

# Site Investigation Drilling Operations

Issue date: 19/02/10

Review date: 18/02/13

<b>SWMS number:</b> SMS-06-SW-1325	<b>SWMS Name:</b> Site Investigation – Drilling Operations			<b>SWMS Team:</b> John Lesiw, Investigation Supervisor Peter Gall, Diamond Driller David Gordon, Diamond Driller Steve Tucker, Diamond Driller John Pace, Monitoring Leader Robert Coventry, Geotechnical Officer Cynthia Lee, Safety Coordinator
<b>Custodian (Position):</b> Investigation Supervisor	<b>Assumptions:</b> Site specific risks addressed in Pre-work briefing			<b>Content reviewed by Technical expert (SME) and RailCorp safety professional</b> (position including Div/Group)  Jatinder Singh, Geotechnical Group Leader Rob Jackson, Manager Compliance & Information
<b>Approving Authority (Position):</b> Principal Geotechnical Engineer	<b>Plant/Equipment/Tools:</b> <ul style="list-style-type: none"> <li>• Truck Mounted Drilling Rigs</li> <li>• Portable Drilling Rig</li> <li>• Penetration Testing Equipment</li> <li>• Support Vehicle</li> <li>• Water Pressure Pumps</li> </ul>	<b>Records/Reporting:</b> Worksite Protection Plan SMS-06-GD-0333  SMS-06-FM-0163 Pre-work Briefing	<b>Permits/licences required:</b> Bobcat/Skidsteer Licence  Hiab Crane Permit	<b>PPE required:</b> <ul style="list-style-type: none"> <li>• Safety Boots</li> <li>• High Visibility Vests</li> <li>• Hard Hat</li> <li>• Protective Clothing</li> <li>• Medium Impact Safety Glasses</li> <li>• High level cut resistant gloves</li> <li>• UV Protective Cream</li> <li>• Ear Muff or ear plugs</li> <li>• P2 Face mask</li> </ul> <p>PPE requirements shall meet PPE SMS-06-GD-0323</p>
<b>Applicable Standards, Codes of Practice and guidance:</b> <ul style="list-style-type: none"> <li>• OHS Regulation 2000 Working with Plant clause 134-144</li> <li>• AS 1726 Geotechnical Site Investigations</li> <li>• Code of Practice: Noise Management and Protection of Hearing at Work</li> <li>• Code of Practice: Working in Hot &amp; Cold Environments</li> <li>• National Code of Practice for Manual Handling</li> <li>• Code of Practice: Electrical practices for Construction Work</li> <li>• COP: Control of Hazardous Substances</li> <li>• SMS-06-GD-0372 Working on or near Public Roads</li> <li>• RTA Traffic Control at Worksites</li> </ul>	<b>Inspection requirements</b> <ul style="list-style-type: none"> <li>• SMS-16-FM-0085 Plant Equipment Inspection &amp; Maintenance</li> <li>• SMS-16-FM-0089 Lifting Equipment Inspection</li> <li>• SMS-16-FM-0716 Mobile Plant Pre-start Daily Checklist</li> </ul>	<b>Service schedule:</b> Investigation Supervisor to search underground services  <b>MIMS or METRE Ref:</b> N/A	<b>Training/Qualifications required:</b> <ol style="list-style-type: none"> <li>1.RISI Rail Industry Safety Induction</li> <li>2.Electrical Safety Awareness</li> <li>3.First Aid Certificate</li> <li>4.Rail Safety Competency PO2</li> <li>5.Drillers Certificate (ADITC)</li> <li>6.Traffic Controller Certificate RTA</li> <li>7.CV Vehicle Loading Crane Certificate (&lt;10 Tonnes)</li> </ol>	

# Site Investigation Drilling Operations

Issue date: 19/02/10

Review date: 18/02/13

Number	Step	Hazard or human error (Safety/Environmental hazards identified, including physical environment, human errors, plant and equipment)	Risk ranking before controls	Control (to be Implemented to eliminate or reduce the risk to the lowest practicable level)	Risk ranking after controls	Responsibility	Job step to be completed in accordance with (name associated documentation)
1	Site establishing. Organise resources, check Hazardous Locations Register, load vehicle and drive to worksite	Muscular stress or strain	C+	Ensure all personnel are already trained in manual handling and use correct tools Job rotation to avoid constant exposure Use other personnel to share load Use correct tools where appropriate	D	Drillers / Site Controller	SMS-06-FM-0635 Manual Handling ID Risk Assessment Checklist SMS-06-GD-0001 Guide to Manual Handling
2	Arriving on site and receive Pre-Work Briefing	Possible Train, Vehicular and Pedestrian hazards	B+	Pre-work Briefing covering hazards	C+	Drillers / Site Controller	SMS-06-FM-0163 Pre-work Briefing SMS-06-FM-0774 Worksite Protection Plan
		Slips, trips and falls	C+	Safety boots	D	Drillers / Site Controller	SMS-06-FM-0163 PPE
3	Set up Worksite Protection for rail corridor  Or  Traffic Control roadside	Struck by train, track machine or vehicle	B+	Implement Worksite Protection Plan Pre-work Briefing Local Safety Induction	C+	Protection Officer	RailCorp Network Rules & Procedures SMS-06-FM-0774 Worksite Protection Plan SMS-06-GD-0372 Work on or Near Public Roads SMS-11-FM-0925 Local Safety Induction

# Site Investigation Drilling Operations

Issue date: 19/02/10

Review date: 18/02/13

Number	Step	Hazard or human error (Safety/Environmental hazards identified, including physical environment, human errors, plant and equipment)	Risk ranking before controls	Control (to be Implemented to eliminate or reduce the risk to the lowest practicable level)	Risk ranking after controls	Responsibility	Job step to be completed In accordance with (name associated documentation)
		Struck by traffic or other vehicle	B+	<ul style="list-style-type: none"> <li>Arrange for Road Occupancy Licence (ROL) by Project Manager and use Traffic Controller</li> <li>Traffic Control Plan</li> <li>Wear high visibility vest</li> <li>Pre-work Briefing with risk assessment on traffic conditions and access route</li> <li>Use witches hats or barriers around worksite that may not impact on pedestrian walkways when worksite includes plan, equipment and tools</li> </ul>	D	Project Manager Traffic Controller	SMS-06-GD-0372 Working on or Near Public Roads RTA Traffic Control at Worksites
4	Positioning of drilling machine at borehole location to commence work	Contact with overhead electrical wire, electrical & signal structures	A	Use observer when setting up drilling rig & lifting mast. Have suitably trained person direct drilling rig into position Avoid travelling across steep slopes Obtain electrical power out permit beforehand	C+	Drillers / Site Controller	Working in Accordance with an Electrical Permit SMS-06-SW-0267 SMS-06-GD-0001 Manual Handling
		Tipping over	B+	Check site for stability and ground condition if ground condition too steep or wet, assess risks again Relocate to firm ground	C+	Drillers / Site Controller	SMS-11-FM- 0925 Local Safety Induction
5	Check borehole location for buried services	Electrocution, serious burns and damage to infrastructure & plant	A	Carry out Dial-Before-You-Dig search and have plans onsite Cable locators to mark services onsite Use hand auger for the first 1.5 metres and stand on LV rubber matt while augering Wear insulated gloves and safety boots	C+	Drillers / Site Controller	SMS-06-FM-0384 Services Search Request
6	Unload equipment using crane on truck	Strain muscles from handling equipment	C+	Share load with other drillers	D	Drillers with CVV Loading Licence	

# Site Investigation Drilling Operations

Issue date: 19/02/10

Review date: 18/02/13

Number	Step	Hazard or human error (Safety/Environmental hazards identified, including physical environment, human errors, plant and equipment)	Risk ranking before controls	Control (to be Implemented to eliminate or reduce the risk to the lowest practicable level)	Risk ranking after controls	Responsibility	Job step to be completed In accordance with (name associated documentation)
7	Unloading drilling equipment from drilling rig	Manual handling and mechanical handling equipment injuries	C+	Ensure all staff are trained in manual handling techniques and use of drilling tools  Deploy job rotation avoid constant exposure  Use other personnel to "share the load"  All lifting equipment are inspected and tested 6 monthly  Check all lifting slings prior to use	D	Drillers with CVV Loading Licence Site Controller	SMS-06-FM-0163 Pre-work Briefing
8	Coupling and lowering drilling equipment to commence drilling operations	Back and muscular strain from manual handling of plant and equipment  Hand injury	C+	Use winches and mechanical rod and casing breaker  Use Stilsons fit for purpose to lifting and undoing rods and casing  Use cut resistant gloves to protect hands	D	Drillers / Site Controller Site Assistant	SMS-06-GD-0001 Manual Handling
		Caught by rotating spindle	B	Machine guard installed for protection  Operating Driller stands one metre from spindle, others 6 metres away  Loose hair tucked within hard hat  No loose clothing  Driller / Operator to check no personnel around drilling area prior to engaging for drilling	D	Drillers / Site Controller Site Assistant	SMS-06-GD-0225 Plant  SMS-06-FM-0370 Plant Hazard ID and Risk Assessment on Drilling Rig
		Cut and crushed fingers	C+	Operating Driller stands one metre from spindle, others 6 metres away	D	Drillers / Site Controller Site Assistant	SMS-06-FM-0163 Pre-work Briefing
		Joint injuries	C+	Deploy job rotation to avoid constant exposure  Use other personnel to "share the load"	D	Drillers / Site Controller Site Assistant	SMS-06-FM-0163 Pre-work Briefing  SMS-06-GD-0225 Plant

# Site Investigation Drilling Operations

Issue date: 19/02/10

Review date: 18/02/13

Number	Step	Hazard or human error (Safety/Environmental hazards identified, including physical environment, human errors, plant and equipment)	Risk ranking before controls	Control (to be Implemented to eliminate or reduce the risk to the lowest practicable level)	Risk ranking after controls	Responsibility	Job step to be completed In accordance with (name associated documentation)
9	Removing core from core barrel	Hit by moving object	C+	Keep a clear distance from rotating drill head Barricade 6 metres of work area Stand on side of barrel when extracting core	D	Drillers / Site Controller Site Assistant	SMS-06-FM-0163 Pre-work Briefing SMS-06-GD-0225 Plant
		Blast of high water from pump – foreign body to eyes	C+	Ensure water hoses are in good order Correct fitting used Wear medium impact safety glasses	D	Drillers / Site Controller Site Assistant	SMS-06-GD-0323 PPE Guide SMS-06-FM-0163 Pre-work Briefing
10	Placing rock core from core barrel	Muscular strain to back, upper and lower limbs	C+	Ensure all staff are trained previously in manual handling techniques and use of drilling tools Deploy job rotation to avoid constant exposure Use other personnel to “share the load” Place core box near to receive rock core	D	Site Controller	SMS-06-GD-0001 Manual Handling
11	Carry out SPT Testing	Crushing injury from hammer	A	Double check if lifting hooks secured when attaching hammer to rods Check all lifting slings prior to use Use cut resistant gloves	D	Drillers / Site Controller Site Assistant	SMS-16-FM-0075 Pre-Job Plant Inspection SMS-16-FM-Lifting Equipment Inspection
		Injury to hands and fingers	C+	Operating driller stand in clear of one metre away from lifting equipment, others 6 metres	D	Drillers / Site Controller Site Assistant	SMS-06-FM-0163 Pre-work Briefing
		Exposure to noise above 85 dBA	C+	Wear ear muff or ear plugs	D	Drillers / Site Controller Site Assistant	SMS-06-GD-Noise Management
12	Carry out EFCP Testing	Hands and fingers caught in pushing ram while adding and removing pushing rods	C+	Ensure control in “Off” position	D	Drillers / Site Controller Site Assistant	SMS-06-FM-0163 Pre-work Briefing
		Exposure to noise above 85 dBA	C+	Wear ear muff or ear plugs	D	Drillers / Site Controller Site Assistant	SMS-06-GD-Noise Management

# Site Investigation Drilling Operations

Issue date: 19/02/10

Review date: 18/02/13

Number	Step	Hazard or human error (Safety/Environmental hazards identified, including physical environment, human errors, plant and equipment)	Risk ranking before controls	Control (to be Implemented to eliminate or reduce the risk to the lowest practicable level)	Risk ranking after controls	Responsibility	Job step to be completed In accordance with (name associated documentation)
13	Mixing Bentonite, Biogel with water	Manual handling	C	Ensure all staff are trained previously in manual handling techniques and use of drilling tools Deploy job rotation to avoid constant exposure Use other personnel to "share the load" Use lifting crane to handle recycling tank during preparation of mud Vigilance when handling drilling fluid	D	Drillers / Site Controller Site Assistant	SMS-06-GD-0199 Dangerous Goods & Hazardous Substances SMS-06-GD-0001 Manual Handling
	Respiratory inhalation of mist and vapour	C+	Wear P2 face mask	D	Drillers / Site Controller Site Assistant	SMS-06-GD-0199 Dangerous Goods & Hazardous Substances SMS-06-GD-0323 PPE	
	Foreign body to eyes	C+	Wear medium impact safety glasses	D	Drillers / Site Controller Site Assistant	SMS-06-GD-0323 PPE	
	Contact dermatitis from bentonite & Biogel clay	C+	Wear rubber gloves Maintain personal hygiene by washing hands and change of clean clothing Follow instruction from MSDS of Bentonite & Biogel	D	Drillers / Site Controller Site Assistant	Bentonite & Biogel MSDS SMS-06-FM-0202 Dangerous Goods & Hazardous Substances Risk Assessment	
14	Reloading drilling equipment onto drilling rig	Strain muscles from handling equipment	C+	Share load with other drillers	D	Drillers with CVV Loading Licence	

# Site Investigation Drilling Operations

Issue date: 19/02/10

Review date: 18/02/13

Number	Step	Hazard or human error (Safety/Environmental hazards identified, including physical environment, human errors, plant and equipment)	Risk ranking before controls	Control (to be Implemented to eliminate or reduce the risk to the lowest practicable level)	Risk ranking after controls	Responsibility	Job step to be completed in accordance with (name associated documentation)
		Manual handling and mechanical handling equipment injuries	C+	Ensure all staff are trained in manual handling techniques and use of drilling tools  Deploy job rotation avoid constant exposure  Use other personnel to "share the load"  All lifting equipment are inspected and tested 6 monthly  Check all lifting slings prior to use	D	Drillers with CVV Loading Licence Site Controller	SMS-06-FM-0163 Pre-work Briefing
15	Clean up worksite	Strain muscles from handling equipment	C+	Share load with other drillers	D	Drillers with CVV Loading Licence	
		Manual handling and mechanical handling equipment injuries	C+	Ensure all staff are trained in manual handling techniques and use of drilling tools  Deploy job rotation avoid constant exposure  Use other personnel to "share the load"  All lifting equipment are inspected and tested 6 monthly  Check all lifting slings prior to use	D	Drillers with CVV Loading Licence Site Controller	SMS-06-FM-0163 Pre-work Briefing

## **Site Investigation Drilling Operations**

Issue date: 19/02/10

Review date: 18/02/13

**NOTE: Each work group or team member must sign off on the SWMS to acknowledge they have been briefed about or instructed in the SWMS**

# Site Investigation Drilling Operations

Issue date: 19/02/10

Review date: 18/02/13

RailCorp Level 2 Risk Matrix - Regional & Local (Workplace)		Likelihood/Frequency							Definition for Use - Regional & Local level (Workplace)
		Event Frequency	Less than once every 1000 years	Once every 100 to 1,000 years	Once every 10 to 100 years	Once every 1 to 10 years	More than once per year up to and including 10 times per year	More than 10 times per year	
Consequence		Historical (Likelihood)	Unheard of in the rail industry	Has occurred once or twice in the rail industry	Has occurred many times in the rail industry, but not in NSW	Has occurred once or twice in NSW	Has occurred frequently at specific locations		Used for workplace hazards and safety risks that do not consider the whole of the network. Indicatively this matrix is appropriate for use where the hazards under consideration are up to 10% of the total network exposure. This includes regional and local workplace risk assessments.
		Workplace Predictive (Likelihood)	Not expected to occur	May occur only in exceptional circumstances	Could occur at some time but not likely	You would expect it to occur at least once in the next 10 years performing similar activities	You would expect it to occur at least once this year performing similar activities	You would expect it to occur at least once this month performing similar activities	
			F1	F2	F3	F4	F5	F6	As an example, the Level 2 scale would be used when examining the risk of slips, trips and falls on specific RailCorp platforms within a region or at a particular station, or the risk of fire within a depot.
Consequence			Incredible	Improbable	Remote	Occasional	Probable	Frequent	
>10 Fatalities	C6	Disastrous	B-	B+	A	A	A	A	There are 3 options for descriptors which can be used to determine the frequency category. One set of descriptors is provided for frequency, one for historical likelihood, and one for predictive likelihood in the workplace. Choose the most appropriate.
2-10 Fatalities	C5	Catastrophic	C+	B-	B+	A	A	A	
1 Fatality (2-10 Major Injuries)	C4	Critical	C-	C+	B-	B+	A	A	To score the risk, follow the steps:
1 Major Injury	C3	Major	D	C-	C+	B-	B+	A	
1 or more Minor Injuries	C2	Minor	D	D	C-	C+	B-	B+	1. Identify the magnitude of the credible consequence if the risk were to occur. If applicable, risks should be considered in terms of the safety (this matrix), commercial and environmental impact (using other matrices).
First aid treatment, or illness/injury not requiring treatment	C1	Negligible	D	D	D	C-	C+	B-	