMENTAL CONDITIONS

- EXTREME WEATHER (Wind, Rain, Hail, Light)
- TEMPERATURE (Hot, Cold, Heat, Fire)
- GROUND (GEOTECH properties, contamination, etc.)
- NOISE
- WATER
- ???

EXTERNAL SAFETY INTERFACES

- MEMBERS OF THE PUBLIC
- TRAFFIC
- ADJACENT PROPERTY / BUILDINGS
- POWER / SERVICES LOCATIONS
- EXTERNAL FIRE / EMERGENCY PLANS
- DAY / NIGHT, WEEKDAY / WEEKEND

TOXICITY

- LEAD / ASBESTOS
- HANDLING PROCEDURES
- PRECAUTIONS
- VENTILATION

FIRE / EXPLOSION

- PREVENTION SYSTEMS
- DETECTION SYSTEMS
- FIRE PROTECTION
- EMERGENCY ISOLATION SYSTEMS
- INERT ATMOSPHERE
- EMERGENCY PROCEDURES

ENVIRONMENTAL IMPACT

- VAPOUR EMISSIONS
- DUST EMISSIONS
- EFFLUENT
- NOISE
- GROUND SEEPAGE
- WASTE MINIMISATION

UTILITIES AND SERVICES

- LIGHTING
- AIR / WATER
- OXYGEN
- WATER

COMMISSIONING / STARTUP / SHUTDOWN

- REQUIREMENTS
- SEQUENCE

SAFETY EQUIPMENT

- PERSONNEL PROTECTION
- SAFETY SHOWERS
- BARRIERS/GUARDS

NATURAL HAZARDS

- EARTHQUAKE
- FLOODING
- THUNDERSTORM (LIGHTNING PROTECTION)
- HIGH WINDS

INSPECTION AND TESTING

- ELIMINATING
- ISOLATION
- ACCESS
- INSPECTION AND TESTING

DEMOLITION

- EASE
- ISSUES
- DOCUMENTATION

DOCUMENTATION

- OPERATIONS
- MAINTENANCE
- INSPECTION AND TESTING
- SEQUENCE
- EMERGENCY
- SAFETY RISK RECORDS / REPORTS

QUALITY CONTROL

- INSPECTION AND TESTING
- QUALITY ASSURANCE

CONSTRUCTION EQUIPMENT

- SEQUENCE
- TIMING, ACCESS

CHAIR 2

Summary of CHAIR-2 Study Guidewords

Sample CHAIR-2 Minute Recording Sheet

CHAIR-2 Study Guidewords

SAMPLE - CHAIR-2 - STUDY GUIDEWORDS

Construction Based Guidewords

Card Number	Guidword	Sub-Prompts	Card Number	Guidword	Sub-Prompts
CHAIR 2.2	ELIMINATE	Falls (of people) Falling material / objects Stepping on or striking against objects Caught or trapped Lifting and carrying - over exertion Asphyxiation / drowning Machinery Electricity Transport / mobile plant Toxicity, Fires and Explosions	CHAIR 2.5	AVOID	Construction/Lifting Sequence Timing / Locations Temporary Instability Access / Egress Delays / Confined Space Erection / Dismantling Heat / Cold / Noise
CHAIR 2.3	SUBSTITUTE	Falls (of people) Falling material / objects Stepping on or striking against objects Caught or trapped Lifting and carrying - over exertion Asphyxiation / drowning Machinery Electricity Transport / mobile plant Toxicity, Fires and Explosions	CHAIR 2.6	OTHER ISSUES?	Modification Isolation / engineering controls Personnel Protective Equipment Alter / rearrange Increase / reduce Simplify /Improve
CHAIR 2.4	COMBINE	Construction / Lifting Sequence Timing Locations			

SAMPLE - CHAIR-2 - MINUTE RECORDING SHEET

Project: **Construction Step:** **Date:**

Drawing(s)/Reference(s): **Revision:**

No.	Guideword	Risk Issue(s)	Causes	Consequences	Safeguards	Action(s)	Res. Person & Date Due

CHAIR-2 STUDY GUIDEWORDS

The purpose of the CHAIR-2 guidewords is to stimulate discussion on improving the proposed construction method by making modifications to the design.

ELIMINATE

- Falls (of people)
- Falling material / objects
- Stepping on or striking against objects
- Caught or trapped
- Lifting and carrying - over exertion
- Asphyxiation / drowning
- Machinery
- Electricity
- Transport / mobile equipment
- Toxicity, Fires and Explosions

SUBSTITUTE

- Falls (of people)
- Falling material / objects
- Stepping on or striking against objects
- Caught or trapped
- Lifting and carrying - over exertion
- Asphyxiation / drowning
- Machinery
- Electricity
- Transport / mobile equipment
- Toxicity, Fires and Explosions

COMBINE

- Construction / Lifting Sequence
- Timing
- Locations

AVOID

- Construction / Lifting Sequence
- Timing / Locations
- Temporary Instability
- Access / Egress
- Delays / Confined Space
- Erection / Dismantling
- Heat / Cold / Noise

OTHER ISSUES?

- Modification
- Isolation
- Engineering Controls
- Personnel Protective Equipment
- Alter / rearrange
- Increase / reduce
- Simplify
- Improve

CHAIR 3

Summary of CHAIR-3 Study Guidewords

CHAIR-3 Worksheet

CHAIR-3 Study Guidewords

CHAIR-3 WORKSHEET

DETAILED MAINTENANCE / REPAIR SAFETY IN DETAILED DESIGN (CHAIR-3) STUDY				Reference:	
System:		**Sub-System:**		**Item/Component:**	
Maintainability Aspect	**Assessment**	**(Good, Fair, Poor, N/A) and WHY**		**Recommendation/Comment**	**Who/Date**
POSTURE / MANUAL HANDLING					
ACCESS / EGRESS					
HEIGHTS / DROPPED OBJECTS					
WEIGHT					
DISCOMFORT / STRESS					
PERSONNEL PROT. EQUIPMENT					
VISIBILITY					
SLIPS, TRIPS, FALLS					
ROTATING / MOVING EQUIPMENT					
IS REPAIR DIFFERENT?					
OTHERS THAT MAY APPLY (list below)					

CHAIR-3 STUDY GUIDEWORDS

The purpose of the CHAIR-3 guidewords is to stimulate discussion on improving the maintenance and repair of the proposed design when it is in its operating phase.

POSTURE / MANUAL HANDLING

ACCESS / EGRESS

HEIGHTS / DROPPED OBJECTS

WEIGHT

DISCOMFORT / STRESS

PERSONNEL PROTECTION EQUIPMENT

VISIBILITY

SLIPS, TRIPS, FALLS

ROTATING / MOVING EQUIPMENT

IS REPAIR DIFFERENT?

OTHER ISSUES THAT MAY APPLY?

additional CHAIR study guidewords

CHAIR STUDY GUIDEWORDS

Additional

The purpose of the "Additional" guidewords section is to emphasise that other issues may exist that need to be considered, and the CHAIR facilitator should consider if these are best covered with additional guidewords prior to the workshop.

However, too many guidewords may devolve the process into a laborious checklist exercise, which can restrict the "brainstorming process".

- _____
- _____
- _____
- _____

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Appendix H

Planning NSW Conditions of Consent

DETERMINATION OF A DEVELOPMENT APPLICATION FOR STATE SIGNIFICANT AND INTEGRATED DEVELOPMENT UNDER SECTION 80 OF THE ENVIRONMENTAL PLANNING AND ASSESSMENT ACT, 1979

I, the Minister for Infrastructure and Planning, under Section 80 of the *Environmental Planning and Assessment Act 1979* ("the Act"), determine the development application ("the Application") referred to in Schedule 1 by granting consent subject to the conditions set out in Schedule 2.

The reason for the imposition of conditions is to:

a) minimise any adverse environmental impacts associated with the development;
b) provide for the on-going environmental management of the development; and
c) provide for regular monitoring and reporting on the development.

Craig Knowles MP
Minister for Infrastructure and Planning
Minister for Natural Resources

Sydney, 2003 File No. S02/01719

SCHEDULE 1

Application made by:	Blue Circle Southern Cement Limited ("the Applicant');
To:	The Minister for Planning;
In respect of:	Lot 1 DP 582277, Lot 2 DP 774598, Lot 22 DP 582276, Lot 100 DP 882139, Taylor Avenue, New Berrima, Wingecarribee local government area;
For the following:	The upgrade of Kiln 6 and associated works at the existing cement works ("the development") as described in *Berrima Kiln 6 Upgrade Project – Statement of Environmental Effects* prepared by Olsen Environmental Consulting and dated November 2002, and includes the following: • increase in the output of Kiln 6 from 0.98 Mtpa to approximately 1.35 Mtpa;

- installation of a raw mill with dust collector and second preheater string with pre-calciner and tertiary air duct;
- modification to the raw materials reclaim system;
- widening of the cooler bed and upgrade of the heat exchanger and cooler dust collection;
- replacement of the clinker handling conveyor;
- upgrade of the coal mill capacity;
- intermittent use of existing Kiln 5 during periods of Kiln 6 maintenance, shut-down and during high production demands;

Development Application: Integrated DA No. 401-11-2002-i, lodged with the Department of Planning on 22 November 2002, accompanied by *Berrima Kiln 6 Upgrade Project – Statement of Environmental Effects* prepared by Olsen Environmental Consulting and dated November 2002;

State Significant Development: Under section 76A(7) of the Act, the proposed development is classified as State significant development because it is a type of development (minerals processing) listed in Schedule 1 of *State Environmental Planning Policy No. 34 – Major Employment-Generating Industrial Development* and has a capital investment in excess of $20 million.

BCA Classification: Class 8 – HV/LV Switchroom, rawmill building, gas conditioning plant, second pre-heater tower, switchroom for second pre-heater tower, tertiary air duct, coal milling switchroom, coal milling and firing upgrade, cooler heat exchanger, cooler baghouse, cooler switchroom, and clinker conveyor AF05

Note:

1) To ascertain the date upon which this consent becomes effective, refer to section 83 of the Act
2) To ascertain the date upon which this consent is liable to lapse, refer to section 95 of the Act.
3) If the Applicant is dissatisfied with this determination, section 97 of the Act grants him or her a right of appeal to the Land and Environment Court, which is exercisable within 12 months of receiving notice of this determination.

SCHEDULE 2

In this consent, except in so far as the context or subject-matter otherwise indicates or requires, the following terms have the meanings indicated:

Act	*Environmental Planning and Assessment Act, 1979*
AEMR	Annual Environmental Management Report
Applicant	Blue Circle Southern Cement Limited
BCA	Building Code of Australia
cement works	existing development on the site as at the date of this consent
cement works upgrade	the development to which this consent applies
construction	any activity requiring a Construction Certificate, the laying of a slab or significant excavation work
Council	Wingecarribee Shire Council
dB(A)	decibel (A-weighted scale)
Department	NSW Department of Urban and Transport Planning
Director-General	Director-General of the NSW Department of Urban and Transport Planning, or delegate
DLWC	NSW Department of Land and Water Conservation
dust	any solid material that may become suspended in air or deposited
SEE	Statement of Environmental Effects for the upgrade to Kiln 6 entitled *Statement of Environmental Effects – Berrima Kiln 6 Upgrade Project*, dated November 2002 and prepared by Olsen Environmental Consulting.
EPA	NSW Environment Protection Authority
EPL	Environment Protection Licence issued under the *Protection of the Environment Operations Act, 1997*
$L_{Aeq\ (15\ minute)}$	equivalent average sound pressure level that is measured over a 15 minute period
Minister	NSW Minister for Infrastructure and Planning, or delegate
Mtpa	Million tonnes per annum
operation	any activity that results in the production, or intended production of commercial quantities of cement clinker after commissioning of the cement works upgrade
Principal Certifying Authority	the Minister or an accredited certifier, appointed under section 109E of the Act, to issue a Part 4A Certificate as provided under section 109C of the Act
Regulation	*Environmental Planning and Assessment Regulation, 2000*
site	the land to which this consent applies

1. GENERAL

Obligation to Minimise Harm to the Environment

1.1 The Applicant shall implement all practicable measures to prevent or minimise any harm to the environment that may result from the construction and operation of the cement works upgrade.

Scope of Development

1.2 [1]The Applicant shall carry out the development generally in accordance with:

a) Development Application No. 401-11-2002-i, lodged with the Department of Planning on 22 November 2002;
b) *Berrima Kiln 6 Upgrade Project – Statement of Environmental Effects*, dated November 2002 and prepared by Olsen Environmental Consulting;
c) *Noise Impact Assessment for Kiln 6 Upgrade Project*, dated 4 November 2002 and prepared by Hatch Associates Pty Limited;
d) *Air Quality Review – New Berrima Plant, Number 6 Kiln Upgrade*, dated 19 November 2002 and prepared by Holmes Air Sciences;
e) additional information supplied to the Department by the Applicant regarding noise, air and water dated 22 January 2003;
f) additional information supplied to the Department by the Applicant regarding the design of the second pre-heater tower dated 4 February 2003;
g) additional information supplied to the Department by the Applicant regarding air and noise dated 13 February 2003;
h) additional information supplied to the EPA by the Applicant regarding discharge points from Lake Quality dated 4 March 2003 and forwarded to the Department by the Applicant on 31 March 2003; and
i) the conditions of this consent.

In the event of an inconsistency between a condition of this consent and the documents listed under a) and h) above, the condition of consent shall prevail to the extent of the inconsistency.

1.3 The Applicant shall operate the cement works upgrade to meet the following requirements:

a) the upgraded Kiln 6 is to be utilised as the primary and principal kiln on the site, subject to shut-down and maintenance requirements;
b) Kiln 5 may be utilised as a secondary, back-up kiln during shut-downs, maintenance and periods of clinker demand above the maximum capacity of the upgraded Kiln 6;
c) the production capacity of the upgraded Kiln 6 is to be limited to ensure that the maximum clinker production capacity of the combined upgraded Kiln 6 and Kiln 5 does not exceed 1.560 million tonnes per annum (rolling annual average); and
d) any other combination of production capacities through the upgraded Kiln 6 and Kiln 5 that may be agreed by the Director-General in writing, on a case-by-case basis, prior to the implementation of that production capacity regime. Any such regime will be constrained by the general scope of the development application for the cement works upgrade and subject the requirements of this consent (other than this condition) and the requirements of any Environment Protection Licence or other instrument applying to the cement works upgrade.

Note: The development application for the cement works upgrade has been assessed and determined as a non-designated development under Part 2, Schedule 3 of the *Environmental Planning and Assessment Regulation 2000*. That Part

[1] Incorporates an EPA General Term of Approval (A1)

requires that the cement works upgrade will not significantly increase the environmental impacts of the cement works as posed prior to the commencement of the cement works upgrade. Condition 1.3 aims to limit the impacts of the cement works, as upgraded in accordance with this consent, to reflect the intent of Part 2, Schedule 3 of the *Environmental Planning and Assessment Regulation 2000*. It is understood that should clinker demand increase significantly in future, the Applicant intends to investigate options to satisfy the increased demand without increased reliance on Kiln 5, as configured prior to the approval of the cement works upgrade.

1.4 [2]The scope of the cement works upgrade and the scope of this consent do not include the use of alternative fuels, being any material not currently used as kiln fuel on the site prior to the date of this consent.

Note: At the time of this consent, fuels including coal, natural gas, coke breeze and fuel oil were combusted in kilns on the site. It is noted that the Applicant was progressing the consideration of alternative fuels in kilns on the site at the time of this consent. While this consent does not explicitly preclude continued consideration of those alternative fuels, or any formulation of a future proposal by the Applicant to pursue the use of those fuels on site, an appropriate planning and assessment process would need to be undertaken in accordance with the *Environmental Planning and Assessment Act 1979* before the implementation of any alternative fuels proposal affecting the cement works upgrade could be commenced.

Provision of Documents

1.5 Where practicable, the Applicant shall provide all documents and reports required to be submitted to the Director-General under this consent in an appropriate electronic format. Provision of documents and reports to other parties, as required under this consent, shall be in a format acceptable to those parties and shall aim to minimise resource consumption.

Note: At the date of this consent, an appropriate electronic format for submission to the Director-General is the "portable document format" (pdf) or another format that may be readily converted to pdf.

Statutory Requirements

1.6 The Applicant shall ensure that all necessary licences, permits and approvals are obtained and kept up-to-date as required throughout the life of the cement works. No condition of this consent removes the obligation for the Applicant to obtain, renew or comply with such licences, permits or approvals.

Compliance

1.7 The Applicant shall ensure that all employees, contractors and sub-contractors are aware of, and comply with, the conditions of this consent. The Applicant shall be responsible for the environmental impacts resulting from the actions of all persons on the site, including any visitors.

1.8 Prior to the commencement of each of the events listed from a) to b) below, or within such period as otherwise agreed by the Director-General, the Applicant shall certify in writing, to the satisfaction of the Director-General, that it has complied with all conditions of this consent applicable prior to the commencement of that event.

[2] Incorporates an EPA General Term of Approval (O3.1)

Where an event is to be undertaken in stages, the Applicant may, subject to the agreement of the Director-General, stage the submission of compliance certification consistent with the staging of activities relating to that event. The events referred to in this condition are as follows:

a) construction of the cement works upgrade; and
b) operation of the cement works upgrade.

1.9 Notwithstanding conditions 1.8 of this consent, the Director-General may require an update on compliance with all, or any part, of the conditions of this consent. Any such update shall meet the reasonable requirements of the Director-General and be submitted within such period as the Director-General may agree.

1.10 The Applicant shall meet the requirements of the Director-General in respect of the implementation of any measure necessary to ensure compliance with the conditions of this consent, and general consistency with the SEE and those documents listed under condition 1.2. The Director-General may direct that such a measure be implemented in response to the information contained within any report, plan, correspondence or other document submitted in accordance with the conditions of this consent, within such time as the Director-General may agree.

2. CONSTRUCTION AND OCCUPATION CERTIFICATION

2.1 In relation to the construction and occupation of the cement works upgrade, the Applicant shall provide to the Director-General and Council the following:

a) written notification of the appointment of a Principal Certifying Authority;
b) copies of all Construction Certificates issued for the cement works upgrade;
c) written notification of the intention to commence construction work, to be received at least two working days prior to the commencement of construction. In the event that more than one Construction Certificate is issued, notification shall be provided prior to the commencement of construction the subject of each Certificate;
d) copies of all Occupation Certificates issued for the cement works upgrade; and
e) written notification of the intention to occupy all relevant components of the cement works for which an Occupation Certificate has issued, to be received at least two working days prior to occupation. In the event that more than one Occupation Certificate is issued, notification shall be provided prior to the occupation the subject of each Certificate.

Note: Part 4A of the *Environmental Planning and Assessment Act 1979* provides specific details of the Applicant's obligations in relation to construction certification and provides the overarching requirements in this regard. These requirements have been summarised and reproduced under condition 2.1 of this consent to highlight the need for this certification.

2.2 Prior to the commencement of any construction work associated with the cement works upgrade, the Applicant shall erect at least one sign at the site and in a prominent position at the site boundary where the sign can be viewed from the nearest public place. The sign shall indicate:

a) the name, address and telephone number of the Principal Certifying Authority;
b) the name of the person in charge of the construction site and telephone number at which that person may be contacted outside working hours; and
c) a statement that unauthorised entry to the construction site is prohibited.

The sign(s) shall be maintained for the duration of construction works.

3. ENVIRONMENTAL PERFORMANCE

Noise Impacts

3.1 Construction activities associated with the cement works upgrade shall only be carried out:

a) between 7:00 am and 6:00 pm, Monday to Friday inclusive, during periods in which the cement works is shut-down, and construction noise is audible at the boundary of the site;
b) between 7:00 am and 1:00 pm on Saturdays, during periods in which the cement works is shut-down, and construction noise is audible at the boundary of the site;
c) at no time on Sundays or public holidays, during periods when the cement works is shut-down, and construction noise is audible at the boundary of the site;
d) at any time during periods in which the cement works is in operation; and
e) at any time if construction noise is inaudible at the boundary of the site.

3.2 Subject to compliance with the requirements of this consent, the cement works upgrade may be operated 24 hours per day, 7 days per week.

3.3 [3]The Applicant shall design, construct, operate and maintain all new and upgraded components forming part of the cement works upgrade to ensure that for each receiver location listed in Table 1 below, the noise level at each receiver location does not exceed the maximum allowable noise contribution limit at the receiver location specified.

Table 1 – Maximum Allowable Noise Contribution Limit (dB(A))

Receiver Location	Day[a] $L_{Aeq(15\ minute)}$	Evening[b] $L_{Aeq(15\ minute)}$	Night[c] $L_{Aeq(15\ minute)}$
4 Melbourne Street	37	37	37
Chelsey Park Farm	30	30	30
Candowie Farm	37	37	37

a. Day is defined as the period from 7:00am to 6:00pm Monday to Saturday and 8:00am to 6:00pm on Sundays and public holidays.
b. Evening is defined as the period from 6:00pm to 10:00pm.
c. Night is defined as the period from 10:00pm to 7:00am Monday to Saturday and 10:00pm to 8:00am on Sundays and public holidays

Note: Noise contributions specified in Table 1 are to be interpreted as contributions from the new and upgraded components forming part of cement works upgrade only and not as noise limits for the site as a whole.

3.4 [4]The maximum allowable noise contributions identified in condition 3.3 apply under all meteorological conditions, except:

a) during wind speeds greater than $3ms^{-1}$ measured at 10 metres above ground level; or
b) during temperature inversion conditions of greater than 3^oC/ 100m and wind speeds of greater than $3ms^{-1}$ measured at 10 metres above ground.

[3] Incorporates EPA General Terms of Approval (L6.1 and L6.2)
[4] Incorporates an EPA General Term of Approval (L6.4)

3.5 [5]For the purpose of assessment of noise contributions specified under condition 3.3, noise from the cement works upgrade shall be:

a) measured at the most affected point on or within the receptor site boundary or at the most affected point within 30m of the dwelling (rural situations), where the dwelling is more than 30m from the property boundary; and
b) where applicable, subject to the modification factors provided in Section 4 of the *New South Wales Industrial Noise Policy* (EPA, 2000).

3.6 [6]Notwithstanding condition 3.5 of this consent, should direct measurement of noise from the site be impractical, the Applicant may employ an alternative noise assessment method deemed acceptable by the EPA (refer to Section 11 of the *New South Wales Industrial Noise Policy* (EPA, 2000)). Details of such an alternative noise assessment method accepted by the EPA shall be submitted to the Director-General prior to the implementation of the assessment method.

Air Quality Impacts

Dust Emissions

3.7 The Applicant shall design, construct, operate and maintain the cement works upgrade in a manner that minimises dust emissions from the site.

3.8 The Applicant shall take all practicable measures to ensure that all vehicles entering or leaving the site and carrying a load that may generate dust are covered at all times, except during loading and unloading. Any such vehicles shall be covered or enclosed in a manner that will prevent emissions of dust from the vehicle at all times.

3.9 All trafficable areas and vehicle manoeuvring areas on the site shall be maintained in a condition that will minimise the generation or emission of wind blown or traffic generated dust from the site at all times.

Discharge Limits

3.10 The Applicant shall design, construct, operate and maintain the cement works upgrade to ensure that for each discharge point listed in Table 2 below, the concentration of each pollutant listed for that discharge point does not exceed the maximum allowable discharge concentration limit for that pollutant at the discharge point specified. All concentration limits specified in the table are based on 101.3 kPa, 273 K, dry reference conditions and shall be determined in accordance with the monitoring requirements described under condition 4.1.

Table 2 - Monitoring Locations and Maximum Allowable Discharge Concentration Limits (Air)

EPA Identification Point	Pollutant	Units of Measure	Concentration Limit
2 – Main Exhaust Stack on Kiln No. 6[a]	Cadmium	mgm^{-3}	0.1
	Mercury	mgm^{-3}	0.1
	Hazardous substances	mgm^{-3}	1.0
	Nitrogen oxides	mgm^{-3}	1000
	Solid particles	gm^{-3}	0.15
8 – New Baghouse Outlet	Solid particles	mgm^{-3}	50

a. the location of this point is the same as that described in EPL No. 1698

[5] Incorporates an EPA General Term of Approval (L6.3)
[6] Incorporates an EPA General Term of Approval (L6.3)

Note: The Environment Protection Licence for the cement works may specify discharge concentration limits for other air emissions point on the site, outside the scope of this consent.

In addition to air pollutant concentration limits imposed under this consent and the provisions of any Environment Protection Licence (EPL) relevant to the cement works upgrade, the EPL also specifies load-based limits for pollutants emitted from the cement works as a whole.

Water Quality Impacts

3.11 [7]Except as may be expressly provided by a licence under the *Protection of the Environment Operations Act 1997* in relation to the cement works upgrade, section 120 of that Act (pollution of waters) shall be complied with in, and in connection with, the carrying out of the cement works upgrade.

Erosion and Sediment Control

3.12 All construction vehicles exiting the site, having had access to unpaved areas, shall depart via a wheel-wash facility.

3.13 All erosion and sedimentation controls required as part of this consent shall be maintained for the duration of the construction works, and until such time as all ground disturbed by the construction works, has been stabilised and rehabilitated so that it no longer acts as a source of sediment.

Site Drainage and Stormwater

3.14 The Applicant shall ensure that the cement works upgrade does not lead to an increase in the volume or flow rate of stormwater leaving the site over and above pre-development flow conditions.

Traffic and Transport Impacts

3.15 The Applicant shall establish a bus transport system generally consistent with that identified in section 6.9 of the SEE to transport construction employees to and from the site during the construction period.

3.16 The Applicant shall ensure that vehicles associated with the cement works upgrade do not stand or park on any public road or footpath adjacent to the site. Measures provided by the Applicant shall include sufficient parking for all employees and contractors during construction and operation of the cement works upgrade and management measures to ensure that heavy vehicles entering the site are not permitted to queue on Taylor Avenue at any time.

Waste Management Impacts

3.17 [8]The Applicant shall not cause, permit or allow any waste generated outside the site to be received at the site for storage, treatment, processing, reprocessing or disposal, or any waste generated at the site to be disposed of at the site, except as expressly permitted by a licence under the *Protection of the Environment Operations Act 1997*. For the purpose of this condition, "waste" does not include any material normally brought to the site for the purpose of cement clinker production (as detailed in the documents listed under condition 1.2 of this consent) or any material normally recycled or reused within the cement works or cement works upgrade.

[7] Incorporates an EPA General Term of Approval (L1.1)
[8] Incorporates an EPA General Term of Approval (L5.1 and L5.2)

Visual Amenity Impacts

3.18 The Applicant shall ensure that all external lighting associated with the cement works upgrade, and including those lights already erected, is mounted, screened, and directed in such a manner so as not to create a nuisance to surrounding properties or roadways. The lighting shall be the minimum level of illumination necessary and shall comply with *AS 4282(INT) 1995 – Control of Obtrusive Effects of Outdoor Lighting.*

3.19 The second pre-heater tower shall be designed, constructed, operated and maintained in a manner that minimises the visual impact to surrounding properties and roadways.

Note: The second pre-heater tower shall be built in a manner consistent with that described in the additional information provided (identified in condition 1.2 f)). This includes using the building materials identified and minimising the height of the pre-heater tower.

4. ENVIRONMENTAL MONITORING AND AUDITING

Air Quality Monitoring

4.1 [9]During operation of the cement works upgrade, the Applicant shall periodically determine the pollutant concentrations and emission parameters specified in 0 below, at the discharge points indicated and employing the sampling and analysis method specified. All pollutant concentrations and emission parameters for each discharge point shall be determined concurrently and at the frequency indicated in the table.

Table 3 - Discharge Point and Parameter Monitoring (Air)

Discharge Point	Pollutant/Parameter	Units of Measure	Frequency	Sampling Method[b]
Point 1[a] – Main exhaust stack on Kiln No. 5; and Point 2[a] – Main Exhaust Stack on Kiln No. 6	Cadmium	mgm^{-3}	Annual	TM-12, 13, 14
	Mercury	mgm^{-3}	Annual	TM-12, 13, 14
	Hazardous substances	mgm^{-3}	Annual	TM-12, 13, 14
	Nitrogen oxides	mgm^{-3}	Annual	TM-11
	Velocity	ms^{-1}	Annual	TM-2
	Volumetric flow rate	m^3s^{-1}	Annual	TM-2
	Temperature	^oC	Annual	TM-2
	Moisture content in stack gases	%	Annual	TM-22
	Dry gas density	kgm^{-3}	Annual	TM-23
	Molecular weight of stack gases	$g.gmole^{-1}$	Annual	TM-23
	Carbon dioxide in stack gases	%	Annual	TM-24
	Oxygen in stack gases	%	Annual	TM-25
Point 8 – New Baghouse Outlet	Solid particles	mgm^{-3}	Post commissioning	TM-15
	Velocity	ms^{-1}	Post commissioning	TM-2
	Volumetric flow rate	m^3s^{-1}	Post commissioning	TM-2
	Temperature	^oC	Post commissioning	TM-2
	Moisture content in stack gases	%	Post commissioning	TM-22
	dry gas density	kgm^{-3}	Post commissioning	TM-23

[9] Incorporates an EPA General Term of Approval (M2.1)

	Molecular weight of stack gases	g.gmole^{-1}	Post commissioning	TM-23
	carbon dioxide in stack gases	%	Post commissioning	TM-24
	oxygen in stack gases	%	Post commissioning	TM-25

a. the location of this point is the same as that described in EPL No. 1698
b. the Sampling Method shall be undertaken in accordance with the *Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales*

Note: The monitoring conditions for air quality required under this consent are in addition to those already specified under the EPL No. 1698.

4.2 [10]If the results of the monitoring required under condition 4.1 and EPL No. 1698 indicate that the operation of any component of the cement works upgrade, when operating under design loads and normal operating conditions, exceeds the limits imposed under condition 3.10 and EPL No. 1698, the Applicant shall provide details of remedial measures to be implemented to reduce air quality limits to the levels required.

Details of the remedial measures and a timetable for implementation shall be submitted to the Director-General for Approval within such period as the Director-General may require, and be accompanied by evidence that the EPA is satisfied that the remedial measures are acceptable.

Water Quality Monitoring

4.3 [11]During operation of the cement works upgrade, the Applicant shall determine the pollutant concentrations and discharge parameters specified in Table 4 below, at the discharge point indicated and employing the sampling and analysis method specified. All pollutant concentrations and discharge parameters for the discharge point shall be determined concurrently at the frequency indicated in the table.

Table 4 - Discharge Point Pollutant and Parameter Monitoring (Water)

Discharge Point	Pollutant / Parameter	Units of Measure	Frequency	Sampling Method[a]
Point 1 – Overflow point as shown on the document identified in condition 1.2h)	Biological Oxygen Demand (BOD)	mgL^{-1}	Daily, during discharge	Grab Sample
	Oil and Grease	mgL^{-1}	Daily, during discharge	Grab Sample
	Total suspended solids	mgL^{-1}	Daily, during discharge	Grab Sample
	pH		Daily, during discharge	Grab Sample
	Chemical Oxygen Demand (COD)	mgL^{-1}	Daily, during discharge	Grab Sample
	Total Phosphorus	mgL^{-1}	Daily, during discharge	Grab Sample
	Metals (Aluminium, Barium, Calcium, Copper, Lead, Magnesium, Manganese, Nickel, Potassium, Sodium, Total Iron, Zinc)	mgL^{-1}	Daily, during discharge	Grab Sample
	Boron	mgL^{-1}	Daily, during discharge	Grab Sample
	Chloride	mgL^{-1}	Daily, during discharge	Grab Sample
	Cyanide	mgL^{-1}	Daily, during discharge	Grab Sample
	Fluoride	mgL^{-1}	Daily, during discharge	Grab Sample
	Sulfate	mgL^{-1}	Daily, during discharge	Grab Sample

a. the Sampling Method shall be undertaken in accordance with the *Approved Methods for the Sampling and Analysis of Water Pollutants in New South Wales.*

[10] Incorporates an EPA General Term of Approval (L3.1)
[11] Incorporates an EPA General Term of Approval (M2.2)

4.4 [12]The Applicant may seek the approval of the Director-General to alter the frequency of and/or requirement to monitor any pollutant concentration or parameter required under condition 4.3 of this consent. Any request for approval shall only be made provided:

a) concentration/ parameter determination has been undertaken for a period of no less than 12 months (measured from the commencement of operation of the cement works upgrade);
b) there has been no exceedence of any limit placed on the subject concentration/ parameter by any statutory guidelines within that 12-month period;
c) there has been no reasonable complaint received from the public in relation to the subject concentration/ parameter within the preceding 12-month period (refer to condition 5.3 of this consent); and
d) the request is accompanied by written agreement of the EPA with the proposed alteration to the frequency and/ or requirement to monitor of pollutant concentration or parameter determination.

Note: Condition 4.4 recognises that on-going monitoring may demonstrate that the concentration of pollutants and/ or parameters discharged from the site consistently meets relevant statutory guidelines, and the need for rigorous and frequent monitoring may be relaxed.

Auditing

4.5 Within three years of the commencement of operation of the cement works upgrade, and every three years thereafter or as otherwise required by the Director-General, the Applicant shall commission an independent person or team to undertake an Environmental Audit of the cement works upgrade. The independent person or team shall be approved by the Director-General, prior to the commencement of the Audit. An **Environmental Audit Report** shall be submitted for comment to the Director-General, the EPA and Council, within one month of the completion of the Audit. The Audit shall:

a) be carried out in accordance with *ISO 14010 - Guidelines and General Principles for Environmental Auditing* and *ISO 14011 - Procedures for Environmental Auditing*;
b) assess compliance with the requirements of this consent, and other licences and approvals that apply to the cement works upgrade;
c) assess the cement works upgrade operations against the predictions made and conclusions drawn in the SEE and other documents listed under conditions 1.2 a) to 1.2 h), inclusive; and
d) review the effectiveness of the environmental management of the cement works upgrade, including any environmental impact mitigation works.

The Director-General may, having considered any submission made by the EPA and/or Council in response to the Environmental Audit Report, require the Applicant to undertake works to address the findings or recommendations presented in the Report. Any such works shall be completed within such time as the Director-General may agree.

[12] Incorporates an EPA General Term of Approval (M3.2)

5. COMMUNITY INFORMATION AND INVOLVEMENT

5.1 Subject to confidentiality, the Applicant shall make all documents required under this consent available for public inspection upon request. This shall include provision of all documents at the site for inspection by visitors, and in an appropriate electronic format on the Applicant's internet site, should one exist.

Complaints Procedure

5.2 Prior to the commencement of construction for the cement works upgrade, the Applicant shall ensure that the following are available for community complaints for the life of the cement works upgrade (including construction and operation):

a) a telephone number on which complaints about operations on the site may be registered;
b) a postal address to which written complaints may be sent; and
c) an email address to which electronic complaints may be transmitted, should the Applicant have email capabilities.

The telephone number, the postal address and the email address shall be displayed on a sign near the entrance to the site, in a position that is clearly visible to the public. These details shall also be provided on the Applicant's internet site, should one exist.

5.3 The Applicant shall record details of all complaints received through the means listed under condition 5.2 of this consent in an up-to-date Complaints Register. The Register shall record, but not necessarily be limited to:

a) the date and time, where relevant, of the complaint;
b) the means by which the complaint was made (telephone, mail or email);
c) any personal details of the complainant that were provided, or if no details were provided, a note to that effect;
d) the nature of the complaint;
e) any action(s) taken by the Applicant in relation to the complaint, including any follow-up contact with the complainant; and
f) if no action was taken by the Applicant in relation to the complaint, the reason(s) why no action was taken.

The Complaints Register shall be made available for inspection by the EPA or the Director-General upon request.

6. ENVIRONMENTAL MANAGEMENT

Construction Environmental Management Plan (CEMP)

6.1 The Applicant shall prepare and implement a **Construction Environmental Management Plan** (CEMP) to outline environmental management practices and procedures to be followed during the construction of the cement works upgrade. The Plan shall include, but not necessarily be limited to:

a) a description of all activities to be undertaken on the site during construction, including an indication of stages of construction, where relevant;
b) statutory and other obligations that the Applicant is required to fulfil during construction, including all approvals, consultations and agreements required from authorities and other stakeholders, and key legislation and policies;
c) specific consideration of measures to address any requirements of the Department and the EPA during construction;
d) details of how the environmental performance of the construction works will be monitored, and what actions will be taken to address identified adverse environmental impacts;

e) a description of the roles and responsibilities for all relevant employees involved in construction; and
f) the Management Plans listed under condition 6.2 of this consent.

The CEMP shall be submitted for the approval of the Director-General prior to the commencement of construction of the cement works upgrade. Notwithstanding, where construction work is to be undertaken in stages, the Applicant may, subject to the agreement of the Director-General, stage the submission of the CEMP consistent with the staging of activities relating to that work. Construction of each stage shall not commence until written approval has been received from the Director-General. Upon receipt of the Director-General's approval, the Applicant shall supply a copy of the CEMP to the EPA as soon as practicable.

6.2 [13]As part of the CEMP for the cement works upgrade, required under condition 6.1 of this consent, the Applicant shall prepare and implement the following Management Plans:

a) a **Fire Safety Study** for the cement works upgrade, covering all relevant aspects detailed in the Department's publication *Hazardous Industry Planning Advisory Paper No. 2 - Fire Safety Guidelines* and the New South Wales Government's *Best Practice Guidelines for Contaminated Water Retention and Treatment Systems*. The Study shall be submitted for the approval of the Commissioner of the NSW Fire Brigades prior to inclusion in the CEMP.
b) a **Hazard and Operability Study** of the cement works upgrade chaired by an independent, qualified person or team approved by the Director-General. The Study shall be carried out in accordance with the Department's publication *Hazardous Industry Planning Advisory Paper No. 8 - HAZOP Guidelines.*
c) a **Construction Safety Study** for the cement works upgrade, prepared in accordance with the Department's *Hazardous Industry Planning Advisory Paper No. 7 - Construction Safety Study Guidelines*.
d) an **Erosion and Sedimentation Management Protocol** to detail measures to minimise erosion during construction of the cement works upgrade. The Plan shall address the requirements of the EPA and shall include, but not necessarily be limited to:
    i) details of erosion, sediment and surface water pollution control measures and practices to be implemented during construction of the cement works upgrade; and
    ii) demonstration that erosion and sediment control measures will conform with, or exceed, the relevant requirements and guidelines provided in the DLWC's publication *Urban Erosion and Sedimentation Handbook*, the EPA's publication *Pollution Control Manual for Urban Stormwater*, and the Department of Housing's publications *Soil and Water Management for Urban Development* and *Managing Urban Stormwater – Soils and Construction*.

Operation Environmental Management Plan (OEMP)

6.3 The Applicant shall prepare and implement an **Operation Environmental Management Plan** (OEMP) to detail an environmental management framework, practices and procedures to be followed during the operation of the cement works upgrade. The plan shall include, but not necessarily be limited to:

a) identification of all statutory and other obligations that the Applicant is required to fulfil in relation to operation of the cement works upgrade, including all consents, licences, approvals and consultations;
b) a description of the roles and responsibilities for all relevant employees involved in the operation of the cement works upgrade;

[13] Incorporates an EPA General Term of Approval (O3.2)

c) overall environmental policies and principles to be applied to the operation of the cement works upgrade;
d) standards and performance measures to be applied to the cement works upgrade, and a means by which environmental performance can be periodically reviewed and improved;
e) management policies to ensure that environmental performance goals are met and to comply with the conditions of this consent;
f) the Management Plans listed under condition 6.4 of this consent; and
g) the environmental monitoring requirements outlined under conditions 4.1 to 4.3 of this consent, inclusive.

The OEMP shall be submitted for the approval of the Director-General no later than one month prior to the commencement of operation of the cement works upgrade, or within such period otherwise agreed by the Director-General. Operation shall not commence until written approval has been received from the Director-General. Upon receipt of the Director-General's approval, the Applicant shall supply a copy of the OEMP to the EPA and Council as soon as practicable.

6.4 As part of the OEMP for the cement works upgrade, required under condition 6.3 of this consent, the Applicant shall prepare and implement the following Management Plans:

a) a **Noise Management Plan** to outline measures to minimise the impacts from the operation of the cement works upgrade on local noise levels. The Plan shall address the requirements of the EPA and shall include, but not necessarily be limited to:
   i) identification of all major sources of noise that may be emitted as a result of the operation of the cement works upgrade;
   ii) specification of the noise criteria as it applies to the particular activity;
   iii) procedures for the monitoring of noise emissions from the cement works upgrade, in accordance with any requirements of the EPA;
   iv) protocols for the minimisation of noise emissions;
   v) measures to consider and manage the cumulative impact of operating both kilns simultaneously; and
   vi) description of procedures to be undertaken if any non-compliance is detected.

b) an **Air Quality Management Plan** to outline measures to minimise and manage any impacts from the operation of the cement works upgrade on local air quality. The Plan shall address the requirements of the EPA, should there be any. The Plan shall include, but not necessarily be limited to:
   i) identification of all major sources of particulate and gaseous air pollutants that may be emitted as result of the operation of the cement works upgrade, including identification of the major components and quantities of these emissions;
   ii) monitoring of particulate and gaseous emissions from the cement works upgrade, in accordance with any requirements of the EPA;
   iii) procedures for the minimisation of particulate and gaseous emissions from the cement works upgrade, and the reduction of these emissions over time, where appropriate;
   iv) protocols for regular maintenance of process equipment to minimise the potential for dust emissions;
   v) measures to consider and manage the cumulative impact of operating both kilns simultaneously; and
   vi) description of procedures to be undertaken if any non-compliance is detected.

c) an **Emergency Plan** for the cement works upgrade. The Plan shall be prepared in accordance with the Department's publication *Hazardous Industry Planning Advisory Paper No. 1 - Industry Emergency Planning Guidelines*.

Should an Emergency Plan for the cement works already be in existence, this condition may be satisfied by updating the Plan to reflect changes to the site as a result of the cement works upgrade.

d) a **Safety Management System**, covering all operations at the cement works upgrade and associated transport activities involving any hazardous materials. The System shall clearly specify all safety-related procedures, responsibilities and policies, along with details of mechanisms for ensuring adherence to safety procedures. The System shall be developed in accordance with the Department's publication *Hazardous Industry Planning Advisory Paper No. 9 - Safety Management*. Should a Safety Management System for the cement works already be in existence, this condition may be satisfied by updating the System to reflect changes to the site as a result of the cement works upgrade.

e) a **Water Supply Strategy** with an aim to investigate and pursue options for the use of alternative sources of water, such as stormwater reuse or treated effluent from sewage treatment plants, in order to reduce the dependency on extracting water from the Wingecarribee River.

> Note: Options for the use of alternative water sources considered as part of the Water Supply Strategy may be the subject of a separate approvals process.

f) The Applicant shall prepare and implement a **Transport Code of Conduct** to outline management of traffic conflicts associated with the construction and operation of the cement works upgrade. The Code shall meet the requirements of Council, NSW Police and the RTA, should there be any. The Code shall include, but not necessarily be limited to:

i) details of any restriction to traffic routes;
ii) minimum requirements for vehicle maintenance to address noise and exhaust emissions;
iii) speed limits to be observed along routes to and from the sites and within the site; and
iv) behaviour requirements for vehicle drivers to and from the site and within the site.

6.5 Within three years of the commencement of operation of the cement works upgrade, and at least every three years thereafter, the Applicant shall undertake a formal review of the Operation Environmental Management Plan (OEMP) required under condition 6.3 of this consent. The review shall ensure that the OEMP is up-to-date and all changes to procedures and practices since the previous review have been fully incorporated into the OEMP. The Applicant shall notify the Director-General, Council and the EPA of the completion of each review, and shall supply a copy of the updated OEMP to those parties on request. The Applicant shall also make any revised OEMP available for public inspection on request.

7. ENVIRONMENTAL REPORTING

Incident Reporting

7.1 The Applicant shall notify the EPA and the Director-General of any incident with actual or potential significant off-site impacts on people or the biophysical environment as soon as practicable after the occurrence of the incident. The Applicant shall provide written details of the incident to the EPA and the Director-General within seven days of the date on which the incident occurred.

7.2 The Applicant shall meet the requirements of the Director-General to address the cause or impact of any incident, as it relates to this consent, reported in accordance with condition 7.1, within such period as the Director-General may agree.

Note: Condition 7.2 of this consent does not limit or preclude the EPA from requiring any action to address the cause or impact of any incident, in the context of the EPA's statutory role in relation to the cement works upgrade.

Annual Performance Reporting

7.3 The Applicant shall, throughout the life of the cement works upgrade, prepare and submit for the approval of the Director-General, an **Annual Environmental Management Report** (AEMR). The AEMR shall review the performance of the cement works upgrade against the Operation Environmental Management Plan (refer to condition 6.3 of this consent), the conditions of this consent and other licences and approvals relating to the cement works upgrade. The AEMR shall include, but not necessarily be limited to:

a) details of compliance with the conditions of this consent;
b) a copy of the Complaints Register (refer to condition 5.3 of this consent) for the preceding twelve month period (exclusive of personal details), and details of how these complaints were addressed and resolved;
c) a comparison of the environmental impacts and performance of the cement works upgrade against the environmental impacts and performance predicted in the SEE and the additional information listed under condition 1.2;
d) results of all environmental monitoring required under this consent and other approvals, including interpretations and discussion by a suitably qualified person;
e) a list of all occasions in the preceding twelve-month period when environmental performance goals for the cement works upgrade have not been achieved, indicating the reason for failure to meet the goals and the action taken to prevent recurrence of that type of incident;
f) identification of trends in monitoring data over the life of the cement works upgrade to date;
g) a list of variations obtained to approvals applicable to the cement works upgrade and to the site during the preceding twelve-month period; and
h) environmental management targets and strategies for the following twelve-month period, taking into account identified trends in monitoring results.

7.4 The Applicant shall submit a copy of the AEMR to the Director-General, the EPA and Council every year, with

a) the first AEMR to be submitted within twelve months of commencement of operation of the cement works upgrade; and
b) the second and subsequent AEMRs to be submitted concurrently with the EPA's Annual Return.

7.5 The Director-General may require the Applicant to address certain matters in relation to the environmental performance of the cement works upgrade, in response to review of the Annual Environmental Report and any comments received from the EPA and/or Council. Any action required to be undertaken shall be completed within such period as the Director-General may agree.

Note: The AEMR does not aim to satisfy any requirement of the EPA with regard to any Annual Return required under any licence issued for the cement works upgrade under the *Protection of the Environment Operations Act 1997*.

Appendix I

BSCS Site OHS Rules

BCSC- XX-XX

SITE RULES

APPROVALS				
	NAME	POSITION	SIGNED	DATE
ORIGINATOR	David M. Wilson	Project Safety Adviser		
CHECKED	Gerry Gal	Construction Manager		
APPROVED	Keith Partridge	Project Manager		
APPROVED	Ian Unsworth	BCSC Plant Manager		
APPROVED	Bob Stode	BCSC HR Resource Manager		

REV	DATE	REVISION DESCRIPTION	BY	CHK	APPD	HC DEV
D1	06.01.03	Issued for Review	DW			
D2	03.02.03	Issued for review and comments to GG, KP RA	DW			
D3	07.03.03	Issued for review and comments to GG, KP RA	DW			
D4	10.03.03	Issued for review and Comment to GG, KP, RS	DW			
D7	07.04.03	Issued for Review and Comment to JW,GG,KP	DW			

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Preamble

The Berrima No.6 Kiln Upgrade Project team's safety and environment objective(s) are to ensure a safe and healthy working environment through design, manufacture, construction, commissioning and operations phases of the project.

Each of the above phases have their own safety and environmental requirements, not the least those associated with the construction and commissioning activities whilst the plant is operational as well as during the shutdowns in 2003 and 2004.

This Health, Safety and Environment document and associated Contracts, Legislation Codes of Practice, Guidelines, Standards, Procedures, rules and references identify and encompass the working behaviours and safe work practices that will be expected of all Employees, Vendors and Contractors, Subcontractors and Visitors engaged on, or visiting the Project by the Project Management team and owners.

Within this plan the word safety is taken to include occupational health, workplace safety, environment management and plant integrity.

It is the intention of the Hatch Project Management team to have this Health, Safety and Environment Plan and site rules document endorsed by the Project Steering committee. The Health, Safety and Environment Plan and site rules will also be part of specification and tender documents distributed to all vendors and contractors, and shall form part of the contract.

Keith Partridge
Project Manager

1 LEGISLATION

The New South Wales Occupational Health and Safety Act 2000 and Regulations 2001 are the primary legislation and regulations affecting the management of the No.6 Kiln Upgrade Project.

The objectives of the Act and Regulations are to protect the health, safety and welfare of persons working at/or affected by the construction process and operations and require that risk of injury or illness resulting from theses activities be managed to an As Low As Reasonably Practical/Possible (ALARP) Level

The Act and Regulations states how these objectives are to be achieved.

The Act also defines the responsibilities and obligations of people working on the project. People with specific obligations include the Project Manager, Construction Manager, contractors, designers, manufacturers, importers and suppliers of substances for use at the site and people who work on the project or may affect those people working on the project.

The Act requires safety and health management systems to be in place, effective management structures to provide competent supervision and a way for competencies to be reviewed and recognised.

The Occupational Health and Safety Regulations 2001 supports the Act, giving more detail on how the objectives can be achieved.

2 DEFINITIONS

Competency - Ability and understanding through skill and knowledge, to a recognised standard, to carry out specific work.

Critical Procedures – Critical site procedures and work instructions that if not followed could lead to serous injury to plant and personnel.

Employees – BCSC, Hatch, and Boral workers who carry out work, to include contractor, and sub-contractors employees on the No.6 Kiln upgrade projects and sites.

Employer - The employer of a coal site worker.

Fit for Duty - Presenting to work and carrying out work in a state allowing that work to be carried out safely.

No. 6 Kiln Upgrade Project - Construction of and upgrade of plant, infrastructure, and services to increase the process capability of the BCSC Berrima Plant.

Hatch – Project and Construction Managers acting on and behalf of Blue Circle Southern Cement/Boral.

Hazard - Anything with the potential to cause injury or illness to a person.

Light Vehicles - Cars, utilities, personnel carriers, buses and trucks under 8 tonne.

Mobile Plant - Plant capable of being moved under its own power.

Owners – Boral/Blue Circle Southern Cement are the owners and operators of the Processing plant

PPE - Personal Protective Equipment worn by employees to protect them from hazards.

Risk - The risk of injury or illness to a person arising out of a hazard.

Site Rules - Rules put in place by the Project Manager and are specific to Blue Circle Southern Cement No. 6 Kiln Upgrade project team, contractors, contractor's employees, Sub-Contractors, and other suppliers.

CP'S - Critical Procedures, a documented way or arrangement of facilities to achieve and acceptable level of risk.

Cardinal Rules- Those rules and requirements that if broken could result in disciplinary action, including removal of site, for employees, contractors and their employees or sub-contractors.

3 OBLIGATIONS FOR SAFETY

3.1 PROJECT MANAGER

The project manager has the following obligations: -

- Ensure risk to persons working on the project are at an acceptable level;
- Develop and implement a Safety and Health Management Systems for the life of the project;
- Develop, implement and maintain a management structure;
- Provide for adequate planning, supervision, organisation, leadership and control of the project team;
- Regular monitoring of the work place, and
- Appropriate inspections of each work place.
- Maintain project records and administers the document control system

3.2 EMPLOYERS

An employer's principal obligation is to take all practicable steps to protect the health and safety of their employees on the No. 6 Kiln Upgrade Project. This obligation requires employers to provide a healthy and safe working environment.

Employers must also take all reasonably practicable steps to ensure other persons at or near the No. 6 Kiln Upgrade Project are not exposed to health and safety risks. This obligation requires employers to establish health and safety management practices which protect all persons under their control or affected by their work.

3.3 LINE MANAGER / SUPERVISOR

The Line Manager or Supervisor who works for an employer and has control of a workplace, its access or egress, or plant or substance in a workplace must take all reasonably practicable steps to ensure the workplace is safe and without risk to health and safety.

3.4 EMPLOYEES

Employees have an obligation to act responsibly and perform their work in accordance with safety standards applied by their employer, the regulation or relevant codes of practice. They are expected to take reasonable care to protect the health and safety of themselves and others.

3.5 NON-EMPLOYEES

Non-employees and others must comply with the standards of the workplace and obey directions of persons at the workplace. For example, a delivery driver operating a vehicle at a workplace has an obligation to comply with standards imposed by an employer or principal contractor to ensure health and safety.

3.6 REPORTING HAZARDS, NEAR MISS INCIDENT(S) AND INJURIES

It is the duty of persons employed on the BCSC No.6 Kiln Upgrade Project to report any accident to the PROJECT MANAGER as soon as possible after the occurrence.

Injuries that result in a Loss Time Injury (LTI), or Medical Treatment Injury (MTI) need to be reported as soon as possible, within 24 hours of the event.

3.7 INDUCTIONS

All persons who undertake work on the Number 6 Kiln Upgrade project, other then visitors, will need to be inducted to the plant and the project. Those persons undertaking construction work will need to have completed the General OHS Induction Training for Construction training course and hold a 'Green' Card' prior to be allowed to perform construction work on the site.

3.8 BEHAVIOUR AND DISCIPLINE

A person employed at the BCSC No.6 Kiln Upgrade Project shall obey any reasonable direction given by a supervisor, Project Team Member, or Plant Management in accordance with that person's duties and responsibilities.

A person shall not proceed to any place of work at the BCSC No.6 Kiln Upgrade Project until he/she has taken all reasonable steps to ensure that no hazards exist at that place and has authority to enter that place.

A person shall not enter an area of the BCSC No.6 Kiln Upgrade Project that has been fenced or barricaded without the authority of the person who has placed the barrier and must comply with the steps outlined in the Isolation and Barricading Critical Procedure. Failure to do so could result in disciplinary action being taken against the person and their employer.

A person shall not enter or remain at the BCSC No.6 Kiln Upgrade Project if he/she is:

Under the influence of alcohol or a drug; or suffering from any physical or mental condition, to the extent that he/she is thereby prevented from performing his/her duties in a safe manner.

A person shall not take or consume at the BCSC No.6 Kiln Upgrade Project site any intoxicating, mood or mind altering substance, or other any other item, that may affect their ability to perform their job or job task in a safe and competent manner.

A person employed at the BCSC No.6 Kiln Upgrade Project shall not use threatening, obscene, or abusive language to any other person employed at the BCSC No.6 Kiln Upgrade Project.

A person employed at the BCSC No.6 Kiln Upgrade Project shall not fight with any other person or behave in a riotous or disorderly manner. Fighting will not be tolerated and could result in those participating in a fight be subjected to the disciplinary, action upon conclusion of an investigation.

A person shall not bring pets or animals onto the BCSC No.6 Kiln Upgrade Project nor feed wild animals living or entering onto the site.

A person shall not sleep while on duty at the BCSC No.6 Kiln Upgrade Project without the express permission of the PROJECT MANAGER.

A person shall not destroy, damage or deface any equipment, structure, and notice or sign in any other manner cause damage to the BCSC No.6 Kiln Upgrade Project or its fittings.

People working on the upgrade project should be aware that their behaviour, out side of work hours, in the local community, reflects on the project and project team as a whole.

Boral Blue Circle Cement have made it clear that inappropriate behaviour, outside of work hours in the local community, with not be tolerated and persons drawing attention to them selves through inappropriate behaviour may be required to explain there behaviour and why they should continue with the project to the plant owner or his representative

3.9 FITNESS FOR DUTY

3.9.1 Alcohol

To combat the affect(s) that alcohol has on the workplace and to support the BCSC alcohol policy, random sampling for alcohol, to determine fitness to work, will be conducted in accordance with the Blue Circle Southern Cement Alcohol policy and testing procedures.

A self-testing unit is made available to all contractor and site employees and is located adjacent to the BCSC Control Centre.

Contractors will need to develop similar policies and procedures and will, in the event of someone testing positive, have provisions in place to return the affected person to their accommodation, or home.

3.9.2 Prescription and Over the Counter Medications

Due to the nature of the work and the hazards associated with some of the construction processes, people who are prescribed, or who are self medicating; using medications other then Paracetimal, will need to discuss the effects these medication(s) may have on their ability to work with their Doctor or Chemist to ensure that use of this medication will not place them at risk of injury.

All persons working at or visiting the Project must present themselves in a state that does not prevent them carrying out the work safely. Each person must advise their supervisor before commencing work of any factor that may influence their fitness for duty.

Each person involved in a serious incident or an incident resulting in injury or at their supervisors direction may be tested for alcohol and other drugs.

Each person has a legislative responsibility to report to their supervisor any person they suspect is not fit for duty.

3.10 COMPETENCY

A person must not operate any equipment for which they have not been trained, or has appropriate certification to operate. Persons under training will be directly supervised by the competent person who is authorised to conduct training.

3.11 LOCK OUT/DANGER TAGS

All isolations of plant and equipment must comply with the Project Isolation Procedures that require the use of Personal Locks and/or Personal Danger Tags before working on any equipment.

3.12 ELECTRICAL WORK

Persons working on electrical plant or equipment must hold the appropriate qualifications and be authorised to undertake the work.

3.13 LIGHT VEHICLES

Will only be permitted on the project if used for work purposes. No private vehicles are permitted in the work areas or site. Persons entering on the plant are reminded to adhere to the speed limits and all road rules. It is expected that, if fitted, that all persons operating vehicles on the site will wear their seatbelt at all time while the vehicle is in motion.

3.14 ACCESS TO SITE

Only persons authorised by the PROJECT MANAGER are permitted to access the BCSC No.6 Kiln Upgrade Project. All persons working on the project, who complete the Site Specific Induction, will be issued with a numbered Induction Sticker. This sticker will need to be displayed on their hard hat in a visible location for easy identification.

3.15 FIREARMS

No firearms, weapons or ammunition are permitted on the BCSC No.6 Kiln Upgrade Project.

4 PERSONAL PROTECTIVE EQUIPMENT

4.1 DRESS STANDARD AND PPE

Dress standard and PPE requirements apply to all personnel entering the site.

The minimum mandatory dress standard and PPE required to enter the site is:

a. 100% cotton short or long sleeve shirt and trousers or, 100% cotton long sleeve overalls,
b. Safety footwear with steel toe protection,
c. Safety eye protection, and
d. Safety head protection.
e. High Visibility Clothing

Safety eye and head protection is not required to be worn while inside Administration or Amenity buildings unless there is a risk of eye or head injury as a result of the activity being performed.

Persons doing hot work including grinding, cutting and welding will be required to wear 100% Cotton Drill shirts and trousers.

PPE and clothing is to be used and worn correctly.

4.2 SAFETY HELMETS

Safety Helmets will -

- Conform with Australian Standard 1801
- Be replaced as per instructions on the helmet or after any major impact.
- Be fitted with chinstraps when working at elevated levels or when constantly bending down or in excessively windy conditions.

4.3 SAFETY FOOTWEAR

Safety Footwear will –

- Conform with Australian Standard 1270
- Be steel capped as per AS Class 1 classifications.
- Be replaced when defective (i.e.) worn soles, broken stitching, split uppers or exposed steel toecaps.
- Shoelaces to be tied.

4.4 SPECIAL PERSONAL PROTECTIVE EQUIPMENT

Personnel may be exposed to hazards during the performance of a task, by being in proximity to, being in a hazardous environment or at risk of coming in contact with a hazardous substance. Where risk to personnel cannot be removed or reduced by other means (i.e.) elimination, engineering or administrative controls, then additional special protective clothing and equipment must be provided and used.

Where specified on a Permit to Work, a procedure, regulations, Material Safety Data Sheets (MSDS) or Job Safety Analysis (JSA), personnel engaged in the activity shall wear the additional PPE requirements.

4.5 EYE PROTECTION

It is mandatory for all persons entering site to wear eye protection. The minimum standard shall be eyewear that provides front and side protection as identified in AS 1337.

When carrying out the following work activities the following eye protective equipment must be worn:

Welding and Oxy activity	Welding shield worn over safety glasses.
Grinding	Goggles with a minimum of “medium” impact rating and face protection.
Drilling/Hammering	Minimum of safety glasses.
Chipping (manually)	Minimum of safety glasses or goggles.
Scabbling	Goggles with a minimum of “medium” impact rating and face protection
Compressed Air Tools	Minimum of safety glasses, goggles as a preference
Hydrostatic/pneumatic testing	Minimum of safety glasses and face protection.
Using chemicals including Solvents and cleaners:	Refer to manufacturers MSDS for minimum required PPE. Where eye protection is not specified on the MSDS safety glasses shall be worn.
Steel strapping/banding	Minimum of Safety glasses.
Insulation	Refer to manufacturers MSDS for minimum required PPE. Where eye protection is not specified on the MSDS safety glasses shall be worn.
Painting	Safety glasses for brush or roller application. Goggles for spray application. Refer to product MSDS for additional eye protection requirements.
Other high speed rotating tools	Goggles with a minimum of “medium” impact rating and face protection

4.6 HAND PROTECTION CONFORMING TO AS 2161

The wearing of gloves specific to the work to be undertaken is mandatory in all instances where there is a likelihood of hand injury occurring. The gloves will conform to AS 2161. The following are examples of hazardous materials that require specific hand protection:

- Sheet metal;
- Reinforcing or Structural Steel;
- Wire or wire mesh;
- Rough or sawn timbers;
- Cement products, Acids, Chemicals, or Hot Work;
- Any material or substance where hands could be subjected to harmful or injurious contact.

4.7 RESPIRATORY EQUIPMENT

Respiratory equipment conforming to AS 1716 shall be worn when performing task where respiratory protection is required. Example(s) of task requiring respirators are,

Spraying or handling material that is detrimental to the respiratory system as identified on the manufacturers Material Safety Data Sheet (MSDS) for the product;

Engaged in sand blasting, spray concreting and the application of spray refectory,

Entering an area containing harmful or toxic atmospheric contaminants or where the oxygen content is below 20.8% and or above 23% by volume;

Only personnel with current training and authorisation shall use supplied air type respirators.

4.8 HEARING PROTECTION

Use of hearing protection conforming to AS 1270 is mandatory in areas signposted with 'Hearing Protection Required' signage and when using powertools and where identified as a PPE requirement under the JSA

4.9 HIGH VISABILITY VEST & CLOTHING

High Visibility clothing and or vest, suitable for day and night time use, must be worn on the plant and on the construction site at all times. The only exclusion form this requirement is when performing 'Hot Work' where the person performing the cutting, welding, grinding or heating should remove the vest and don the appropriate PPE for the task at hand. Once the Hot Work is completed, the operator must replace his vest or uncover their High Visibility clothing. All personnel are expected to keep their High Visibility clothing in a clean and serviceable condition at all times to ensure its effectiveness and visibility.

5 ATW (S), JOB SAFETY ANALYSIS, AND WORK METHODS

An Authority to Work Permit will be required for all work packages being undertaken on the construction project.

- All hazards are to be identified before commencing work using Job Safety Analysis (JSA);
- Safe work methods determined by the JSA must be understood and followed.
- The JSA formulated for the task shall be developed with input from all the members of the work team who are undertaking the work and should be signed off by all those who participated in development of the JSA.
- Work requiring additional permits must be performed in accordance with the conditions stated on the "Authority to Work Permit and terms outlined in the additional permits. "
- Where specified on the Authority to Work (ATW), a procedure, regulations, Material Safety Data Sheets (MSDS) or Job Safety Analysis (JSA), personnel shall wear the additional PPE requirements;
- If the job environment, method of work, work team structure or complexity of the job changes, the Job shall be reviewed with the Site Supervisor and a revised JSA will be undertaken and submitted to ensure the information remains current and applicable with the progression of the work activity.
- The user shall inspect all tools and equipment prior to using to ensure safe working condition and where applicable that a current inspection tag is fitted.
- Only the correct tools shall be used for the required task.
- Correct manual handling methods are to be used. Use of mechanical devices or assistance by other personnel shall be considered when conducting manual handling activities;
- Non-platform ladders shall only be regarded as a means of access and egress.
- The use of ladders (other than Platform Ladders) for purposes other than access/egress must be approved.
- The throwing or dropping of any gear, equipment or other items is STRICTLY FORBIDDEN. Where manual carrying of tools and equipment is not possible, approved lifting equipment shall be used for lifting and lowering

6 HOUSEKEEPING

An untidy work area causes accidents, inefficiency and creates hazards. Use receptacles provided and remember that 'there is a place for everything and everything belongs in its place.

- It is everybody's responsibility to maintain a clean work area. 'If you make a mess, clean it up'.

- Tools and equipment are to be securely contained to prevent them falling;
- Easy access to emergency equipment must be maintained at all times;
- Nails protruding from timber must be removed or bent over to make safe;
- Work areas shall be inspected and be in a clean and tidy condition prior to commencing work.
- All work areas shall be cleaned regularly and surplus material removed or stacked daily;
- Rubbish, debris and other waste materials shall be removed from the work area regularly;
- Adequate provision shall be made for containment and removal of accumulated waste materials;
- Equipment or materials shall not be stacked or stored in access ways, emergency exits or obstruct emergency services equipment;
- Storage or stacking shall be orderly and maintained for easy access. Stacking shall be stable with heaviest items lowest;
- Work areas shall be kept clean and clear of slip, trip, stumble or fall hazards;
- Access and egress ways to remain free of obstructions;
- Sharp or pointed objects shall be capped and must not protrude into access ways;
- Fire extinguishers shall be visible and readily accessible;
- Tools and other equipment shall not be left where they can fall to a lower level;
- Adequate provision shall be made for the placement and storage of bolts, nuts etc in work areas.

7 PORTABLE ELECTRICAL EQUIPMENT

A huge variety of portable electrical equipment is used on site and when not used or maintained in the correct manner the outcomes can be lethal.

The following requirements are designed to minimise this risk and are mandatory on site:

- Where mobile welding machines are used to supply power they shall comply with AS 2790 and be labelled as such;
- All portable electrical equipment shall be inspected, tested and tagged (colour coded) as per the Construction Code of Practice and/or Australian Standard 3760;
- Damaged electrical equipment (insulation, faulty switch, etc) shall be tagged 'Out of Service' and removed from work area;
- Power leads shall not exceed 32 metres in length (total) including the length of the cord on the appliance;
- All connection plugs shall be of a bonded type or made of clear transparent material;
- Power leads shall be positioned to prevent damage, wetting or becoming a trip hazard. Where an electrical lead is elevated it shall be suspended using nonconductive material;
- Power leads shall not be routed so that they obstruct access ways or walkways;
- All power leads shall be isolated when not in use and removed from the work area immediately when the task has been completed;
- Portable ELCB boxes shall be used to distribute power directly to power tools only and not as an adapter to extend the length of power leads or for multiple distributions of power leads;
- Plug boards (domestic type with independent isolation switches) may be used in office locations. Double adapters shall not be used on site;
- No person other than an authorised licensed electrician shall make any repairs or alterations to power tools, plugs, fittings, leads or other electrical appliance or installation;
- Electrical switch boxes and distribution boards must have clear identification, doors properly secured and unobstructed access and fitted with a means to physically isolate and lock them out.

Remember: When connecting or disconnecting tools from the electricity supply, make sure that the switch from the electricity supply is in the '**OFF'** position.

8 TOOLS & EQUIPMENT

Portable tools are used for a wide variety of jobs and when used correctly can help do many of them quickly, efficiently and safely.

Accidents with power and hand tools happen often because of improper actions and attitudes. Supervisors must ensure that all employees are instructed in the safe use of all power and hand tools applicable to their work.

Employees shall only use power and hand tools for which they are competent.

The following requirements are designed to minimise the risks:

- The proper tool must be used for the job. Substituting the wrong tool is not acceptable;
- All tools must be maintained in a safe working condition;
- All tools must be inspected before use. Damaged tools must be tagged 'Out of Service' and removed from the workplace;
- Tools and equipment must be properly stored when not in use;
- Guarding on machinery and power tools must be in place and functioning as designed;
- Current colour coded tags must be fitted to all electrical tools, rigging and lifting equipment and personal fall protection equipment;
- Portable power saws and grinders must be fitted with a 'deadman' switch that prevents the tool from being locked in the 'on' position;
- 9" angle grinders may not be used on site unless with the express written permission of the CONSTRUCTION MANAGER. Where possible, other solutions should be implemented to reduce or prevent the use of 9" grinders.

9 FALL PREVENTION (AS1891.4)

Where a person is at risk of falling ANY distance, effective measures must be taken to prevent that person from falling. Prevention methods should take risk management approach with PPE being the last report.

Effective measures include:

- The provision of edge protection (guardrails);
- The use of scaffold or elevated working platform (boomlift, cherry picker, scissor lift).

- Where it is not practicable to provide the equipment referred to above, industrial fall-arrest systems, devices and anchorages must be used. Persons must receive proper instruction on the correct use, inspection, care and fitting of this equipment before using it on the job.

Note: Personal protective equipment should be considered only when other control systems are not practicable or to increase protection.

- An “Excavation / Penetration Permits is required before removing floor-plate or gridmesh or creating any penetration in which a person or object may fall through or into.
- All floor-plate or gridmesh panels lifted for access must be securely fixed immediately once re positioned upon completion of work;
- Holes or openings, with dimensions of more than 200mm x 200mm or with a diameter greater than 200mm, in floors must be adequately covered and clearly marked OR be adequately protected by solid guard rails and kickboards;
- All persons working where there is the potential to fall from, through or into any place or thing, shall wear approved fall protection equipment in the form of a full body harness with lanyard attached to a fixed point above their head, where practical;
- All persons in elevated work platforms (boom lift or cherry picker) and mancages shall wear approved safety harness with lanyard. The lanyard shall be attached to the approved anchorage point in the basket at all times.
- Personal Safety Lanyards shall not be “back-hooked”.

10 SCAFFOLDING/LADDERS

- Ladders in use must be secured and supported;
- Ladders must extend at least 900mm above the access platform of the structure being accessed;
- All scaffolding work shall be undertaken in accordance with Occupational Health and Safety Regulations 2001 and AS/NZS 1576 Parts 1 to 5;
- All scaffolding shall be erected/altered/dismantled under the charge of a certificated person
- The 'Scafftag' system is to be used to tag scaffolds.
- A Scafftag Holder/s identifying the scaffold as "not fit for use" is to be placed in a prominent position at every access to the scaffold as early as possible during the construction of the scaffold;
- Once the scaffold is complete and has been inspected and is "fit for use" a correctly completed Scafftag shall be inserted into the Scafftag Holder/s
- A competent person must inspect all scaffolds that are to remain erected for long periods at least every 15 days. Records of inspections are to be kept in a scaffold register;
- All scaffold shall be constructed using approved scaffold components;
- Scaffold planks and kick boards shall be securely lashed down with non-flammable material so as to avoid possible movement during use;
- Rigid handrails, mid rails and kick boards shall be provided on all working platforms and access towers;
- Ladder access points must be protected to prevent people falling through them;
- Incomplete scaffolds are to be barricaded, signposted and have the scafftag removed;
- Where portable ladders are used for access to working platforms they shall be single ladders complying with AS 1892 Part 1 and 2;
- Ladders shall be pitched at a slope of not less than 1:4 nor more than 1:6;
- Ladders shall be braced and secured against displacement in any direction;
- Ladders shall extend at least 900mm above landings;
- The maximum height between successive landings serviced by a portable ladder shall not exceed four (4) metres;
- There shall be clear and unobstructed access to ladders at each landing;
- Ladders on mobile scaffolds shall be clear of the supporting structure.

11 COMPRESSED AIR EQUIPMENT

Personal Protective Equipment must be appropriate to the work undertaken when using compressed air. This would include but is not limited to eye, ear and respiratory protection;

- Compressed air shall not be used as a means of personal cleaning. Never discharge compressed air against any part of your body or at any other person;
- Safety clips are to be fitted to all hose connections. Safety chains or 'whip checks' are to be fitted on bull hose couplings to compressor manifolds;
- All air hoses are to be routed in such a way as to not create trip hazards in access ways and to prevent damage by vehicles, equipment or other activities;
- The air supply is to be properly isolated and residual pressure released before connecting or disconnecting tools or other hoses. Hoses are not to be crimped;
- Hoses are not to be left unattended when connected to a compressed air source that may be inadvertently turned on causing whipping of the hose and potential serious injury;
- Hoses that are used in elevated areas are to be secured;
- Impact wrench sockets must be used in conjunction with lock rings;
- Compressed air is not to be used for cleaning with out the permission of the site supervisor and where there is no other method of cleaning available.

12 GAS CYLINDERS

- When not in use gas cylinders shall be removed from the workfront and stored in designated storage areas;
- Gas cylinders shall be kept in an upright position and secured with non-flammable material;
- Flammable and Non-flammable gas shall be segregated and stored as identified in AS 4332-1995
- Cylinders must be removed from the work area when empty;
- Cylinders shall be shut off when not in use;
- Cylinders shall not be so placed as to obstruct or restrict free access;
- Cylinders shall be stored away from electrical equipment;
- When transporting cylinders ensure cylinders are kept upright or are placed in approved cylinder racks;
- Gas cylinders shall not be transported inside the cabin of vehicles;
- All cylinders to have contents tag (Full, In Use, Empty) in place;
- Keep cylinder fittings clear of oil, grease and other contaminants;
- Flashback arrestors/flash checks must be used on the gauges and torch end of the hoses;
- Gas cylinders may not be placed or used in below ground areas or Confined Spaces.

13 SIGNS & BARRICADING/BUNTING

All persons are required at all times to obey warning and danger signs displayed on site.

Personnel must not enter restricted areas unless authorised to do so. Only authorised personnel shall be entitled to enter into restricted areas.

Unauthorised personnel seeking access to a restricted area shall first get approval for the contractor or person responsible for that area or department. If approval is granted, the person responsible for that area shall explain the hazards that have been identified in the JSA and the appropriate PPE that needs to be worn within the restricted area.

Signs shall comply with AS 1319 – Safety Signs for the Occupational Environment;
Signs must be clearly visible, clean and legible;
Temporary signs erected in the workplace must be properly secured/stable.

Barricading shall be placed around all areas where persons may be exposed to the danger of:

- Being struck by materials;
- Falling into open excavations or penetrations;
- Hazards, toxic or flammable substances;
- Specific work processes (i.e., radiation, pneumatic/hydrostatic testing, scaffolding, rigging, spray painting, abrasive blasting etc);

Requirements for Barricading (general):

- All barricades erected will need to comply with project Barricade and Isolation Critical Procedure
- High visibility flagging (bunting) shall be attached to stable stanchions not more than 3 metres apart. Para webbing should be used in high traffic areas;
- Barricading shall be not less than 900mm or more than 1 metre above the ground;
- Barricading shall have an information tag attached to displaying the reason for the barricade, the contractor, contact name, contact radio channel or phone number and current date. Barricade remaining in place for longer than one shift shall display the expected removal date on the information tag;
- Work areas protected by barricading should be kept as small as is safely practicable;
- Barricading shall be maintained daily and removed immediately the need for the barricade no longer exists.

Requirements for Barricading around Excavations:

- High visibility Para webbing shall be attached to stable stanchions not more than 3 metres apart;
- Excavations in areas of high vehicular movement or pedestrian traffic shall include rigid guard rails fixed between 900mm and 1 metre to stable stanchions not more than 3 metres apart;

- Excavations in areas of high vehicular movement or pedestrian traffic not backfilled at the end of each working day shall include reflectorised plastic tape and flashing warning lights around the excavation. Reflectorised signs shall be erected to give advance warning to vehicle traffic;
- Starter bars or other similar upstands shall be covered with proprietary caps to protect persons who may fall against them.

14 SAFETY REQUIREMENTS FIXED PLANT AND MOBILE EQUIPMENT

14.1 SPECIFIC CONTRACTOR REQUIREMENTS

- The Contractor shall have a competent person, inspect all vehicles, plant and equipment prior to mobilisation and before it is used. Copies of inspection reports should be maintained and made available for inspection if required;
- Daily inspections are to be carried out on all mobile plant and other equipment by the person operating the plant or equipment and an entry made in the plant or equipment logbook;
- All faults or damage identified shall be recorded in the equipment logbook and repaired accordingly;
- Equipment shall not be used if the identified fault or damage interferes with the equipments safety systems or operational ability;
- A competent person shall inspect all vehicles, plant and equipment monthly or as necessary to comply with the Company's, Project's, legislative and manufacturer's requirements;
- Mobile plant must comply with the requirements detailed above; have a current registration certificate and a copy of the most recent inspection report.

  The employer must ensure operators of all plant and equipment has proof of competency prior to their operation of that plant or equipment.
- All mobile plant and equipment used on the BCSC No. 6 Kiln Upgrade Project shall be fitted with an approved coloured flashing warning light mounted on the top of the vehicle and audible reversing alarms;

14.2 GENERAL SITE REQUIREMENTS

- Operating Instructions are to be displayed on all engine driven equipment;
- All warning lamps and gauges are to be checked and operational before use;
- ELCB shall be tested daily before use;
- Locks and latches must be in good condition and functional;
- All redundant wiring, switches and lamps etc must be identified as being redundant or removed;
- Jockey wheel shall be fitted or available on trailerable equipment (where required by design);
- All mobile plant will be fitted with an audible reversing alarm and where required, a yellow revolving or flashing light.
- Clearly labelled Emergency Stop Buttons or Isolation switches are to be fitted to all engine driven mobile plant & equipment.
- Additionally, ensure that equipment is supplied with all relevant safety and health information, warning signs and notices, safe working load notices and evidence of registration and design acceptance.

The following are the required standards for all vehicles at the project:

- All mobile equipment with seats shall be fitted with seat belts;
- Seat belts must be worn when travelling in a vehicle or mobile equipment;
- Riding in the back of utilities, trucks or other mobile equipment where approved seating is not provided is prohibited;
- The maximum speed limit for mobile plant and heavy vehicles (exceeding 2 tonnes) is 20 kmh;
- Cranes when travelling without a load must have the boom lowered and slings removed from the hook;
- A guide must accompany all cranes manoeuvring in site areas and must walk ahead of the crane when mobilizing a load. Crane operators are reminded that they will need to attain a permit to move loads through out the plant and must comply with all the restriction of this permit;
- No vehicles must be loaded beyond its registered load capacity;
- Vehicles to be used for towing must be fitted with an approved tow hitch;
- Motor vehicles must not be left unattended unless the controls are in the correct position for parking and the parking brakes are fully applied;
- Smoking, naked flames and other ignition sources are prohibited when refuelling;
- No person must operate any machine, tool or equipment for which they are not trained or authorised;
- All personnel must hold relevant licenses/certificates of competency when driving vehicles on site;
- All road signs and site traffic regulations must be obeyed;
- All Mobile equipment used on the site and project will be fitted with visual and audible reversing alarms.

15 LIFTING AND RIGGING EQUIPMENT

- Only persons with current certification in dogging, Basic Rigging Intermediate Rigging, Advanced Rigging are permitted to sling loads;

- Lifting and Rigging equipment shall be visually inspected and re-tagged by a competent person every three months and a record maintained;
- Inspection tags and/or colouring must be displayed on all lifting gear;
- Lifting and rigging equipment shall not be loaded beyond it's SWL;
- Point-loading of hooks is prohibited;
- All hooks shall be fitted with an operational Safety Latch to prevent the sling from dislodging;
- Adequate sling protection shall be used to prevent damaging the sling;
- All lifting and rigging equipment must be stored correctly in designated area;
- Only approved lifting and rigging equipment and techniques shall be used for lifting and rigging purposes;
- Slings shall not be exposed to sudden lifts (shock loading);
- Lifting and rigging equipment shall not be used if it is damaged and/or beyond it's designated wear tolerances;
- Current Test certificates shall be available for all lifting and rigging equipment;
- Towing slings and chains will be demarcated to show they are not suitable for use as lifting gear. Lifting and rigging equipment shall not be used for towing purposes;

16 EXCAVATIONS

A permit must be obtained before commencing any excavation and is also required for any wall penetration, removing floor-plate or gridmesh or creating any penetration in which a person or object may fall through or into.

- All floor-plate or gridmesh panels lifted for access must be re-placed into position and securely fixed immediately upon completion of work;
- Holes or openings, with dimensions of more than 200mm x 200mm or with a diameter greater than 200mm, in floors must be adequately covered and clearly marked OR be adequately protected by solid guard rails and kickboards;
- Excavations in areas of high vehicular or pedestrian traffic must be protected by a barrier or barricaded;
- All temporary and permanent excavations must be barricaded; and allow sufficient and safe access must be provided into, out of and around or across all excavations and trenches;
- Any excavation where persons are required to enter and where their head may need to be below the top of the wall may be deemed a Confined Space; Any excavation deeper than 1.5 meters must have the sides adequately shored, battered or sloped back to prevent collapsing of the walls if personnel are required to enter;
- No personnel may be present in an excavation while that part is being mechanically dug with a backhoe or similar device;

17 AUTHORITY TO WORK (ATW) PERMIT

An Authority to Work Permit (ATW) and other Permit procedures are intended to maintain a high level of plant safety by reducing the chance of misunderstanding when non-routine activities are to be carried out.

An (ATW) will be required for all work undertaking during the construction phase of the Project.

Permits, which the Contractor may be required to use relevant to the activity being performed include but are not limited to:

- Hot Work;
- Confined space entry;
- Excavation and Penetration / Floor plate or Handrail removal;
- Isolation of equipment;
- Heavy, critical, or multi crane lifts;
- Personnel box or Personnel cage;
- Entry into a designated area.
- Work in hazardous or ignition areas of the plant

The Construction Manager or his delegate shall review and approve all permits used by the Contractor prior to work commencing. In some situations the contractor may be required to use the Client's permit systems and the Contractor shall ensure adequate time is allowed for the approval process.

18 FIRE PREVENTION

- All fire extinguishers must be correctly installed and inspected regularly as required;
- Fire escapes, fire extinguishers, hydrants and hose reels and other emergency equipment must remain free from obstructions;
- The correct signage must be in place for extinguishers;
- Suitable extinguishers must be readily available at all locations where hotwork is being performed. All faulty fire fighting equipment is to be tagged "Out of Service", removed from the workplace and replaced immediately;
- All fires are to be reported through supervision to the Project Manager immediately;
- Combustibles must be clear of the workplace or protected before commencing work;
- The burning of rubbish or waste or any other material is forbidden;
- Flammable substances must be stored in appropriate containers in approved designated areas when not in use; (refer to product MSDS for specific requirements)
- Any welding, flame cutting, burning or other spark-generated task undertaken in hazardous areas of the plant or site will require a hot work permit.
- All fuel, oil, grease and other Hazardous Substance or Chemical spills shall be contained and cleaned and an incident report raised and forwarded to the Project Safety Adviser Manager;
- The use of a fire extinguisher must be reported to your supervisor immediately. All used fire extinguishers must be removed and replaced.

19 HAZARDOUS SUBSTANCES

Each Contractor shall keep a register of hazardous materials used on the site. The register shall detail:

- The name of the hazardous substance;
- A Risk Assessment;
- A copy of the Material Safety Data Sheet (Date of issue on MSDS no older than 5 years);
- Quantities to be stored on site;
- Location of storage areas.

The storage, use, transport and disposal of Hazardous Substances shall be in accordance with the Product MSDS, relevant Australian Standards and Site requirements;

A copy of the Contractor's current Hazardous Substance register shall be forwarded to the Project Safety Adviser at the commencement of work and any time the register is updated;

- Application for approval of Hazardous Substances must be lodged with the Project Safety Manager and approval granted prior to bringing Hazardous Substances to site.
- Material Safety Data Sheet's (MSDS's) for Hazardous substances must be available to employees at the points of use and storage;
- Detailed MSDS sheets must be available for all materials on site;
- All hazardous materials without an MSDS sheet must be removed from site, or not used until a MSDS sheet is obtained;
- Unnecessary procurement, storage and handling of hazardous substances must be avoided or eliminated;
- Chemicals must be stored in approved designated areas;
- Where possible, the supply of products in aerosol cans shall be avoided. All attempts to procure non-aerosol products shall be made;
- Never handle any chemical or toxic substance without being fully aware of the safe handling/using procedure, protective clothing and equipment to be used and required First Aid treatment in the event of an injury;
- Chemicals must not be placed in food and drink storage facilities;
- Food and drink containers must not be used to store chemicals;
- All chemical containers must be labelled to identify the contents;
- Appropriate facilities such as eyewash station must be readily accessible in all locations where hazardous substances are used or stored.

20 WELDING/CUTTING

A Hot Work Permit will be required for any hot work being undertaken in the coal storage, coal handling, coal conveyors systems or any other hazardous area on the plant and construction site. Operator should check with the Site Supervisor before undertaking hot work in these areas.

- Protective screens must be used during welding operations where appropriate;
- Signs and barricades identifying “Hot Work Above” must be installed beneath welding/cutting operations carried out above ground level;
- Welders must use correct PPE for all risks associated with the job;
- Grinder operators must use appropriate PPE including Goggles with a minimum of “medium” impact rating and face protection;
- Metal particles and offcuts shall be contained and prevented from falling;
- Metal buckets shall be provided for the disposal of welding rod stubs;
- Precautions must always be taken to prevent eye damage from welding arc flash and to protect persons and combustibles from falling sparks and hot metal;
- All cables/hoses shall be protected from physical damage and must be kept in good condition;
- Cables, where possible, should be routed overhead or under walkways;
- All electric/gas welding equipment is to be inspected and maintained;
- Flash arresters on gauges and non-return valves on handsets in gas cutting/welding sets are mandatory;
- At all times cylinders must be secured, used in the upright position and transported using approved lifting boxes, cradles or trolleys;
- All electrical/gas welding equipment shall be kept free from grease/oil;
- Fire extinguisher(s) are required when any welding, cutting, heating or grinding is required or undertaken.
- Work teams will need to provide their own fire extinguisher for their work and are not to use a Plant Fire Extinguisher(s) except in an emergency.
- Adequate ventilation must be provided wherever fumes may accumulate and where natural ventilation is not adequate, mechanical ventilation shall be used;
- Remove and/or protect all flammable material, prior to any hot work;
- Switch off electric welding equipment at the main switch when job is finished.
- Ground clamps are to be placed as close as possible to the work.
- The use of ‘Bic’ type, or plastic butane lighters to light gas powered torches is prohibited.
- Persons undertaking hot work are required to remove any ‘Bic’ type or plastic butane lighters from the body to a safe place away from the hot work area to a safe place.

21 MANUAL HANDLING

Avoid manually lifting heavy loads. Where possible, split large loads into smaller, more manageable loads. The use of mechanical load shifting devices or assistance by other personnel shall be considered when conducting manual handling activities;

The following techniques should be considered when performing manual handling activities.

- Assessment of the load and plan the lift;
- Bend the knees;
- Get a firm grip on load;
- Keep load close to chest;
- Keep back straight;
- Lift vertically using legs;
- Turn with feet not body;

Gloves are to be used when lifting loads with sharp edges or the hazard assessment identifies a risk of cuts or splinters to the hand;

22 LOCKOUT, TAGGING AND ISOLATION

Only the person who placed the tag or a competent repairer, authorised by the PROJECT MANAGER, shall remove an Out of Service tag once the equipment has been repaired or made safe;

Red, White and Black 'Personal Danger' tags **must** be used when equipment is isolated for maintenance, repairs or testing purposes. No person shall be permitted to carry out maintenance or repairs on plant or equipment without firstly isolating all energy sources present.

The Contractor shall use lockout, tagging and isolation procedures approved by the Project Manager and Plant Owner;

Yellow and Black 'Out of Service' tags shall be used to identify damaged plant or equipment or plant and equipment which is not safe for use. No person shall use equipment with an 'Out of Service' Tag attached

23 RAILWAY SAFETY

No work is to be undertaken within two meters of the railroad. Any work being undertaken in the rail corridor will need to be approved by the Plant Manger. All persons working at the side of the railroad will need to ensure that all equipment and vehicles are in a safe position, 3 meters or more away from, along side the railroad

24 WORKING ALONE

If contractors have to work alone in isolated areas, they must ensure that the risk is managed, and ensure they have adequate communication (radio, mobile phone), systems in place to check on these individuals and systems in place to ensure that the tasks they are undertaking are of low risk and that all hazards are controlled. Supervisors must check on these intervals on a regular basis, but no more then at two-hour intervals.

25 MACHINE GUARDING

All rotating, nip and pinch points on plant and equipment must be guarded to prevent any accidental body contact. No equipment is to be operated with the guards removed.

26 GOODS AND MATERIAL – DELIVERY TO SITE

All delivery vehicles shall conform with Site Access requirements;

Where the delivery vehicle and/or driver has not been formally inducted to site, the delivery vehicle shall be escorted by a person designated by the contractor for which the delivery is being made;

The contractor for which the delivery is being made shall be responsible for the unloading of the delivery vehicle;

The delivery driver, after instruction from the contractor-designated person, shall release the binding restraints to enable unloading of the Goods and Material.

Contractors will need to ensure that delivery and transport companies coming to site have the appropriate (PPE) and that drivers wear this equipment whilst on site.

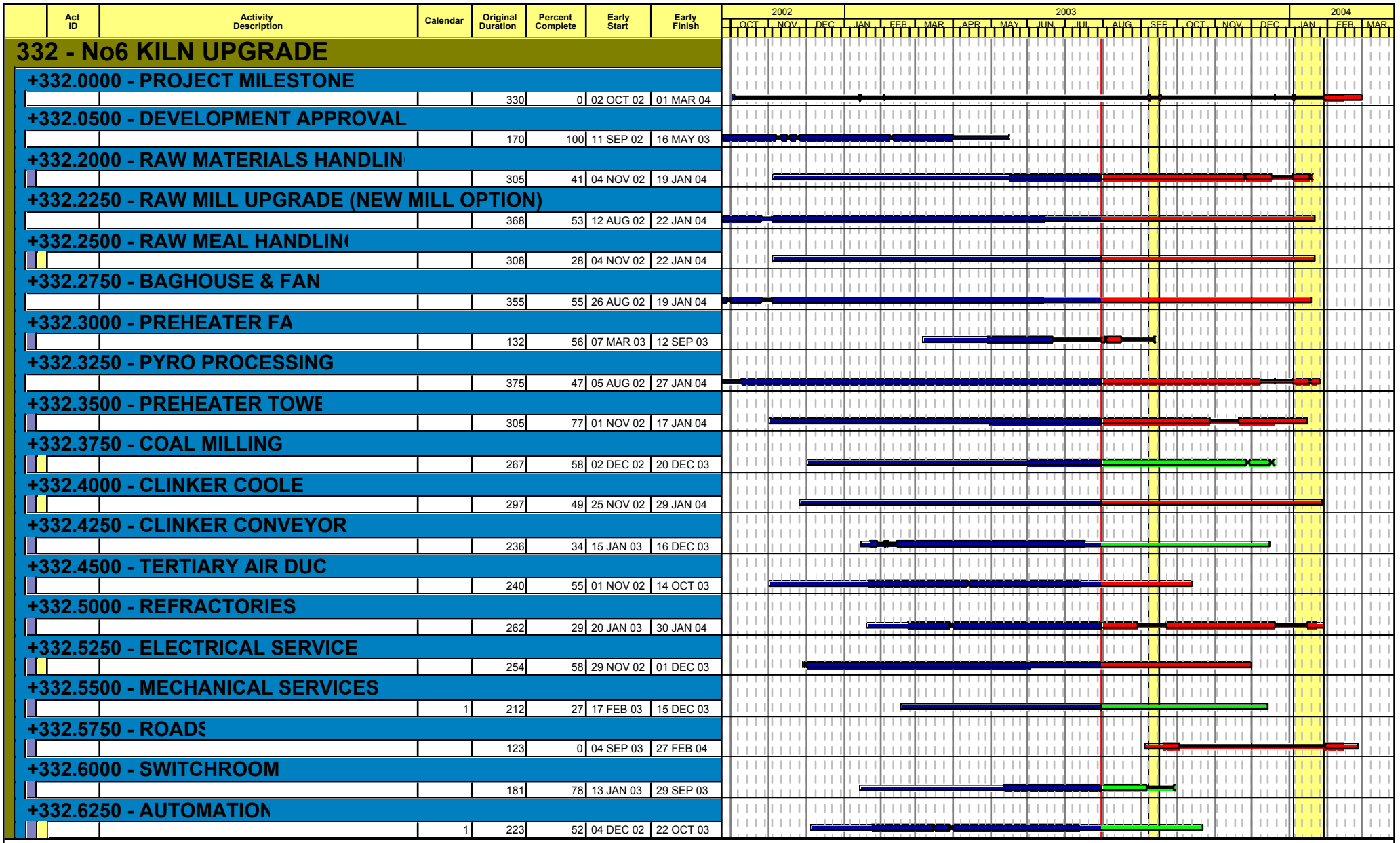
Drivers, prior to releasing the restring straps are to inspect the load to ensure it will not shift, or drop to the group upon release of the restraining equipment.

27 ELEVATING WORK PLATFORMS (EWP)

- The Operator shall carry out a Daily Pre-start Inspection in accordance with a predetermined checklist provided for the EWP;
- A service log book for the EWP shall be provided by the contractor or supplier, the log book shall be checked by the supervisor to ensure all service requirements have been met and action taken as required;
- Prior to operation, a JSA shall be conducted to ensure all hazards associated with the operations of the EWP are identified and control measures are implemented;
- The safe working load (SWL) of the work platform shall not be exceeded;
- The maximum number of persons allowable in the basket as identified by the EWP manufacturer shall not be exceeded;
- Persons shall not enter or leave the EWP basket when elevated unless an approved method of work is in place and that this method has been reviewed by the Site Supervisor.
- The area under the elevated basket shall be bunted when working above personnel access areas and when there is a potential for persons to enter under the elevated basket;
- Loads shall not be transported by an EWP in lieu of the use of a crane or hoist;
- Persons shall wear an approved Safety Harness and Lanyard attached to the approved anchorage point while inside the basket;
- Personal Safety Lanyards shall not be “back-hooked’.
- Persons operating EWP(s) must be competent and where required, must hold an appropriate certificate of competency and /or WorkCover licence.

Appendix J

Project Schedule (Sure Trak BCS 021)



Start date 04 SEP 02
Finish date 01 MAR 04
Data date 31 JUL 03
Run date 11 AUG 03

Early bar
Progress bar
Critical bar
Summary bar
Progress point
Critical point
Summary point
Start milestone point

1A / 1A

Blue Circle Southern Cement
No6 Kiln Upgrade - Berrima
All Activities

BCSC021

Date	Revision	Checked	Approved
31 JUL 03	Progress Update		