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SEDGMAN

Invincible Colliery

Annual Environmental Management Report 2015

Castlereagh Coal

LC/lc
Revision: 1.0

Revision Status

Revision Number	Author	Description	Date	Approved By
Draft	L. Clough	Draft for review	20-Jan-2016	A. O'Brien/J. Duffy
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Distribution

Company Name	Contact Name	Revision	Date
Castlereagh Coal	Brett Moore	1.0	22-Jan-2016
Invincible Colliery	John Duffy	1.0	22-Jan-2016
Department of Trade & Investment	Chris Hammersley	1.0	22-Jan-2016

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Title Block

Name of Mine	Invincible Colliery		
Titles/Mining Leases:	ML1638, ML1635, CCL702, EL7517		
MOP Commencement Date:	May 2013	**MOP Completion Date:**	29 February 2016
AEMR Commencement Date:	1 January 2015	**AEMR Completion Date:**	31 December 2015
Name of Leaseholder:	Shoalhaven Coal Pty Ltd		
Name of Mine Operator:	Sedgman Limited		
Reporting Officer:	William (John) Duffy		
Title:	Mining Engineering Manager		
Signature:	....		
Date:	22 January 2016		

1 Introduction

This Annual Environmental Management Report (AEMR) has been prepared for the Invincible Colliery in compliance with Schedule 5, Condition 4 of the Project Approval 07-0127 and in accordance with the Department of Trade and Investment, Division of Resources and Energy (DRE) *Guidelines to the Mining, Rehabilitation and Environmental Management Process.*

Castlereagh Coal owns and manages the Invincible Colliery, which is located approximately 125km northwest of Sydney and south-east of the township of Cullen Bullen. The site locality is shown on ***Figure 2, Appendix A***. Mining operations were suspended in 2013 and the mine is currently managed under a care and maintenance arrangement pending an application for recommencement of mining operations.

1.1 Consents, Leases and Licences

The current consents, leases and licences as well as the date of grant and expiry date are provided in Table 1. Details of the current Mining Operations Plan (MOP) and any amendments since the previous AEMR are also provided.

Table 1: Consents, Leases and Licences

Document	Date Granted	Expiry Date
Planning Approval PA 07_0127	8 Dec 2008	7 Dec 2016
EPL No 1095	28 February (Anniversary date)	Renewed annually
Consolidation Coal Lease 702	26 Nov 1990	24 Nov 2024
Mining Lease 1635	10 Sep 2009	10 Sep 2030
Mining Lease 1638	6 Nov 2009	6 Nov 2030
Exploration Licence 7517	16 April 2010	16 April 2016
Groundwater Licence 10BL602586	19 Feb 2013	18 Dec 2018
Groundwater Licence 10BL602584	24 Dec 2012	23 Dec 2017
Current Invincible Colliery C&M MOP	May 2013	29 February 2016
MOP Amendments since the previous AEMR	An updated C&M MOP has been prepared for Invincible Colliery since the previous AEMR and was submitted for approval by DRE on 17 December 2015. This updated C&M MOP is expected to commence in March 2016.	

The ownership of land within and adjacent to the mine site is shown on ***Figure 3, Appendix A***.

1.2 Mine Contacts

The contact details for the current mine manager and environmental manager are provided in Table 2.

Table 2: Mine Contacts

Role	Name	Contact details
Mining Engineering Manager	William (John) Duffy	Invincible Colliery, Castlereagh Highway Cullen Bullen, NSW 2790 (02) 6359 0600 John.Duffy@sedgman.com
Environmental Manager	Andrew O'Brien	Sedgman, Level 2, 2 Gardner Close Milton Qld 4064 (07) 3124 4501 Andrew.O'Brien@sedgman.com

1.3 Actions Required at Previous AEMR Review

The AEMR for the period 1 January 2014 to 31 December 2014 was reviewed and accepted by DRE on 23 October 2015. There were no actions required as a result of the DRE review.

2 Operations during the Reporting Period

2.1 Exploration

As the site has been in care and maintenance since 2013, there were no exploration activities undertaken during the 2015 reporting period.

2.2 Land Preparation

As the site has been in care and maintenance since 2013, no land clearing was undertaken for mining activities during the 2015 reporting period.

2.3 Construction

As the site has been in care and maintenance since 2013, there were no construction activities undertaken during the 2015 reporting period.

2.4 Mining

As the site has been in care and maintenance since 2013, there were no mining activities undertaken during the 2015 reporting period.

Most mobile plant and equipment has been removed from the site. Any equipment remaining on site is periodically run, where possible, with pre-start inspections conducted at each instance. Small excavators and dozers are used periodically for short periods for specific tasks such as erosion control and rehabilitation maintenance.

2.5 Coal Processing

As the site has been in care and maintenance since 2013, no coal processing activities occurred and no coal was processed through the coal preparation plant (CPP) during the 2015 reporting period.

2.6 Waste Management

As no mining activities were undertaken during the 2015 reporting period, minimal quantities of waste materials were required to be stored on site.

All sewage from the workshops/administration areas is directed to septic systems which are pumped out by a licensed waste collection and disposal contractor on an as-needs basis.

Waste oils and grease from workshop areas is pumped or gravity flows to oil-water separators before being pumped to a bulk waste oil storage tank. Waste oils and grease stored at the maintenance workshop are collected by a licensed waste recycling contractor on an as needs basis.

All paper and general wastes from administration and workshop areas is disposed of in garbage bins located adjacent to the administration buildings. The bins are regularly collected and the contents placed in large waste skip bins positioned adjacent to the heavy vehicle maintenance building to await removal by a licensed industrial waste collector. Industrial waste collection is undertaken as required.

2.7 Product Stockpiles

As there were no mining activities conducted, the ROM stockpile remained constant during the current reporting period. No coal product was delivered to or removed from the ROM stockpile.

2.8 Water Management

The water management system at Invincible Colliery has been designed, as far as possible, as a closed loop system. All water that enters the site via rainfall or through the water table is diverted to a series of settlement ponds and storage dams within the site.

There are five active sediment dams (SD2, SD3, SD4, SD5 and SD6), one environmental dam (SD1), one storage dam (Main Colliery Dam), two sediment ponds, one clean water storage dam located within the Aboriginal Heritage site (OS-1) and seven inactive fine reject dams currently on site (see ***Figure 4, Appendix A***).

All surface water captured onsite is diverted to the Main Colliery Dam for storage and reuse as required. The Main Colliery Dam is a licensed discharge point (LD002) under EPL 1095. A pumping station has been constructed downslope of the Main Colliery Dam which supplies process water to the CPP and to two water stand pipes for dust suppression.

The ROM Pad and the mine infrastructure area and hardstand areas (i.e. haulage road) are designed to allow water to flow into a road side sediment dam (SD2). Water is pumped from SD2 to SD4, which then drains to the old workings.

All rehabilitation areas are designed with large contour drains which capture runoff during rain events which can then be redirected to sediment dams.

2.9 Hazardous Material Management

The volume of hazardous materials delivered to and stored within the site has reduced substantially as there were no mining operations conducted during the reporting period.

Hazardous material storage tanks containing oils, grease and degreasers have been emptied, isolated and secured. Any additional storage tanks have been removed from the site. Storage tanks remaining on site that contain these materials are kept emptied during the care and maintenance period. One of the above ground self bunded diesel tanks (75,000L Transtank) is operational with up to 35,000L of diesel stored in the facility. A second Transtank (95,000L) is kept on site but is currently not in use.

Diesel is delivered to site as required. In addition, waste oil and grease is stored adjacent to the workshop in a bunded area which is regularly removed by a licensed contractor, along with oily water from the oil and water separator if required.

2.10 Other Infrastructure Management

No production occurred during the reporting period. A summary of the production figures and mining activity for 2015 and the forecast production expectations for 2016 are summarised in Table 3.

Table 3: Production and Waste Schedule

	Cumulative Production (m^3)		
	Start of Reporting Period	***End of reporting period***	***End of next reporting period (estimated)***
Topsoil stripped	0	0	0
Topsoil used/spread	0	0	0
Waste rock	0	0	0

	Cumulative Production (m^3)		
ROM coal	0	0	0
Processing waste	0	0	0
Product coal	0	0	0

The volumes of water stored on site during the 2015 reporting period are shown in Table 4.

Table 4: Stored Water

	Volumes Held (ML)		
	Start of Reporting Period	***End of reporting period***	***Storage Capacity***
Main Dam - Dirty water	110.0	105.0	117.0
Environmental Dam (SD1) - Dirty water	0.01	0.01	0.03
SD2 - Dirty water	*	1.2	6
SD3 - Dirty water	*	0.15	0.3
SD4 - Dirty water	*	0.0	38
SD5 - Dirty water	*	4.0	6.6
SD6 - Dirty water	*	6.5	12.8
Controlled discharge water – LD002	0.0	0.0	117.0

** Water volumes and capacities for these dams were not reported in the previous AEMR.*

3 Environmental Management and Performance

3.1 Environmental Risk Assessment

A formal risk assessment was undertaken by Sedgman Limited for the Invincible Colliery on 27 and 28 May 2015 at the Invincible Colliery site office. A site tour was undertaken to ensure all areas of the Invincible Colliery and adjacent lands held within mining leases were considered in the scope of the risk assessment. The risk assessment was conducted in accordance with the Sedgman Ltd HSEQ Risk Management Procedure (HSE-PC-100000).

Risks identified during the assessment and the associated risk ratings are detailed in Table 5. Management controls are required for all items which have been identified as either high or medium risk. It is expected that current controls listed in Table 5 are sufficient to manage risks.

3.2 Environmental Risk Management

To ensure the implementation and effectiveness of control strategies for identified environmental risks, a number of management plans have been developed in consultation with regulators and other relevant stakeholders. Approved management plans at Invincible Colliery include the:

- Landscape Management Plan;
- Water Management Plan;
- Air Quality Monitoring Program;
- Noise Monitoring Program;
- Environmental Monitoring Program;
- Aboriginal Heritage Management Plan;
- Blast Management Plan;
- Energy Savings Action Plan;
- Road Closure Management Plan;
- Particulate Matter Pollution Reduction Program; and
- Pollution Incident Response Management Plan.

The Invincible Colliery is managed in accordance with approved Management Plans as required. Any variations required to the above Management Plans is undertaken in consultation with the Department of Industry – Division of Resources and Energy (DRE) and other relevant stakeholders.

Table 5: Risk Assessment

Risk Description	Current Controls	Consequence	Likelihood	Risk Rating
Strata Failure	Annual geological survey completed by content expert Daily inspections or prior to entry from mining engineering manager Site in care and maintenance, limited persons onsite Visitors escorted by authorised persons	Major	Unlikely	High
Statutory non-compliance (electrical)	Electrical Engineering Manager appointed (caretaker mode) Electrical statutory checks in current Care and Maintenance MOP	Minor	Unlikely	Low
Statutory non-compliance (mechanical)	Mechanical Engineering Manager appointed (caretaker mode) Mechanical statutory checks in current Care and Maintenance MOP	Minor	Unlikely	Low
Unauthorised access to site	Locked gate to restrict access on all public accesses Highwall bunding along highwalls Security signs Locked buildings and equipment	Low	Unlikely	Low
Contractor Management	Inducted, trained and authorised personnel OTJ risk assessment, SWMS in place MDG15 inspections on equipment Familiar with work area Supervision by authorised persons	Minor	Unlikely	Low
Dust	Watercarts available when truck movements onsite Environmental monitoring as per Environmental Approval Licence Restricted access to pit	Low	Unlikely	Low
Water discharge offsite	Licenced discharge points Environmental dams Environmental monitoring as per Environmental Approval Licence Inspection after rainfall events Pit pumps in place Regular inspections Natural discharge points through Marangaroo sandstone Environmental Management Plan in place	Minor	Unlikely	Low
General waste/sewerage	Designated collection for waste – SITA Licenced sewerage collection from council on as needs basis – manual inspection Oil separators	Low	Unlikely	Low
Fuel/Oil Spills	Contained onsite Self-bunded fuel tanks (1 x 75000L in use, 1 x 95000 not in use) Spill kits Servicing done in pit – decanted into containers and then disposed of through 8eparator Light vehicles serviced offsite Fuel spills pipeline flows down to separator Approved disposal Current SHMS	Low	Unlikely	Low
Theft of equipment – fixed and mobile plant	Locked gate to restrict access on all public accesses Security signs Locked buildings and equipment	Low	Unlikely	Low

Risk Description	Current Controls	Consequence	Likelihood	Risk Rating
Damage to equipment – fixed and mobile plant	Equipment in care and maintenance Restricted access to site Power can be isolated at CHPP Regular statutory inspections of equipment	Minor	Unlikely	Low
Unauthorised use of equipment – fixed and mobile plant	Current SHMS – contractor management, training and authorisations and inductions	Minor	Unlikely	Low
Damage to infrastructure	Visual inspections by Mechanical Engineering Manager Structural integrity audits in the past Traffic management plans and signage	Minor	Unlikely	Low
Noise	Environmental monitoring as per Environmental Approval Licence Restricted access to pit Quarterly noise monitoring by content experts Pumps run during daylight hours only	Low	Unlikely	Low
Statutory non-compliance (Mining)	Mining Engineering Manager in caretaker mode (not appointed at present) Statutory checks in current Care and Maintenance MOP EPL in place Current SHMS	Minor	Unlikely	Low
No appointment of statutory roles	Resource for role being sourced Appointment pending operator arrangement Previous MEM still engaged onsite	Moderate	Unlikely	Medium
Energised equipment	Current SHMS (isolation) Restricted access to site Contractor management	Major	Unlikely	High
Mine subsidence	Mine subsidence plan Regular inspections Fenced off and signposted	Minor	Unlikely	Low
Bushfire & fire	Bushfire Management Plan Fire extinguishers onsite Regional bushfire brigade Fire trail access Regular inspections	Major	Unlikely	High
Vehicle interaction onsite	Traffic Management Plan in place Restricted access to site (in care and maintenance) Authorised to drive onsite	Major	Unlikely	High
Spontaneous combustion and monitoring	Pumping water underground Plan of works to manage spon com Restricted access Inspections Remedial work of known spon com areas Gas monitoring when active	Low	Unlikely	Low

Risk Description	Current Controls	Consequence	Likelihood	Risk Rating
Statutory non-compliance (environmental)	Checks in current Care and Maintenance MOP EPL in place Current SHMS Environmental management plan Monitoring programs Annual Environmental audits	Minor	Unlikely	Low
Personal injury from working alone	Restricted access to inducted and persons familiar with site Phone coverage available in majority of areas of pit Supervision Stay in main areas of the site	Minor	Unlikely	Low
Personal injury from Working at heights	No WAH tasks onsite identified, if so, complete JSA and be competent as per current SHMS	Low	Rare	Low
Lack of rescue and treatment of person who suffers injury	First aid kits available onsite – vehicle, first aid rooms and kitchen Mines rescue not currently needed onsite as in care and maintenance Local emergency services available Mines rescue station at Lithgow if required	Low	Unlikely	Low
Personal injury from Confined spaces	No confined spaces tasks onsite identified, if so, complete JSA and be competent as per current SHMS Current confined spaces fenced and locked off	Low	Rare	Low
Personal injury from Working over water	No Working over water tasks onsite identified, if so, complete JSA and be competent as per current SHMS	Low	Rare	Low
Personal injury from Working under loads	No Working under loads tasks onsite identified, if so, complete JSA and be competent as per current SHMS	Low	Rare	Low
Weed control	Weed Management Plan in place Wheel wash	Low	Unlikely	Low
Aboriginal Heritage Disturbance	Aboriginal Heritage Management Plan Aboriginal Heritage areas signposted and fenced off	Low	Unlikely	Low
Visual pollution	Planned rehabilitation of old workings as part of Mine Closure Plan Mine in care and maintenance	Low	Unlikely	Low
Methane venting	Not a risk at this site			
Neighbours	Community Consultative Committee Meetings Noise agreements with neighbours Complaints hotline and register Site in Care and Maintenance	Minor	Possible	Medium
Exposure to Hazardous Substances	Chemwatch to manage SDS's Cabinets for storage Current SHMS PPE available	Low	Unlikely	Low
Unplanned movement	Traffic Management Plan Trained, competent and appointed personnel Restricted access to site Site in care and maintenance JSA prior to lifting onsite	Low	Unlikely	Low
Site access from public roads	(Cullen Valley only)			

Risk Description	Current Controls	Consequence	Likelihood	Risk Rating
Inrush of water	Not a risk at this site at present Mine in care and maintenance	Low	Rare	Low
Tyre and rim failure	Not a risk at this site at present Mine in care and maintenance	Low	Rare	Low
Overhead power lines	Traffic Management Plan Signage Idiot bars at front gate Site in care and maintenance	Major	Unlikely	High
Underground services	Dig permits Up to drawings of services Current SHMS Site in care and maintenance	Low	Unlikely	Low
Lack of water quality in underground workings	Monitoring and inspection of water quality Monitor any discharges out of main dam	Low	Unlikely	Low
Vermin and pest control	Baiting programs in place as required Report any signs of vermin Regular inspections of work area	Low	Unlikely	Low

3.3 Reporting Requirements

Under the conditions of the mining leases and exploration licences, Castlereagh Coal is required to report to DRE on any non-compliance with conditions and any complaints within 7 days.

Reporting to the Environment Protection Agency (EPA) on compliance and complaints is required under EPL 1095 to be submitted with the annual return. Notification of environmental harm must be made to the EPA within 7 days of an incident occurring and a written report may be requested.

Where an incident of environmental harm is detected, Castlereagh Coal must notify the Department of Planning and Environment (DPE) within 24 hours and provide a written report within 6 days in accordance with the requirements of PA 07-0127. All non-compliances and complaints are reported to DPE in the annual AEMR.

3.4 Meteorological Monitoring

Castlereagh Coal is required to conduct meteorological monitoring at the site in accordance with Schedule 3, Condition 11 of PA 07-0127. The Invincible Colliery weather station is located within the Lot 113 biodiversity offsets area adjacent the Aboriginal heritage site (OS1). A summary of monthly meteorological monitoring results is provided in Table 6.

3.4.1 Rainfall

Invincible Colliery received 543.2 mm of rainfall over 146 rain days during the reporting period. The highest rainfall occurred during January (124.2 mm) and September had the lowest rainfall (12.6 mm). A summary of monthly rainfall data is provided in Table 6.

3.4.2 Temperature

Air temperature is measured at 2 m and 10 m above ground level to account for temperature inversions. The maximum temperature recorded during the reporting period was in December (33.3°C @ 2m, 32.8°C @10m) and the lowest temperature occurred in July (-5.6°C @ 2m, -4.7°C @10m). Average monthly temperatures are summarised in Table 6.

3.4.3 Wind Speed and Direction

Wind speed and direction is shown on Wind Roses provided in ***Appendix B.***

3.4.4 Humidity

The highest humidity recorded during the reporting period at Invincible Colliery occurred during July (97.1%) and the lowest was during December (7.7%) as shown in Table 6.

Table 6: Invincible Colliery weather station data

Month	Rainfall (mm)	Cumulative Rainfall (mm)	No of rain days/ month	Air temp @ 2m (°C)		Air temp @ 10m (°C)			Humidity (%)		
				Mean (Max)	Minimum	Maximum	Mean (Max)	Minimum	Maximum	Minimum	Maximum
January	124.2	124.2	15	23.9	5.2	29.5	23.9	5.8	30.8	19.4	93.9
February	29.2	153.4	13	24.0	7.5	30.6	23.9	7.9	30.1	16.9	93.6
March	22.6	176.0	8	23.4	3.7	31.7	23.2	4.5	31.4	11.4	93.3
April	104.2	280.2	20	17.0	0.2	24.5	16.9	0.8	24.2	32.7	96.8
May	18.2	298.4	11	13.8	-2.7	19.2	13.8	-2.0	19.3	31.0	96.6
June	24.0	322.4	14	12.2	-4.3	15.0	12.4	-3.6	16.0	22.1	96.6
July	42.0	364.4	16	9.8	-5.6	14.9	9.9	-4.7	15.1	24.8	97.1
August	32.4	396.8	10	12.0	-4.0	20.0	12.0	-3.2	19.8	28.2	95.9
September	12.6	409.4	11	15.4	-2.4	21.2	15.3	-1.9	20.9	15.0	95.5
October	19.4	428.8	7	22.3	2.8	29.6	22.4	3.9	29.7	10.3	94.3
November	64.8	493.6	11	22.9	4.1	32.5	22.9	4.7	32.7	11.4	94.3
December	49.6	543.2	10	25.3	5.1	33.3	25.1	5.6	32.8	7.7	93.5
Total	543.2		146								

3.5 Air Quality

3.5.1 Environmental Management

There were no mining activities undertaken during the reporting period, including blasting, coal and overburden haulage by trucks. As such, potential impacts to air quality were minimal. Control measures to minimise air quality impacts include limiting vehicle speeds within the site and utilising a water cart on haul roads as required when undertaking care and maintenance works.

Air quality monitoring is undertaken in accordance with the Air Quality Monitoring Program (AQMP) to verify the effectiveness of air quality control measures and includes deposited dust, particulate matter, and meteorological conditions. The air quality monitoring network consists of five dust deposition gauges and one High Volume Air Sampler (HVAS) measuring particulate matter <10µm (PM_{10}). Monitoring locations are shown on ***Figure 4, Appendix A***.

Air quality impacts at Invincible Colliery are managed in a manner that minimises generation of airborne and visual dust. The control strategies outlined in the AQMP are considered adequate to manage risks associated with air pollution.

3.5.2 Environmental Performance

Castlereagh Coal is required to ensure that dust and particulate emissions do not cause exceedences of the criteria specified by the project approval (PA-07-0127). The air quality impact assessment criteria specified in PA-07-0127 are provided in Table 7.

Table 7: Air quality impact assessment criteria

Pollutant	Averaging Period	Criterion
Total suspended particulate (TSP) matter	Annual average	90 µg/m^3
Particulate matter <10µm (PM_{10})	Annual average	30 µg/m^3
	24 hour average	50 µg/m^3
Deposited dust	Annual average (maximum total)	4 g/m^2/month
	Annual average (maximum increase)	2 g/m^2/month

Deposited dust is monitored on a monthly basis at five representative locations around the mine site (dust deposition gauges IDD1 to IDD5). The annual average criterion for deposited dust (4g/m^2/month) was not exceeded at any of the dust deposition gauges during 2015. The increase in annual average dust levels was less than the criterion of 2g/m^2/month at all gauges. The deposited dust monitoring results and annual averages for 2015 are shown in Table 8.

Table 8: Deposited dust monitoring results

	Total Insoluble Solids (g/m^2/month)				
Date	**IDD1**	**IDD2**	**IDD3**	**IDD4**	**IDD5**
January 2015	0.8	<0.1	<0.1	0.3	0.2
February 2015	0.5	0.4	0.5	0.3	0.3
March 2015	0.6	0.3	1.0	1.3	0.1
April 2015	<0.1	<0.1	<0.1	0.2	1.4
May 2015	0.4	2.2	0.5	0.3	0.3
June 2015	0.7	1.3	<0.1	0.9	0.1
July 2015	<0.1	<0.1	0.6	<0.1	0.9
August 2015	0.7	0.3	0.5	0.3	5.9
September 2015	0.7	0.5	0.7	1.2	0.6
October 2015	0.2	0.1	0.3	0.2	0.6
November 2015	0.8	0.4	3.2	0.4	1.3
December 2015	0.7	0.2	0.5	0.6	0.5
Annual Averages					
2012	1.0	1.1	0.6	0.5	0.9
2013	0.8	0.5	0.5	0.4	0.6
2014	2.0	0.8	1.0	0.6	19.2
2015	0.6	0.6	0.9	0.5	1.0

Monitoring of particulate matter is conducted on a 24-hour basis (recorded continuously and collected weekly) using a HVAS located within the Invincible Colliery site. Total suspended particulates are estimated from the PM_{10} concentrations as outlined in the AQMP.

The annual average criteria for PM_{10} (30 µg/m^3) and TSP (90 µg/m^3) were not exceeded during the 2015 reporting period. The 24 hour maximum allowable limit for PM_{10} (50µg/m^3) was not exceeded during the reporting period. The particulate matter monthly monitoring results and annual averages for 2015 are shown in Table 9.

Table 9: Particulate matter (PM_{10}) and Total suspended particulates (TSP) results

Monthly average	PM_{10} (µg/m^3)	TSP (µg/m^3)
January 2015	3.6	9
February 2015	9.3	23.1
March 2015	9.4	23.5
April 2015	1.5	3.8
May 2015	7.3	18.3
June 2015	2.0	5.0
July 2015	1.8	4.5
August 2015	4.0	10.0
September 2015	5.4	13.5
October 2015	10.0	25.0
November 2015	8.8	22.0
December 2015	15.3	38.3
Annual Average 2015	**6.1**	**15.2**

3.5.3 Reportable Incidents

Monitoring of air quality at Invincible Colliery is conducted in accordance with the AQMP by RCA Laboratories. Monitoring results and compliance with the project approval conditions are

reported on a monthly basis. A summary of monthly monitoring results are provided on the Castlereagh Coal website.

Where exceedences of the impact assessment criteria are detected, these will be reported to the Director General within 24 hours. It should be noted that there were no mining operations conducted during the 2015 reporting period. There were no exceedences of the conditions of the project approval and therefore no incident reporting was required.

3.5.4 Further Improvements

Monitoring of air quality will continue to be conducted during the care and maintenance phase in accordance with the approved AQMP to ensure compliance with the conditions of the project approval. Air quality monitoring equipment and weather stations are regularly inspected, calibrated and maintained as required to ensure optimum operation.

3.6 Erosion and Sedimentation

3.6.1 Environmental Management

Permanent erosion and sediment control (ESC) measures within the Invincible Colliery include containment and diversion of “clean” water around disturbed areas and containment of runoff from these disturbed areas within on-site sediment dams. Temporary measures include contour banks, drainage lines, and rock lined drop structures.

All ESC measures are installed and maintained in accordance with the Water Management Plan - Erosion and Sediment Control Plan (ESCP).

3.6.2 Environmental Performance

Erosion control structures are inspected on a regular basis and repairs undertaken as required. Maintenance and repairs were undertaken on erosion and sediment controls located in rehabilitation areas during the 2015 reporting period. These included:

- Cleaning out and repair of contour drains to achieve required fall and reconstruction of drain walls where required; and
- Repair of eroded slopes and reducing water flow rates to prevent further washouts.

In addition to maintenance of ESC measures, Castlereagh Coal is required to ensure that water discharged from the site does not exceed the pollutant concentration limits specified by the environmental protection licence (EPL 1095). The concentration limits specified in EPL 1095 are provided in Table 10.

Table 10: Water quality concentration limits

Pollutant	Concentration limit
Oil & Grease	10 mg/L
pH	6.5 – 8.5
Total suspended solids (TSS)	30 mg/L

Monitoring of water quality is conducted during discharge of water at the licenced discharge point (LD002). There were 5 discharges of water from LD002 during the 2015 reporting period. Water quality monitored during these discharge events did not exceed the concentration limits specified by EPL 1095 for oil and grease, pH or TSS. The water quality monitoring results recorded during discharges from LD002 during 2015 are shown in Table 11.

Table 11: Water quality monitoring results at the licenced discharge point (LD002)

Date of discharge	Oil & Grease	pH	TSS
30 January 2015	<5 mg/L	6.82	5 mg/L
22 April 2015	<5 mg/L	6.71	13 mg/L
5 August 2015	<2 mg/L	8.23	<5 mg/L
8 September 2015	<2 mg/L	7.24	<5 mg/L
11 November 2015	<2 mg/L	7.85	<5 mg/L

Monthly monitoring of water quality within the Main Dam, Environmental Dam and Silt Dam commenced in December 2015 and will continue on a monthly basis regardless of whether water is discharged from the licenced discharge point. The water quality monitoring results from these dams are shown in Table 12.

Table 12: Water quality monitoring results within site dams 11 December 2015

Water storage dam	Oil & Grease	pH	TSS
Main Dam	<2 mg/L	6.74	<5 mg/L
Environmental Dam	<2 mg/L	2.93	7 mg/L
Silt Dam	<2 mg/L	7.36	32 mg/L

Water quality within the Main Dam was in compliance with the concentration limits specified by EPL 1095 during December 2015.

Water quality limits are not specified in the licence for the Environmental Dam or the Silt Dam. The pH in the Environmental Dam is in the acidic range however this result is consistent with historical values and no release occurs from this dam. The pH in the Silt Dam is considered neutral. The TSS concentration of both dams is considered to be relatively low and the oil and grease concentrations are below detection limits.

3.6.3 Reportable Incidents

ESC measures are maintained in accordance with the ESCP to minimise transport of sediment to downstream waters. Water quality monitoring results and compliance with the licence conditions are reported on a monthly basis and are reported to EPA with the licence Annual Return. A summary of monthly monitoring results is provided on the Castlereagh Coal website.

There were 5 discharge events from LD002 during the 2015 reporting period. There were no exceedences of the pollutant concentration limits during these discharges and there were therefore no reportable incidents during the 2015 reporting period.

3.6.4 Further Improvements

Monitoring of water quality will continue to be conducted during the care and maintenance phase to ensure compliance with the licence conditions. ESC measures are regularly inspected and repairs undertaken as required.

Monthly monitoring of water quality within the Main Dam, Environmental Dam and Silt Dam commenced in December 2015 and will continue on a monthly basis regardless of whether water is discharged from the licenced discharge point.

3.7 Surface Water

3.7.1 Environmental Management

The surface water management system at Invincible Colliery is a closed loop system that utilises a series of settlement ponds and storage dams within the site. These ponds and dams are managed in accordance with the Water Management Plan (WMP) as described in Section

2.8. Water is only discharged from the main colliery dam if water quality concentration limits specified in EPL 1095 are achieved (refer to Table 10).

Water quality monitoring is conducted monthly during any discharge from the main dam (LD002) in accordance with EPL 1095. Water quality is also monitored on a monthly basis at two downstream locations (BSW01 and BSW02) as shown on ***Figure 5, Appendix A.***

3.7.2 Environmental Performance

Water quality monitored during discharge events from the main dam did not exceed the concentration limits for oil and grease, pH or TSS (refer to Table 11) during the 2015 reporting period.

The water quality results recorded within downstream creeks are provided in Table 13. Water quality limits are not stipulated for the downstream surface water monitoring locations (BSW01 & BSW02). However, pH results are considered generally neutral, except for the October pH measurement at BSW01, which was slightly acidic. TSS concentrations are considered to be relatively low except at BSW01 during December. This is likely to be as a result of a reduction in the creek water levels. The concentration of oil and grease at both downstream locations were below laboratory detection limits.

Table 13: Water quality monitoring results at downstream creeks (BSW01 and BSW02)

Sampling date	Oil & grease	pH	TSS
Monitoring location BSW01			
5 August 2015	<2 mg/L	7.6	12 mg/L
8 September 2015	<2 mg/L	6.59	15 mg/L
9 October 2015	<2 mg/L	6.09	19 mg/L
10 November 2015	<2 mg/L	7.60	19 mg/L
10 December 2015	<2 mg/L	7.09	29.5 mg/L
Monitoring location BSW02			
5 August 2015	<2 mg/L	8.18	<5 mg/L
8 September 2015	<2 mg/L	8.07	5 mg/L
9 October 2015	<2 mg/L	7.76	<5 mg/L
10 November 2015	<2 mg/L	7.65	<5 mg/L
10 December 2015	<2 mg/L	7.83	19.0 mg/L

3.7.3 Reportable Incidents

Water quality monitoring results and compliance with the licence conditions are reported on a monthly basis and are reported to EPA with the licence Annual Return. A summary of monthly monitoring results are provided on the Castlereagh Coal website.

There were no exceedences of the water quality concentration limits during the 2015 reporting period and there were therefore no reportable incidents.

3.7.4 Further Improvements

Monitoring of water quality will continue to be conducted during the care and maintenance phase to ensure compliance with the licence conditions. The water management system is regularly inspected and repairs undertaken as required.

3.8 Ground Water

3.8.1 Environmental Management

The mining operation is located on the western escarpment of the Sydney Basin and groundwater intercepted from monitoring bore holes is typically greater than 70m depth. The open cut voids at the Invincible Colliery are less than this depth and generally do not intercept any natural groundwater aquifers. Therefore no specific environmental management controls are considered necessary for groundwater management.

3.8.2 Environmental Performance

Baseline groundwater monitoring has been undertaken in 6 rounds of sampling at 7 monitoring bores between 2011 and 2014. Groundwater monitoring locations are shown on ***Figure 5, Appendix A***. Following the 2014 monitoring event conducted by Environment & Natural Resource Solutions, the following conclusions were made regarding groundwater:

- There were no significant changes in Standing Water Level in monitoring bores since the previous monitoring event. The groundwater levels range between 864.8 mAHD in CP131 and 895.5 mAHD in BHW1;
- Salinity remains relatively fresh at the site with concentrations below 1,000 µS/cm. Salinity results are below the ANZECC guideline for 95% protection of species;
- Field results recorded a range in pH between 5.97 (CP116) and 7.36 (BHW1). pH has declined since the previous monitoring event, however results are generally within the range of historical values and characteristic of groundwater conditions in the area. A moderate increase in pH was observed in BHW1. Low pH in groundwater in the area is expected to represent naturally occurring background conditions associated with silica saturation and oxidation of accessory marcasites grains (iron sulphide) within the weathered sandstone;
- Hardness values are reported between 43 mg/L (LD001) and 350 mg/L (CP115). The majority of Site waters may be classified as moderate to very hard. Results for hardness are relatively consistent at the Site with the exception of CP115 which has consistently increased from 130 mg/L in August 2011 to 350 mg/L in July 2014;
- Concentrations of Nitrate and Sulphate are relatively stable in the majority of bores. However, it is noted that levels in CP115 have decreased since the previous monitoring event where results have previously been increasing since February 2013; and
- Concentrations of heavy metals and metalloids in groundwater at the Site report variable concentrations. Increased levels of Cadmium and Iron were reported in bores at the Site during the July 2014 monitoring event. It is noted that elevated levels of metals may be the result of lower pH at the Site which can increase the solubility of heavy metals.

A further round of groundwater monitoring was conducted by RCA on 10 November 2015. The results of groundwater monitoring conducted during the 2015 reporting period are provided in Table 14.

Table 14: 2015 groundwater monitoring results

Sample site	CP114	CP115	CP116	CP131	CP132	LD001	BHW1
Sample date	10/11/15	10/11/15	10/11/15	10/11/15	10/11/15	10/11/15	10/11/15
AHD (RL) (m)	869.75	893.82	892.20	864.76	887.50	890.30	895.21
Depth to aquifer (m)	35.37	56.13	49.04	73.37	17.23	49.82	44.10
pH	6.36	6.28	6.39	Well dry	6.71	7.15	7.09
Electrical Conductivity (EC) (µS/cm	301	757	588		403	155	453
Nitrite (mg/L)	<0.005	<0.005	<0.005		<0.005	<0.005	<0.005
Total Oxidised Nitrogen (mg/L)	0.040	<0.005	<0.005		0.006	0.22	0.006
Chloride (mg/L)	16	3.2	20		33	5.3	24

Sample site	CP114	CP115	CP116	CP131	CP132	LD001	BHW1
Nitrate (mg/L)	0.039	<0.005	<0.005		<0.005	0.22	<0.005
Sulphate (mg/L)	16	350	140		26	14	4.9
Alkalinity (mg/L)	110	56	160		110	44	200
Calcium (mg/L)	26	89	34		33	11	42
Magnesium (mg/L)	11	33	10		15	4.0	18
Sodium (mg/L)	14	16	66		11	5.4	9.6
Potassium (mg/L)	6.0	10	7.0		8.8	6.7	8.8
Total Hardness (mg $CaCO_3$/L)	110	360	130		140	44	180
Aluminium (µg/L)	35	47	7		33	26	37
Arsenic (µg/L)	<1	<1	<1		<1	<1	<1
Cadmium (µg/L)	<0.1	<0.1	<0.1		<0.1	<0.1	0.3
Chromium (µg/L)	<1	<1	<1		1	<1	<1
Copper (µg/L)	5	<1	<1		<1	23	<1
Iron (µg/L)	<5	8500	5100		4200	21	4000
Lead (ug/L)	<1	<1	<1		<1	<1	<1
Manganese (ug/L)	940	420	670		140	1	200
Molybdenum (ug/L)	<1	7	<1		1	<1	<1
Nickel (ug/L)	27	76	17		6	10	14
Selenium (ug/L)	<1	<1	<1		<1	<1	<1
Zinc (ug/L)	10	21	11		11	100	11000
Mercury (mg/L)	<0.0001	<0.0001	<0.0001		<0.0001	<0.0001	<0.0001

Conclusions made following the most recent groundwater monitoring conducted by RCA are as follows:

- No significant changes were observed in standing water levels (also refer to ***Figure 1*** below);
- Salinity remains relatively fresh and results for EC are below the ANZECC guideline for 95% protection of species;
- The pH at bores LD001, CP114, CP116 and CP132, has increased slightly since the July 2014 monitoring event, however results remain within the range of historical values and characteristic of groundwater conditions in the area. A slight decrease was observed in BHW1, whilst the pH at CP115 remained stable;
- The majority of Site waters may be classified as moderate to very hard. Results for hardness within the bores are relatively consistent across the Site;
- Concentrations of Sulphate have remained stable in bores LD001 and CP114; whilst a slight decrease was observed in bores CP132 and BW01. Sulphate concentrations in bore CP116 has increased since the last monitoring round in July 2014, however the concentration remains within historical levels;
- The Concentrations of Nitrate were observed to have decreased to below laboratory detection limits in bores CP115, CP116, CP132 and BHW1; whilst bore LD001 has remained stable. A slight increase was observed in bore CP114, however all concentrations continue to remain within historical levels; and
- Concentrations of heavy metals and metalloids were consistent with historical monitoring results. Concentrations of Cadmium and Iron have now either reduced, or remained stable; with the exception of bore LD001 and BHW1. An increase in Iron was observed in LD001, whilst an increase in both Iron and Cadmium was observed in BHW1. It should be noted that elevated levels of metals may be the results of a reduction in the pH at BWH1 which can increase the solubility of heavy metals.

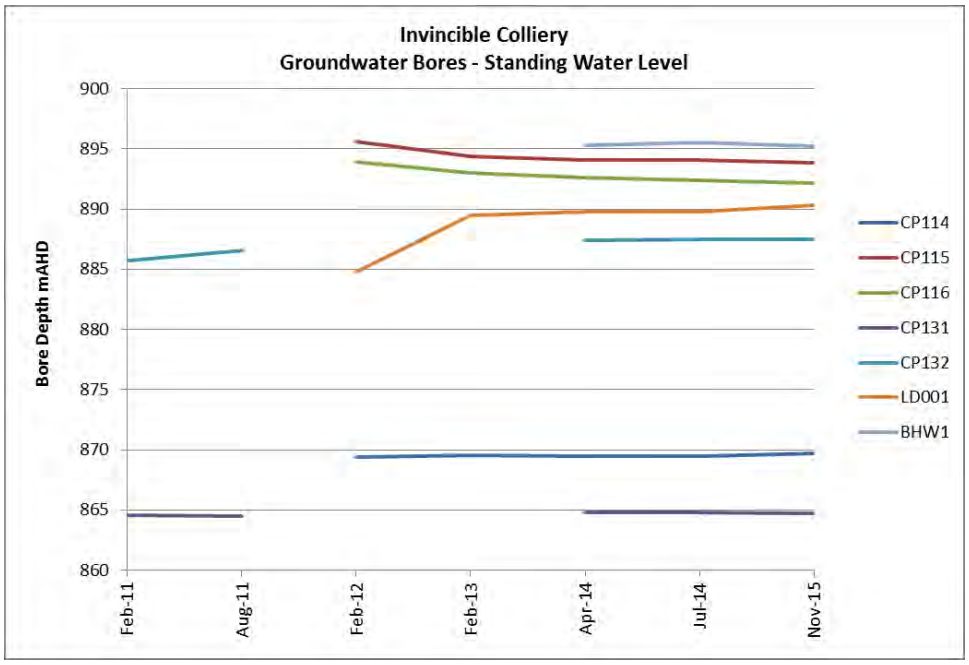


Figure 1: Standing water levels in groundwater bores

3.8.3 Reportable Incidents

Open cut voids at the Invincible Colliery are less than the depth of groundwater levels at the site and mining operations generally do not intercept any natural groundwater aquifers. There have been no impacts detected to groundwater quality during monitoring events and there were therefore no reportable incidents.

3.8.4 Further Improvements

There have been no impacts detected on groundwater levels and water quality at Invincible Colliery and therefore no further improvements are proposed.

3.9 Contaminated Land

3.9.1 Environmental Management

There are no known areas of land contamination within the Invincible Colliery site. There were no works undertaken during the 2015 reporting period that may cause significant land contamination. Control measures are in place for management of hazardous materials that may cause land contamination.

The majority of hazardous materials were removed from site at the commencement of the care and maintenance period. One self-bunded 75,000L diesel tank is currently maintained at the site. This tank is used to store a maximum of 35,000L fuel for pumps and light vehicles. A second tank (95,000L) was drained down and secured and is currently not in use.

Diesel was delivered to site as required during the 2015 reporting period. In addition, waste oil and grease is stored adjacent to the workshop in a bunded area which is regularly removed by a licensed contractor, along with oily water from the oil and water separator as required.

3.9.2 Environmental Performance

There were no mining operations conducted during the 2015 reporting period and as such no specific management controls or monitoring procedures were required. No reportable hydrocarbon spills or other incidents requiring disposal of contaminated material occurred during the reporting period.

3.9.3 Reportable Incidents

There are no known areas of land contamination within the Invincible Colliery site. There were no incidents of land contamination due to storage and handling of hazardous materials during the 2015 reporting period.

3.9.4 Further Improvements

Hazardous substances and land contamination will continue to be managed in accordance with the licence conditions and the C&M MOP. Should significant risks be identified or where reportable incidents occur, environmental control measures will be reviewed and additional controls implemented as required.

3.10 Threatened Flora and Fauna

3.10.1 Environmental Management

Existing vegetation communities and fauna habitat have previously been characterised during the ecological impact assessment (Cumberland Ecology 2014) conducted for the Environmental Assessment. Site environmental values are assessed during annual biodiversity monitoring of the rehabilitation and offsets areas in accordance with the Landscape Management Plan and the Environmental Monitoring Program.

3.10.2 Environmental Performance

There were no vegetation removal or land clearing activities conducted during the 2015 reporting period. No new rehabilitation areas were established and rehabilitation works focused on remediation of failed vegetation in existing rehabilitation areas. Remediation of existing rehabilitation areas is conducted generally in accordance with the approved Landscape Management Plan and are detailed in Section 5.

3.10.3 Reportable Incidents

There were no vegetation removal or land clearing activities during the 2015 reporting period and no significant impacts to environmental values were detected during the annual biodiversity monitoring conducted in November 2015. Therefore there were no reportable incidents during the 2015 reporting period.

3.10.4 Further Improvements

Environmental values will continue to be managed and annual monitoring conducted in accordance with the Landscape Management Plan and the Environmental Monitoring Program. It is expected that the management plans and programs for the Invincible Colliery will be reviewed and updated during the approvals process prior to re-commencement of mining operations.

3.11 Weeds

3.11.1 Environmental Management

Weed management is conducted in accordance with the Landscape Management Plan and spraying is targeted towards known weed species occurrences within the site.

A weed spraying program was developed and implemented by licenced weed spraying contractor, Kleinfelder. An initial round of weed spraying was conducted for 5 days during November commencing on 2 November 2015 to control weed infestations identified within the site.

The initial round of weed spraying was conducted prior to the annual biodiversity monitoring and then a second round of targeted spraying was conducted on 18 January 2016 following feedback of the locations and extent of weed infestations detected during annual monitoring.

A Weed Identification Kit has been developed and is held on site to assist on-site personnel in recognizing noxious weeds within the site. Weed infestations detected by site personnel are reported to the weed spraying contractor.

3.11.2 Environmental Performance

The weed spraying program indicated that the most abundant weed infestations within the site were:

- Blackberry (*Rubus fruticosus*);
- St. John's Wort (*Hypericum perforatum*);
- Briar Rose (*Rosa rubiginosa*); and
- Broom (*Cytisus* sp.).

These species were targeted during 2015 and are being controlled through implementation of the weed spraying program conducted by Kleinfelder.

3.11.3 Reportable Incidents

Weed spraying locations are recorded during the weed spraying program and during annual biodiversity monitoring and are reported annually. There were no reportable incidents in relation to weed management during the 2015 reporting period.

3.11.4 Further Improvements

The weed spraying program will continue to be conducted on an annual basis. Future weed spraying will be conducted during spring and summer and will target those species known to occur within the site as indicated by annual biodiversity monitoring.

3.12 Blasting

3.12.1 Environmental Management

Blasting is managed and monitored in accordance with the Blast Monitoring and Management Plan (BMMP) and the conditions of EPL 1095. However, as no mining operations were undertaken, no blasting was conducted during the 2015 reporting period.

3.12.2 Environmental Performance

Limits for airblast overpressure and ground vibration peak particle velocity from blasting operations are specified in EPL 1095 as outlined in Table 15.

Table 15: Blasting impact assessment criteria

Criteria	Limit	Allowable exceedence
Airblast overpressure level	115 dB(Lin Peak)	Must not be exceeded at any noise sensitive locations for more than 5% of the total number of blasts over a period of 12 months
	120 dB(Lin Peak)	Must not be exceeded at any time at any noise sensitive locations
Peak particle velocity	5 mm/s	Must not be exceeded at any noise sensitive locations for more than 5% of the total number of blasts over a period of 12 months
	10 mm/s	Must not be exceeded at any time at any noise sensitive locations

Blast monitoring is conducted during all blasting operations in accordance with the BMMP and EPL 1095. However, no blasting was conducted during the 2015 reporting period

3.12.3 Reportable Incidents

All blast monitoring results are recorded by the blasting contractor and records are maintained at the site office and made available to statutory agencies on request. As there was no blasting conducted, there were no non-compliances with the licence conditions and therefore no reportable incidents during the 2015 reporting period.

3.12.4 Further Improvements

Where monitoring indicates non-compliance with the licence conditions, additional control measures will be implemented as required. However, no blasting was conducted during the 2015 reporting period and no improvements are currently required.

3.13 Operational Noise

3.13.1 Environmental Management

A Noise Monitoring Program (NMP) has been prepared in accordance with PA 07-0127 outlining the required frequency of monitoring during mining operations. There were no mining operations during the 2015 reporting period, however, quarterly attended monitoring was conducted by Global Acoustics at three locations around the site during care and maintenance activities.

3.13.2 Environmental Performance

Noise impact assessment criteria for monitoring are specified in EPL 1095 and PA 07-0127 as outlined in Table 16.

Table 16: Noise impact assessment criteria

Location	Day time limit	Evening limit	Nigh time limit
At any residence on privately owned land (except Billabong and Hillview properties)	40 dB(A) LAeq (15 minute)	35 dB(A) LAeq (15 minute)	35 dB(A) LAeq (15 minute)

Note: The Billabong and Hillview properties were purchased by Coalpac in 2010.

As there are no evening or night time activities conducted during the care and maintenance period, attended monitoring was conducted at three locations during the day period only. The results of quarterly attended noise monitoring are outlined in Table 17. There were no

exceedences of the impact assessment criteria (where applicable) detected during quarterly monitoring conducted during the 2015 reporting period.

Table 17: Quarterly attended noise monitoring results

Location	Start Date and Time	Vertical temperature gradient (°C/100m)	Wind speed (m/s)	Invincible Colliery noise	L_{Aeq} (dB)
Quarter 1					
Cullen Bullen South	26/3/2015 9:07	-2.0	0.0	Inaudible	37
Cullen Bullen West	26/3/2015 8:52	-2.0	0.0	Inaudible	45#
Cullen Bullen Centre	26/3/2015 8:33	-2.0	1.5	Inaudible	61#
Quarter 2					
Cullen Bullen South	22/6/2015 13:37	-2.0	5.7	Inaudible	36
Cullen Bullen West	22/6/2015 13:15	-2.0	5.7	Inaudible	43*
Cullen Bullen Centre	22/6/2015 12:57	-2.0	6.7	Inaudible	64*
Quarter 3					
Cullen Bullen South	20/8/2015 09:45	-2.0	0.5	Inaudible	42#
Cullen Bullen West	20/8/2015 10:02	-2.0	0.5	Inaudible	46#
Cullen Bullen Centre	20/8/2015 10:17	-2.0	2.1	Inaudible	60#
Quarter 4					
Cullen Bullen South	2/12/2015 13:57	-2.0	8.2	Inaudible	49*
Cullen Bullen West	2/12/2015 16:23	-2.0	7.7	Inaudible	51*
Cullen Bullen Centre	2/12/2015 16:03	-2.0	8.2	Inaudible	57*

Note: #Noise from the Invincible Colliery was determined by Global Acoustics to be inaudible at the time of monitoring and there was therefore no exceedance of the licence limits.
**Noise measurements are affected by wind speed (over 3m/s^2) and vertical temperature gradient (over 3°C/100m). As wind speeds of over 3m/s^2 were measured at these locations at the time of monitoring, Global acoustics determined that the impact assessment criteria did not apply.*

3.13.3 Reportable Incidents

Where an exceedance of the impact assessment criteria is detected during monitoring, Castlereagh Coal will notify the Director-General and affected landowners except where there is a negotiated agreement with landowners. As there were no noise limit exceedences detected during quarterly monitoring, there were no reportable incidents.

3.13.4 Further Improvements

Where non-compliance with approval and licence conditions is detected or noise complaints are received, corrective actions will be implemented as required. As there were no non-compliances during the 2015 reporting period, no further improvements are required.

3.14 Visual, Stray Light

3.14.1 Environmental Management

Flood lighting is provided at the processing area to illuminate crushing plant, coal stockpiles and hardstand areas. This lighting extends across to the extraction area, however, lighting is located below the crest of surrounding hills. Portable lighting is also used where required in the extraction area.

Main flood lights and any portable lights are directed away from nearby residences and the Castlereagh Highway. Flood lights attached to towers, are adjustable to enable modification of light direction and placement. All lighting is directed to minimise extraneous light within the catchment.

3.14.2 Environmental Performance

PA 07-0127 requires that Castlereagh Coal takes all practicable measures to mitigate off-site lighting impacts and minimise visual impacts of the project. Light levels were reduced during the 2015 reporting period as there were no mining operations conducted.

3.14.3 Reportable Incidents

There were no non-compliances with PA 07-0127 or complaints received in relation to visual impacts of lighting and there were therefore were no reportable incidents relating to lighting during the 2015 reporting period.

3.14.4 Further Improvements

Where visual impacts of lighting are detected, Castlereagh Coal will implement corrective actions as required. As there were no non-compliances or complaints during the 2015 reporting period, no further improvements are required.

3.15 Aboriginal Heritage

3.15.1 Environmental Management

Several artefact scatters, open camp sites and an isolated find were located during an archaeological field survey conducted in 2010. Only one of these sites (Invincible OS1 artefact scatter) was determined to have high archaeological significance.

An Aboriginal Heritage Management Plan (AHMP) has been prepared and implemented in accordance with PA 07-0127 and in consultation with the then Department of Environment and Climate Change and the Aboriginal community. The artefact scatter site OS1 is located outside the mine disturbance area and has been fenced and signposted in accordance with the AHMP.

3.15.2 Environmental Performance

Regular inspections were conducted to ensure no disturbance had occurred to the artefact scatter site OS1. There was no disturbance of this site during the 2015 reporting period.

Where vegetation clearing or ground disturbance works uncover previously unrecorded objects of Aboriginal heritage, this would be reported to the Aboriginal party and the Office of Environment and Heritage. There were no vegetation clearing or ground disturbance works conducted in previously undisturbed areas during the 2015 reporting period.

3.15.3 Reportable Incidents

No disturbance of OS1 occurred and no vegetation clearing or ground disturbance works were conducted in previously undisturbed areas and there were therefore no reportable incidents during the 2015 reporting period.

3.15.4 Further Improvements

Aboriginal heritage values will continue to be managed in accordance with the AHMP. Where disturbance of Aboriginal heritage values occurs, corrective actions will be implemented and the AHMP revised as required. As there were no impacts on Aboriginal heritage during the 2015 reporting period, no further improvements are required.

3.16 European Heritage

3.16.1 Environmental Management

No items of European heritage are present within the Invincible Colliery site. A heritage assessment conducted for the Environmental Assessment (Hansen Bailey 2011) indicated that the nearest European heritage values include a bottle scatter located approximately 1km to the east and an assemblage of sandstone footings located approximately 1.5km to the south of the site. No specific management measures for European heritage are implemented for the site.

3.16.2 Environmental Performance

No items of European heritage are likely to be disturbed during site operations and no specific management measures are required.

3.16.3 Reportable Incidents

No items of European heritage were disturbed during the 2015 reporting period and there were therefore no reportable incidents.

3.16.4 Further Improvements

No specific management measures for European heritage are implemented for the site and no further improvements are currently required.

3.17 Spontaneous Combustion

3.17.1 Environmental Management

There are no known occurrences of spontaneous combustion at the Invincible Colliery. Experience to date in mining at the Invincible Colliery has demonstrated that the waste material, stockpiled coal and other relevant materials have a low propensity to spontaneously combust. There are therefore no potential adverse impacts expected as a result of spontaneous combustion at the Invincible Colliery.

3.17.2 Environmental Performance

There were no incidences of spontaneous combustion in coal stockpiles or overburden material during the reporting period.

3.17.3 Reportable Incidents

There were no incidences of spontaneous combustion and therefore no reportable incidents occurred during the reporting period.

3.17.4 Further Improvements

The Lithgow Seam is known to have a low propensity for spontaneous combustion. Any future extraction, processing and stockpiling of coal will continued to be managed to ensure any potential for spontaneous combustion is minimised.

3.18 Bushfire

3.18.1 Environmental Management

Bushfire hazards are managed in accordance with the Landscape Management Plan. A number of measures and safeguards have been implemented to minimise bushfire risk at Invincible Colliery, these include:

- Fitting fire extinguishers to all earthmoving and mining equipment;
- Fitting and maintaining efficient exhaust systems and spark arresters to mobile equipment;
- Advising NSW Rural Fire Service, regulatory authorities and neighbours of any burning-off operations;
- Ensuring that vehicles with low level exhaust systems do not leave defined tracks in locations and conditions likely to lead to ignition of combustible plant material; and
- Maintaining, at the request of NSW Forestry Corporation, existing fire trails or access roads at the extremities of the lease area, which serve as access for fire fighting services as well as establishing a fire break to the limits of operations at the open cut.

3.18.2 Environmental Performance

There were no bushfire events within the Invincible Colliery site during the reporting period. There was a bushfire observed by the MEM in adjacent bushland approximately 1km to the northeast of the site on the 11th November 2015. The fire was reported to NSW Rural Fire Service (Wolgan Valley) who responded and the fire was extinguished.

3.18.3 Reportable Incidents

There were no bushfire events within the site during the reporting period. However, there was a fire in bushland adjacent to the site which was reported to NSW Rural Fire Service. The fire was extinguished and there were no further incidents.

3.18.4 Further Improvements

Bushfire management will continue to be undertaken in accordance with the Landscape Management Plan. There were no bushfire events within the site during the reporting period. Fires observed within adjacent bushland will be reported as required to the NSW Rural Fire Service. There were no incidents within the site in relation to bushfire and no further improvements to current incident response procedures are required.

3.19 Mine Subsidence

3.19.1 Environmental Management

There was no underground or highwall mining undertaken during the reporting period. As such, no subsidence management measures were required to be implemented.

3.19.2 Environmental Performance

There was no underground or highwall mining undertaken and no subsidence occurred during the reporting period

3.19.3 Reportable Incidents

There was no occurrence of subsidence and there were therefore no reportable incidents during the reporting period.

3.19.4 Further Improvements

There was no occurrence of subsidence during the reporting period and therefore no further improvements are required.

3.20 Hydrocarbon Contamination

3.20.1 Environmental Management

All fuel and oil storage areas on site are contained within bunded areas to Australian standards or are contained within concreted workshop areas serviced by fuel and oil separation facilities. Any material contaminated by hydrocarbons will be remediated to OEH criteria or standards or as considered appropriate.

3.20.2 Environmental Performance

There were no reportable hydrocarbon spills or other incidents causing contamination during the reporting period.

3.20.3 Reportable Incidents

There were no incidents relating to storage and handling of hydrocarbons during the 2015 reporting period.

3.20.4 Further Improvements

Should significant risks be identified or where reportable incidents occur, environmental control measures will be reviewed and additional controls implemented as required.

3.21 Methane Drainage/Ventilation

3.21.1 Environmental Management

The underground workings at Invincible Colliery have been closed and decommissioned. There was no underground mining conducted during the reporting period. There are no methane drainage issues and venting is not conducted at the site.

3.21.2 Environmental Performance

There are no methane drainage issues and venting is not conducted at the site.

3.21.3 Reportable Incidents

There are no methane drainage issues and venting is not conducted at the site. There were therefore no reportable incidents relating to methane drainage or ventilation.

3.21.4 Further Improvements

There are no methane drainage issues and venting is not conducted at the site, further improvements are not currently required.

3.22 Public Safety

3.22.1 Environmental Management

Access to working areas of the open cut are controlled by locked gates. Access to the site by members of the public is via contact at the mine office where visitors or contractors can only be escorted by site personnel around the site. Warning signs have been placed on extremities of operations to ensure members of the public are aware of the presence of the open cut working.

3.22.2 Environmental Performance

No impacts or non-compliances associated with public safety occurred during the 2015 reporting period.

3.22.3 Reportable Incidents

There were no impacts or non-compliances associated with public safety and therefore no reportable incidents occurred during the reporting period.

3.22.4 Further Improvements

There were no impacts or non-compliances associated with public safety and no further improvements are currently required.

3.23 Other Issues and Risks

There were no other environmental issues or risks identified for the care and maintenance phase of the Invincible Colliery during the 2015 reporting period.

4 Community Relations

4.1 Environmental Complaints

There were no complaints received in relation to activities at the Invincible Colliery during the reporting period.

4.2 Community Liaison

4.2.1 Stakeholder Engagement

Castlereagh Coal commenced ownership of Invincible Colliery in May 2015 and the site is in care and maintenance. Castlereagh Coal is currently exploring further opportunities for community engagement processes through the development of a community consultation program for engagement with neighbouring landholders, government agencies and local communities.

The community consultation process aims to provide stakeholders and the community with appropriate opportunities to access project information and provide feedback on care and maintenance activities and future mining operations at the Invincible Colliery. Methods employed by Castlereagh Coal are outlined in Table 18.

Table 18: Stakeholder Engagement

Activity	Details
Community Engagement and Communications	CCC members and near neighbour consultation State and local Government briefings and meetings Employee briefings Regular community newsletters with local area distribution
Community Issues Management	Community contact line Near neighbour engagement Complaint response procedures Reporting of community complaints / concerns to the CCC and Annual Environmental Management Report (AEMR)
Community Support	Financial contributions to Cullen Bullen and wider local community groups via LCC and directly
Environmental Monitoring and Management	Environmental impact monitoring Environmental management procedures AEMR (Annual Review) reporting

4.2.2 Consultation Completed in the Reporting Period

The Invincible Colliery is currently in care and maintenance and no mining operations occurred during the reporting period. Stakeholder consultation was therefore limited to an on-site meeting with State agencies and a meeting held with members of the Community Consultative Committee (CCC). The details of these meetings are provided in Table 19.

Table 19: Details of meetings

Meeting title	Date held	Attended by
On-site meeting with State agencies	30 July 2015	Castlereagh Coal Sedgman Department of Trade and Investment Environmental Protection Agency Forestry Corporation

Meeting title	Date held	Attended by
CCC Meeting	25 August 2015	Castlereagh Coal Sedgman Committee chairperson Committee members
On-site meeting with Department of Planning & Environment	15 October 2015	Sedgman Castlereagh Coal Department of Environment & Planning (Chris Schultz)

The on-site meeting with State agencies was held to discuss future site operations and to determine agency expectations for environmental management. Agreement was reached with agencies on the ongoing management of rehabilitation areas, rectification of soil erosion, care and maintenance operational arrangements and amendment of the C&M MOP.

The CCC meeting was held to introduce Castlereagh Coal as the new mine owner and Sedgman as the mine operator and to reinstate the CCC following a period of administration during which little consultation has occurred. The outcomes of the CCC meeting are detailed in the meeting minutes available on the Castlereagh Coal website.

The on-site meeting with DPE was held to discuss compliance with the conditions of approvals. Agreement was reached regarding the ongoing management of subsurface heating (Cullen Valley Mine), compliance audit actions (Cullen Valley Mine), independent environmental audit (Invincible Colliery), rehabilitation works, environmental monitoring, weed spraying and the CCC committee.

4.2.3 Proposed Future Consultation

Castlereagh Coal is committed to actively participating in regular CCC meetings. Minutes of these meetings are publicly available to view on the Castlereagh Coal website: www.castlereaghcoal.com.au. The next CCC meeting is to be held in late February/early March 2016.

Castlereagh Coal is in the process of engaging a specialist consultant to design and implement a community consultation program. It is expected that this program will consist of dissemination of project information and obtaining stakeholder and community feedback through methods such as near-neighbour mail-outs, government agency briefings and community information sessions.

5 Rehabilitation

5.1 Buildings

As the site has been in care and maintenance since 2013, there were no operational activities undertaken during the current reporting period. As such, there were no renovations or removals of buildings during this time

5.2 Other Infrastructure

As the site has been in care and maintenance since 2013, there were no operational activities undertaken during the current reporting period. As such, there was no works conducted on site infrastructure during the reporting period.

5.3 Rehabilitation of Disturbed Land

5.3.1 Rehabilitation Goals and Objectives

The primary objective of site revegetation and regeneration is to create a stable final landform with acceptable post-mining land use and suitability. Disturbed areas within the mining leases will be progressively revegetated and regenerated to self-sustaining native vegetation communities.

Rehabilitation areas are to be established progressively once mining operations recommence and will be managed in accordance with the Landscape Management Plan. In the long term, rehabilitation areas are to become integrated with adjacent native vegetation communities.

Rehabilitation areas are monitored on an annual basis and will be managed until self-sustaining. Final rehabilitation areas are to achieve the rehabilitation completion criteria specified in the Landscape Management Plan.

5.3.2 Success of Rehabilitation Areas

During annual biodiversity monitoring conducted in February 2015, the Biodiversity Offset Areas (BOAs) at Invincible Colliery were assessed as being largely fragmented and in a state of natural regeneration back to grassy woodland, particularly plots that are adjacent to native woodland areas. Flora diversity in these areas were comparable to the previous years of monitoring with a greater number of eucalypt saplings present in February 2015.

The vegetation condition of BOAs is variable with areas of high, moderate and low condition as well as areas with evidence of erosion and weed infestations. Some areas previously assessed as moderate condition have now been assessed as high condition indicating that these areas are progressing towards natural regeneration.

The target vegetation community for rehabilitation areas is grassy woodland community. Annual monitoring in rehabilitation areas detected an overabundance of *Acacia* species requiring modification of the rehabilitation seed mix. There were areas of *Acacia* dieback with resultant proliferation of groundcover species. It is expected that shorter lived *Acacia* species in these areas will be successively replaced by the longer lived *Eucalyptus* species.

Soils in these areas were found to contain large amounts of rocky material and low organic material, however, soils were considered unlikely to be a limiting factor for plant growth and rehabilitation success. Moderate to severe erosion was observed in rehabilitation areas, particularly on steeper slopes.

Surface rock and timber were observed in abundance in rehabilitation areas providing important habitat for native species. There was evidence of Sugar Gliders use of nesting boxes in older rehabilitation areas, however there was no evidence of use of the nesting boxes in newer areas due to the immature vegetation providing little protection and foraging opportunities.

Further monitoring was conducted during November/December 2015 however; the results of this monitoring were not available at the time of completing this report.

5.3.3 Rehabilitation Works Undertaken during the Reporting Period

No new rehabilitation areas were established during the 2015 reporting period. Full contouring and revegetation of new rehabilitation areas within Invincible Colliery will be undertaken once future operations recommence.

Rehabilitation works during the reporting period focused on assessment of failed vegetation in existing rehabilitation areas. Remediation of existing rehabilitation areas will be undertaken in the next reporting period in accordance with the approved Landscape Management Plan.

Rehabilitation activities undertaken during the next reporting period will include:

- Benching, topsoil and replanting of failed rehabilitation areas on steep slopes (approximately 2.04 ha);
- Monitoring and reseeding (if required) of rehabilitation areas that are not yet established (approximately 4.01 ha); and
- Rectification of existing erosion/washout and slumping within rehabilitation areas and repair E&S control measures (approximately 1.01 ha).

Rehabilitation objectives were monitored during the annual biodiversity monitoring conducted in February 2015 and November/December 2015 to assess the progress of rehabilitation areas in accordance with the Landscape Management Plan. Where annual monitoring indicates that plant densities and species diversity is not in accordance with the Landscape Management Plan, replanting and/or reseeding of failed rehabilitation areas will be undertaken and the rehabilitation seed mix will be amended as required.

Rehabilitation activities during the 2015 reporting period are shown on ***Figure 6, Appendix A***.

5.4 Rehabilitation Trials and Research

Castlereagh Coal conducts monitoring and assessment of the success of rehabilitation areas within the Invincible Colliery site including existing nesting box trials. Annual biodiversity monitoring was conducted by Kleinfelder during February 2015 and November/December 2015.

A nesting box trial was implemented in June 2013 to provide supplementary habitat for native fauna species in rehabilitated areas. The nesting box trial consists of two plots at the Invincible Colliery which contain six nesting boxes per plot. A further plot has been located in adjacent mature woodland as a reference site.

The type of nesting boxes selected for the trial were identified as being suitable for native species that occur in the local area. Specifically the nesting boxes were selected to provide supplementary habitat for the Squirrel glider, Gang gang cockatoo and other parrot species, Long eared pied bat and the Kookaburra.

Annual biodiversity monitoring conducted in February 2015 found evidence of Sugar Gliders use of nesting boxes in older rehabilitation areas at Invincible Colliery, however there was no evidence of use of the nesting boxes in newer areas due to the immature vegetation providing little protection and foraging opportunities.

Further monitoring was conducted during November/December 2015 however; the results of this monitoring were not available at the time of completing this report.

5.5 Further Development of the Final Rehabilitation Plan

The Invincible Colliery Care & Maintenance Mining Operations Plan (C&M MOP) submitted to DRE on 17th December 2015 outlines the rehabilitation objectives and criteria for the Invincible Colliery during the care and maintenance phase. The rehabilitation plan remains unchanged from that described in the C&M MOP.

6 Activities Proposed in the Next AEMR Period

A summary of disturbed areas and rehabilitated land within the Invincible Colliery lease areas is provided in Table 20.

Table 20: Rehabilitation Summary

	Area Affected/Rehabilitated (hectares)		
A. MINE LEASE AREA	***To date***	***Last report***	***Next report (estimated)***
A1 Mine Lease(s) Area	2,063	2,063	2,063
B. DISTURBED AREAS			
B1: Infrastructure Area (other disturbed areas to be rehabilitated at closure including facilities, roads)	14.9	12.0	14.9
B2: Active Mining Area (excluding items B3 - B5 below) – existing mine voids	9.8	4.4	9.8
B3: Waste Emplacements (active/unshaped/in or out-of-pit)	30.6	26.0	30.6
B4: Tailings Emplacements (active/unshaped/uncapped)	2.4	1.7	2.4
B5: Shaped Waste Emplacement (awaits final vegetation)	9.1	11.2	9.1
ALL DISTURBED AREAS	66.8	55.3	66.8
C: REHABILITATION PROCESS			
C1: Total Rehabilitated Area (except for maintenance)	61.9	61.2	61.9
D: REHABILITATION ON SLOPES			
D1: 10 to 18 Degrees	40.2	40.2	40.2
D2: Greater than 18 Degrees	8.4	8.4	8.4
E: SURFACE OF REHABILITATED LAND			
E1: Pasture and Grasses	0	0	0
E2: Native Forest/Ecosystems	61.9	61.2	61.9
E3: Plantations and Crops	0	0	0
E4: Other (include non vegetation outcomes)	0.2	0.2	0.2

The discrepancies between areas reported in the last AEMR and areas reported in this AEMR are not as a result of increases in disturbed areas. There has been no further disturbance within the site since the last reporting period. The differences are as a result of improved GIS mapping prepared for this reporting period and more accurate calculation of these areas. The areas provided above are consistent with the Invincible Colliery C&M MOP submitted on the 17th December 2015.

Maintenance activities undertaken in rehabilitation areas during the 2015 reporting period and proposed in the next reporting period are outlined in Table 21.

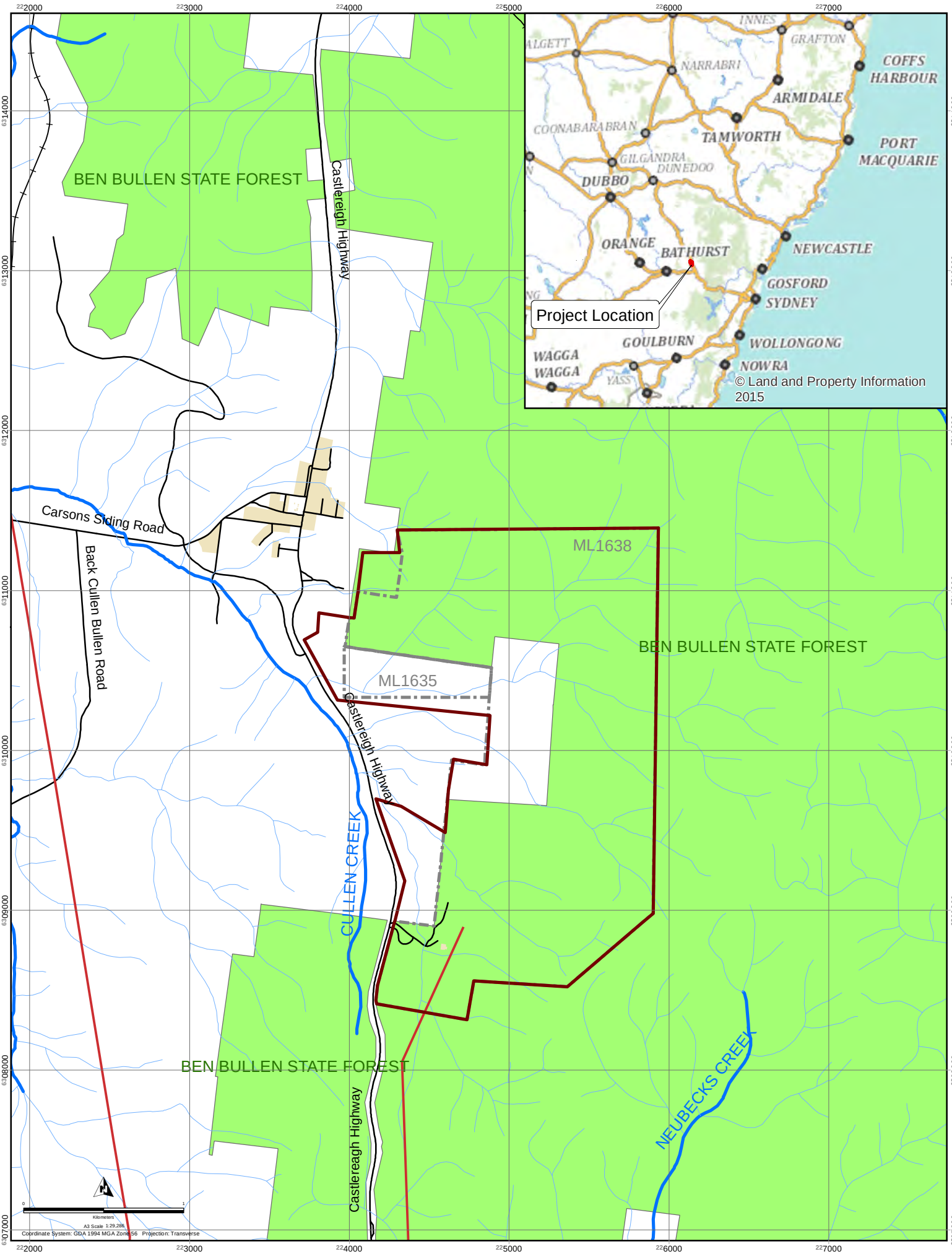
Table 21: Maintenance Activities on Rehabilitated Land

	Area Treated (ha)		
Nature of Treatment	**Report Period**	**Next Period**	**Comment/control strategies/treatment detail**
Additional erosion control works	0	1.01	Repair/reconstruction of erosion control devices
Re-covering	0	0	NA
Soil treatment	0	0	NA
Treatment/management	0	0	NA

	Area Treated (ha)		
Nature of Treatment	Report Period	Next Period	Comment/control strategies/treatment detail
Reseeding/replanting	0 0	2.04 4.01	Reseeding/replanting in existing rehabilitation areas Monitoring and reseeding (if required) in existing rehabilitation areas
Adversely affected by weeds	63.4	62 (estimate only – as this will depend on the extent of weed infestations observed at the time)	Weed spraying program
Feral animal control	0	0	NA

Appendix A

Site Plans



Invincible Colliery
Annual Environmental Monitoring Report 2015
Date: 21/01/2016

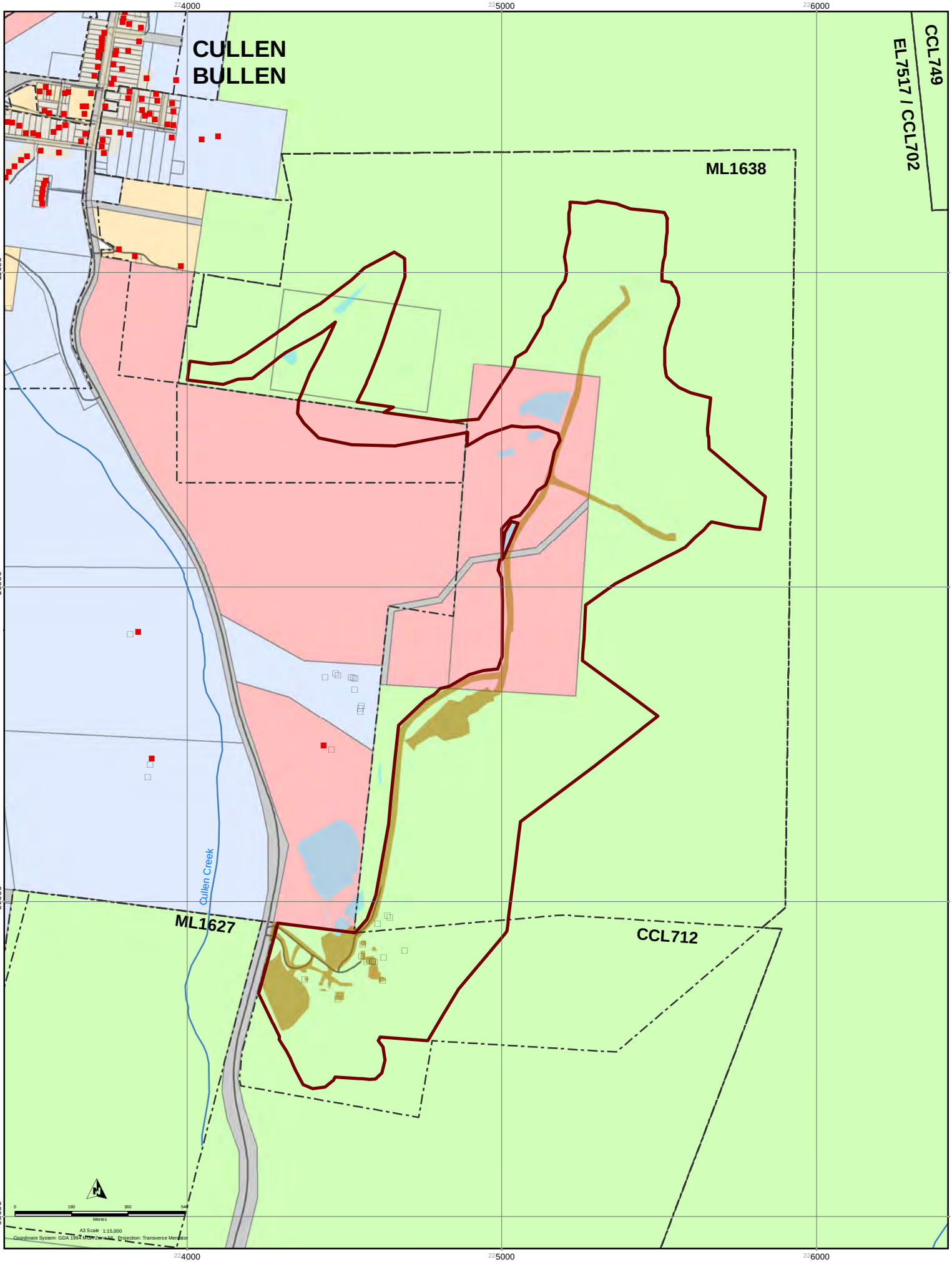
FIGURE 2
PROJECT LOCATION

Legend

- Project Approval Area
- Invincible Mining Leases
- State Forest
- Main Roads
- Minor Waterways
- Major Waterways

Castlereagh Coal

File:A399-D01-MP-I-R7-0001a-F2-Location-20160119



Invincible Colliery
Annual Environmental Monitoring Report 2015
Date: 22/01/2016

FIGURE 3
LAND OWNERSHIP

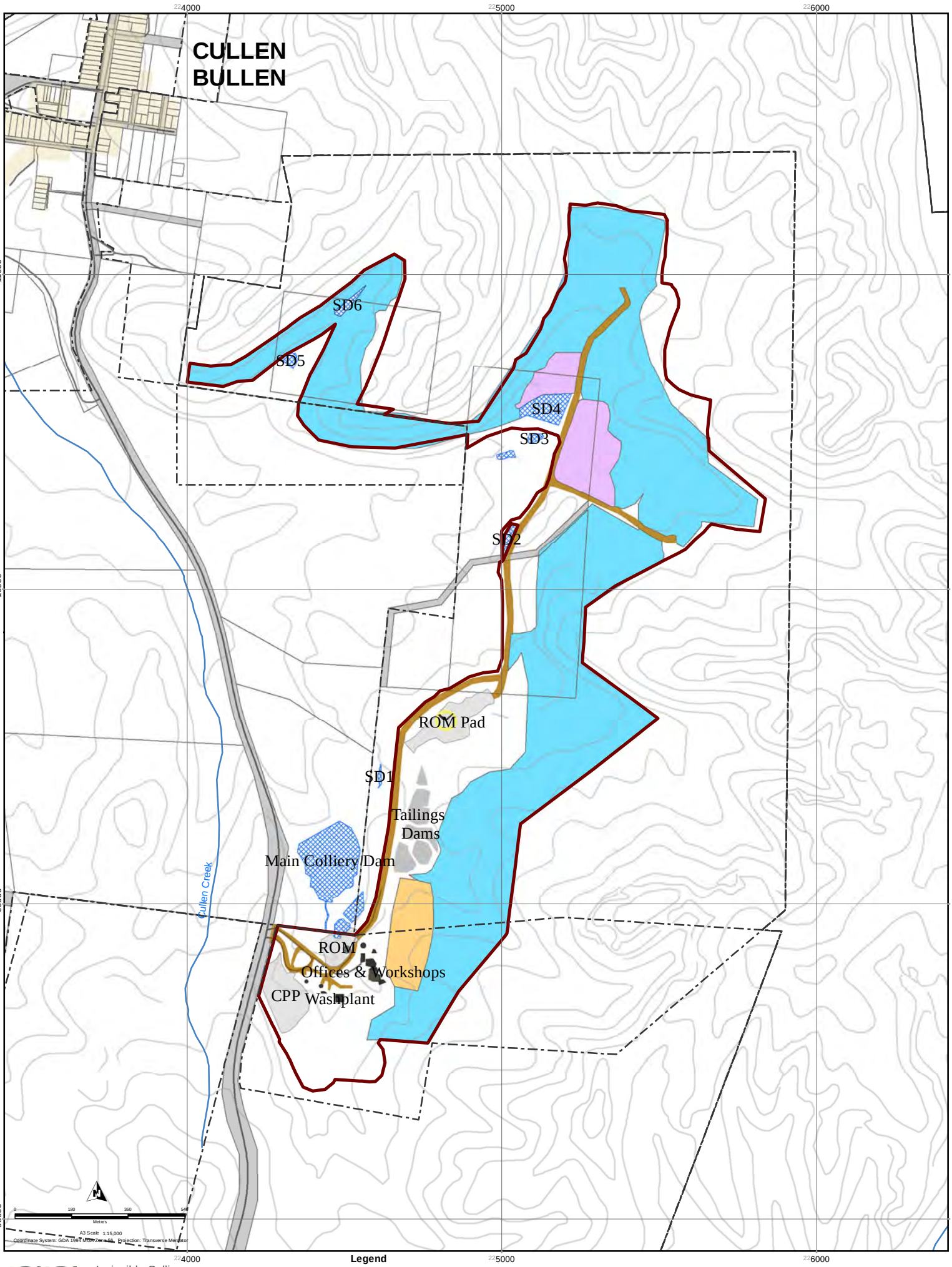
Legend

- Major Rivers and Creeks
- Mining Tenements
- Approved Disturbance Area
- Main Roads
- Conveyor
- Water Pipeline
- Water Management Structure
- Infrastructure
- Railway

Buildings, Dwellings
- Building
- Private Freehold Dwelling
- Mine Owned Dwelling
- Cadastral Boundaries

Ownership
- Crown Land
- Mine Owned Land
- Privately Owned
- Baal Bone Colliery
- State Forest

File:A399-D01-MP-I-R7-0002a-F3-Ownership-20160119



Invincible Colliery
Annual Environmental Monitoring Report 2015
Date: 22/01/2016

FIGURE 4
MINING ACTIVITIES

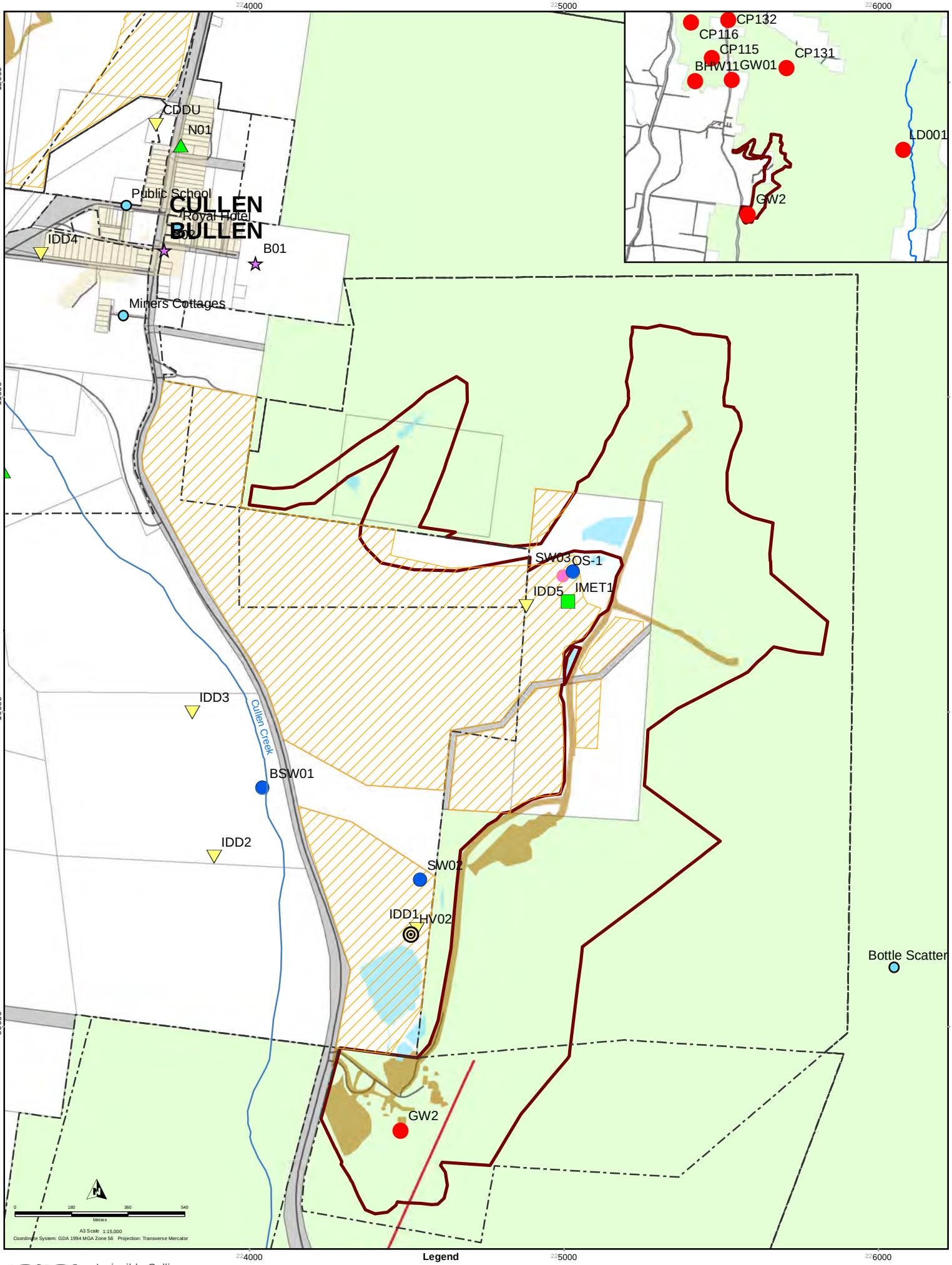
Legend

- Major Rivers and Creeks
- Mining Tenements
- Approved Disturbance Area
- Conveyor
- Water Pipeline
- Railway
- Main Roads
- Water Management Structure
- Infrastructure Areas
- Haul Roads, other roads
- Sub Surface Heating Area
- Tailings Dams
- External Dams

Mining Activities

- Active Mining: Pre 2008
- Active Mining: 2008-2009
- Active Mining: 2013
- 2014 - 2015 - No Mining

File:A399-D01-MP-I-R7-0003a-F4-Mining-20160119



Invincible Colliery
Annual Environmental Monitoring Report 2015
Date: 22/01/2016

FIGURE 5
ENVIRONMENTAL MONITORING LOCATIONS

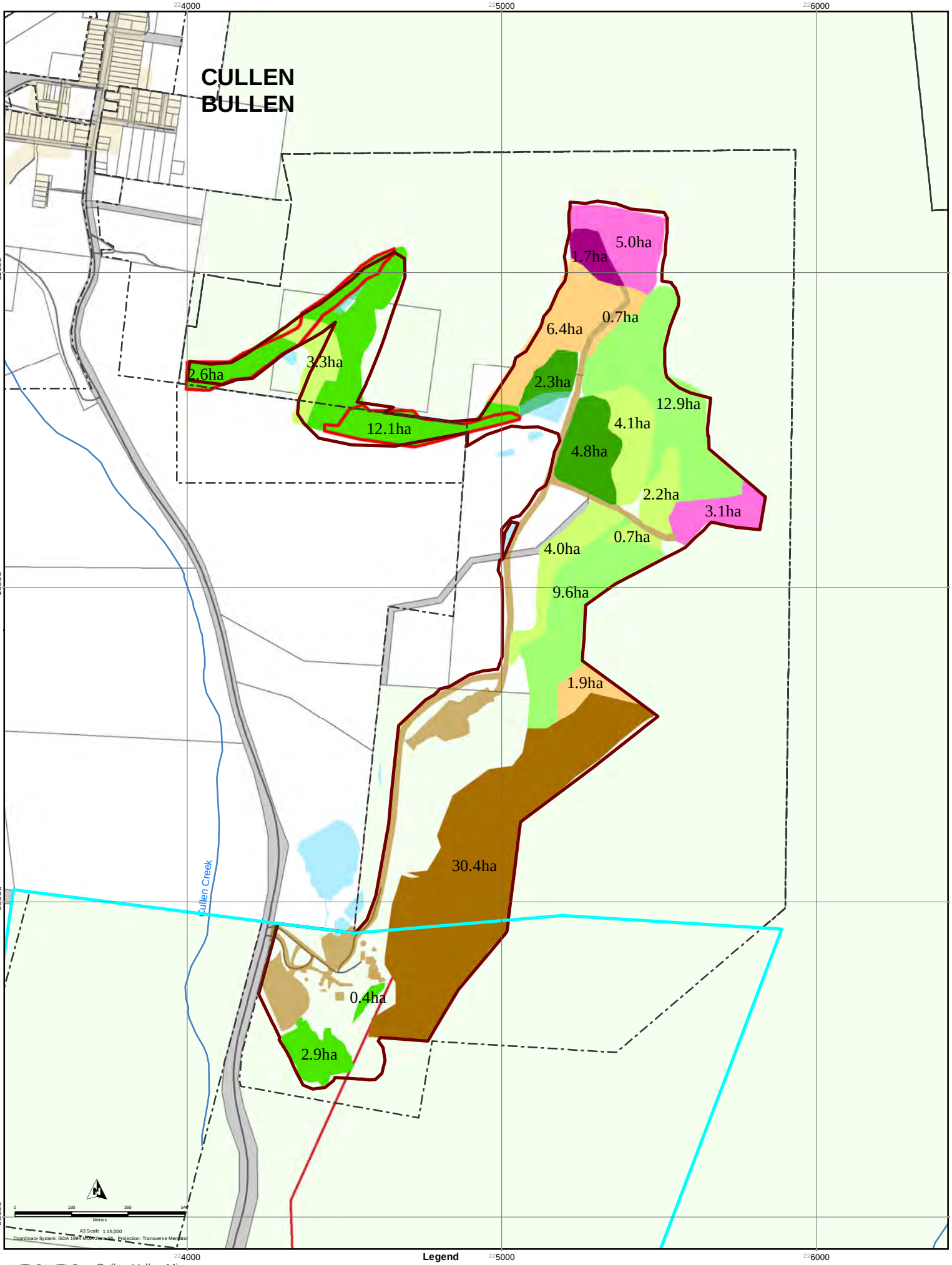
Legend

- Major Rivers and Creeks
- Mining Tenements
- Railway
- Conveyor
- Water Pipeline
- Approved Disturbance Area
- Main Roads
- State Forest
- Water Management Structure
- Infrastructure
- Conservation & Offset Areas
- Under Species Management Plan
- Aboriginal Heritage Site
- Non-indigenous heritage site

Sample Sites

- Blast Monitor
- Compensatory Habitat
- Depositional Dust
- Groundwater Monitoring Bore
- Meteorological Station
- Noise Monitor
- PM10 Monitor
- Surface Water Monitoring Location

File:A399-001-MP-I-R7-0004a-F5-Monit-20160119



Cullen Valley Mine
Annual Environmental Monitoring Report 2015
Date: 21/01/2016

FIGURE 7
REHABILITATION ACTIVITIES 2015

Legend

- Major Rivers and Creeks
- Mining Tenements
- Approved Disturbance Area
- Water Management Structure
- Infrastructure
- Main Roads
- State Forest
- **Rehabilitation**
- Coarse Rejects
- Void
- Slope > 18 Degrees
- 2010 Seeded Rehabilitation
- 2011 Seeded Rehabilitation
- 2012 Seeded Rehabilitation
- Established Rehabilitation
- Shaped and Topsoiled Dumps (Unseeded)
- Unshaped / Active Dumping Areas

File:A399-D01-MP-I-R7-0005a-F6-Rehab-20160119

Appendix B

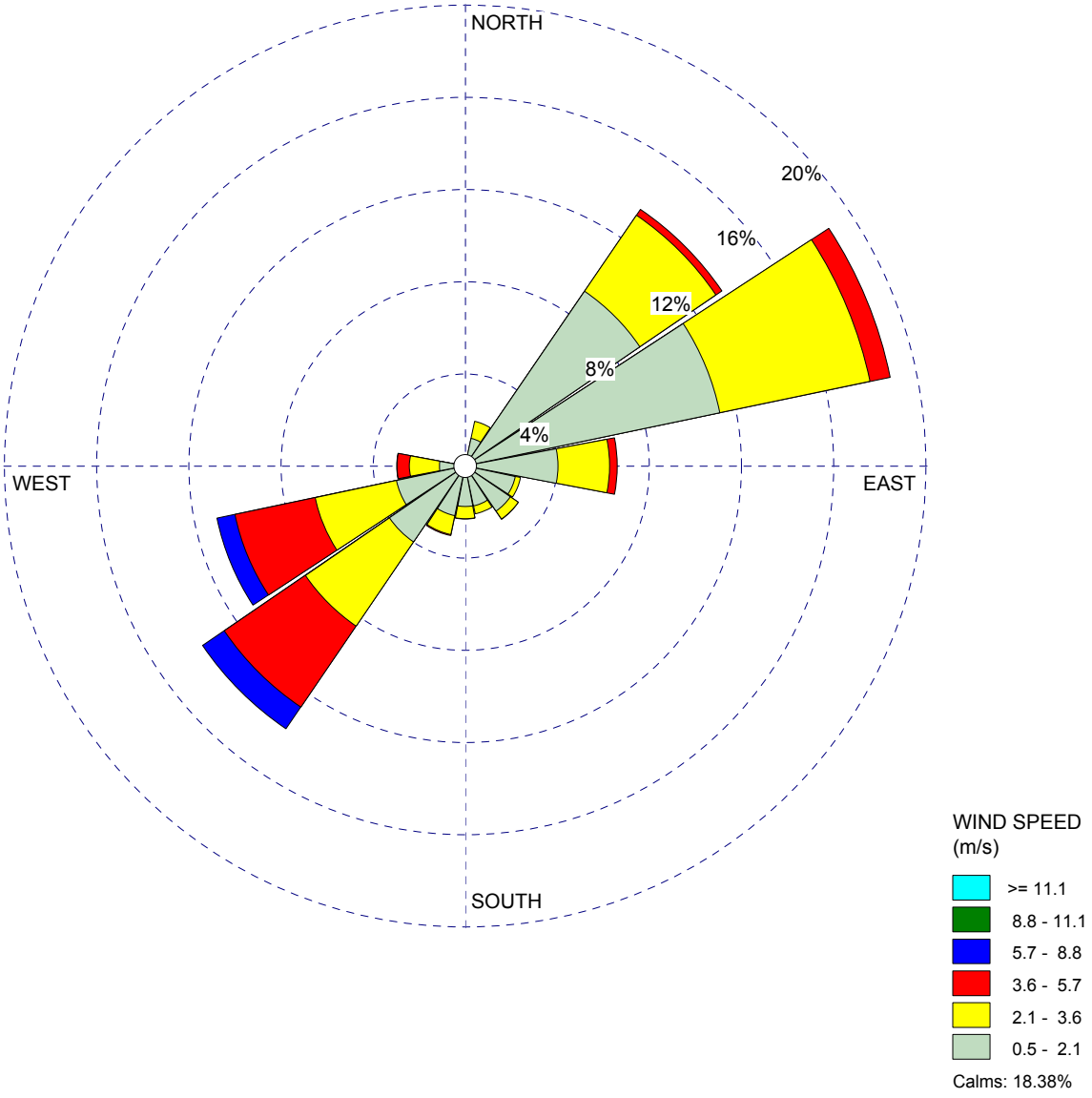
Wind Roses

WIND ROSE PLOT:

INVINCIBLE COLLIERY: LITH002

DISPLAY:

Wind Speed
Direction (blowing from)



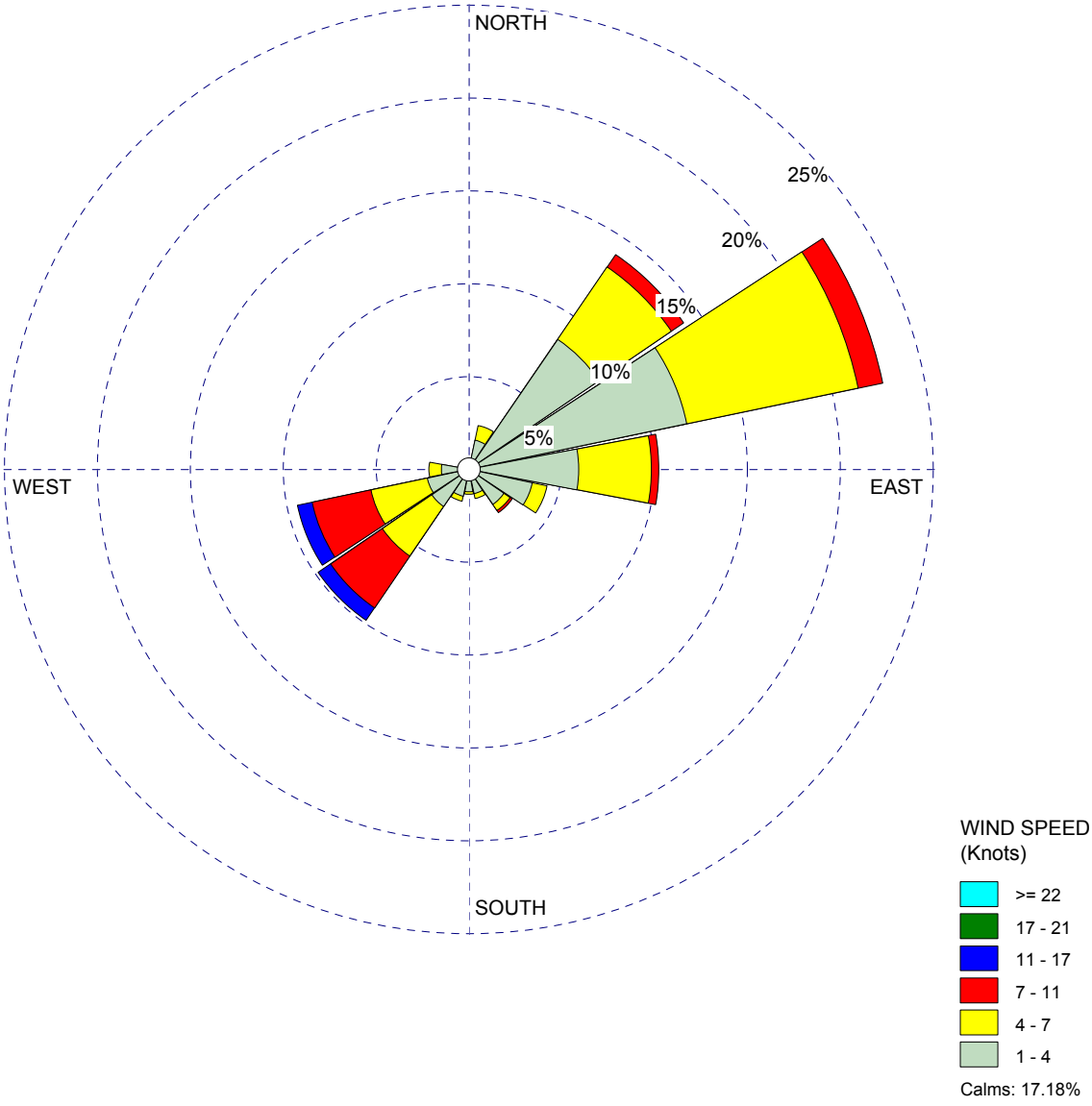
COMMENTS:	DATA PERIOD: **Start Date: 1/01/2015 - 00:00** **End Date: 31/12/2015 - 23:00**	COMPANY NAME:	
		MODELER:	
	CALM WINDS: **18.38%**	TOTAL COUNT: **8758 hrs**	
	AVG. WIND SPEED: **1.76 m/s**	DATE: **22/01/2016**	PROJECT NO.: **A399-D01**

WIND ROSE PLOT:

Station # 002

DISPLAY:

Wind Speed
Direction (blowing from)



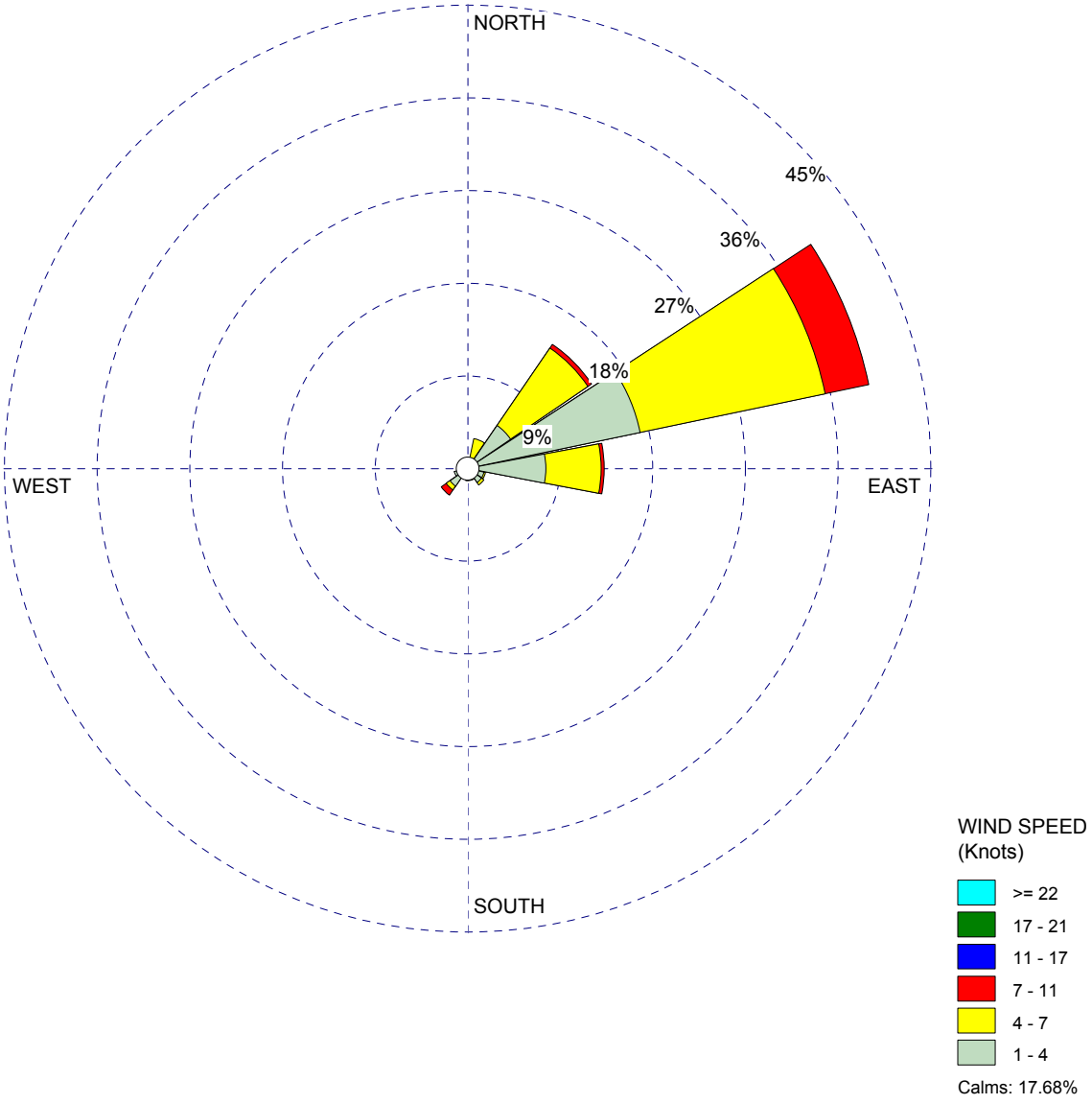
COMMENTS:	DATA PERIOD:	COMPANY NAME:	
	Start Date: 1/01/2015 - 00:00 **End Date: 31/01/2015 - 23:00**	MODELER:	
	CALM WINDS: **17.18%**	TOTAL COUNT: **744 hrs**	
	AVG. WIND SPEED: **3.44 Knots**	DATE: **22/01/2016**	PROJECT NO.: **A399-D01**

WIND ROSE PLOT:

INVINCIBLE COLLIERY: LITH002

DISPLAY:

Wind Speed
Direction (blowing from)



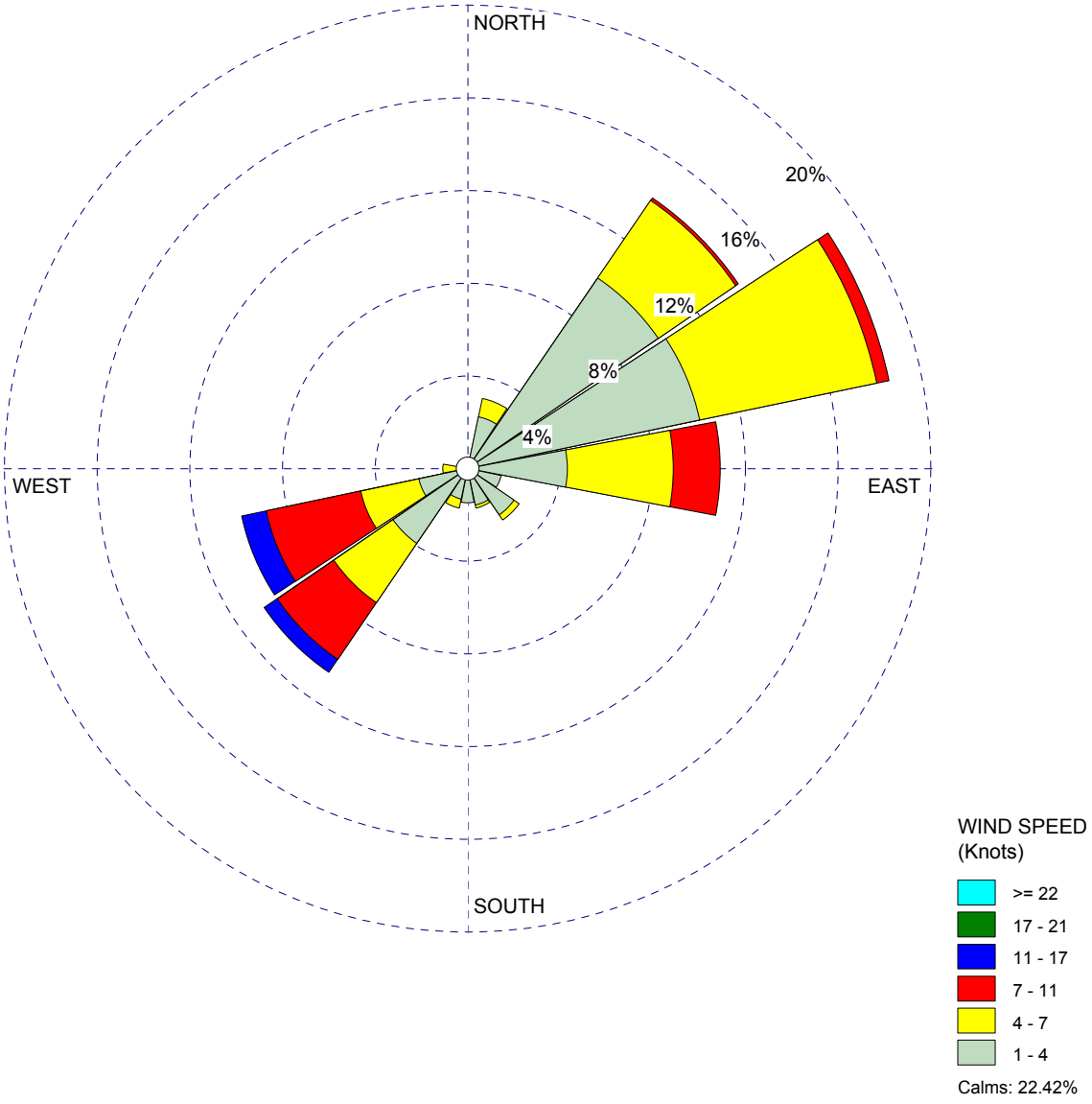
COMMENTS:	DATA PERIOD:	COMPANY NAME:	
	Start Date: 1/02/2015 - 00:00 **End Date: 28/02/2015 - 23:00**	MODELER:	
	CALM WINDS: **17.68%**	TOTAL COUNT: **672 hrs**	
	AVG. WIND SPEED: **3.28 Knots**	DATE: **22/01/2016**	PROJECT NO.: **A399-D01**

WIND ROSE PLOT:

INVINCIBLE COLLIERY: LITH002

DISPLAY:

Wind Speed
Direction (blowing from)



COMMENTS:	DATA PERIOD:	COMPANY NAME:	
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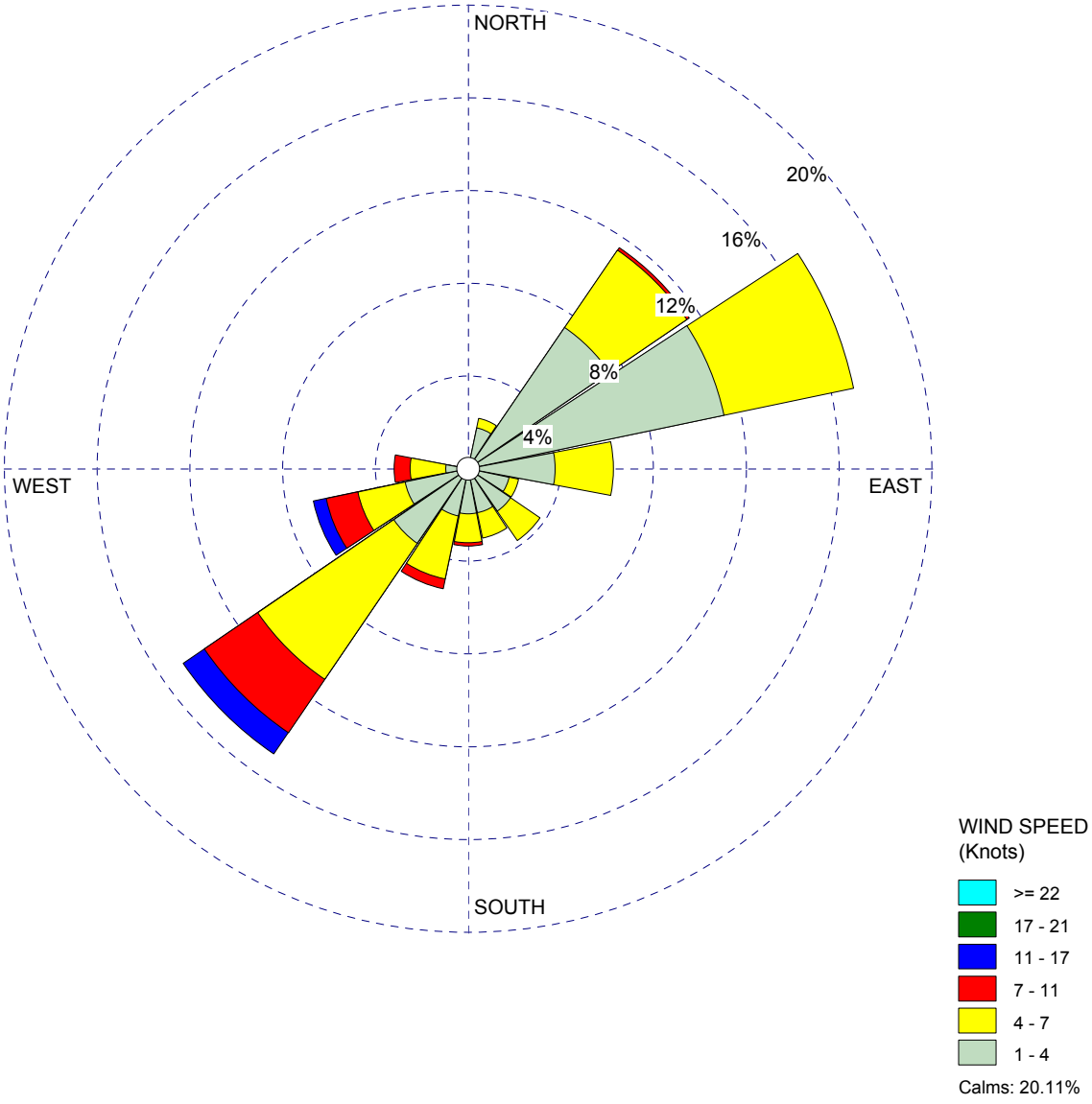
	CALM WINDS: **22.42%**	TOTAL COUNT: **744 hrs**	
	AVG. WIND SPEED: **3.32 Knots**	DATE: **22/01/2016**	PROJECT NO.: **A399-D01**

WIND ROSE PLOT:

INVINCIBLE COLLIERY: LITH002

DISPLAY:

Wind Speed
Direction (blowing from)



COMMENTS:	DATA PERIOD:	COMPANY NAME:	
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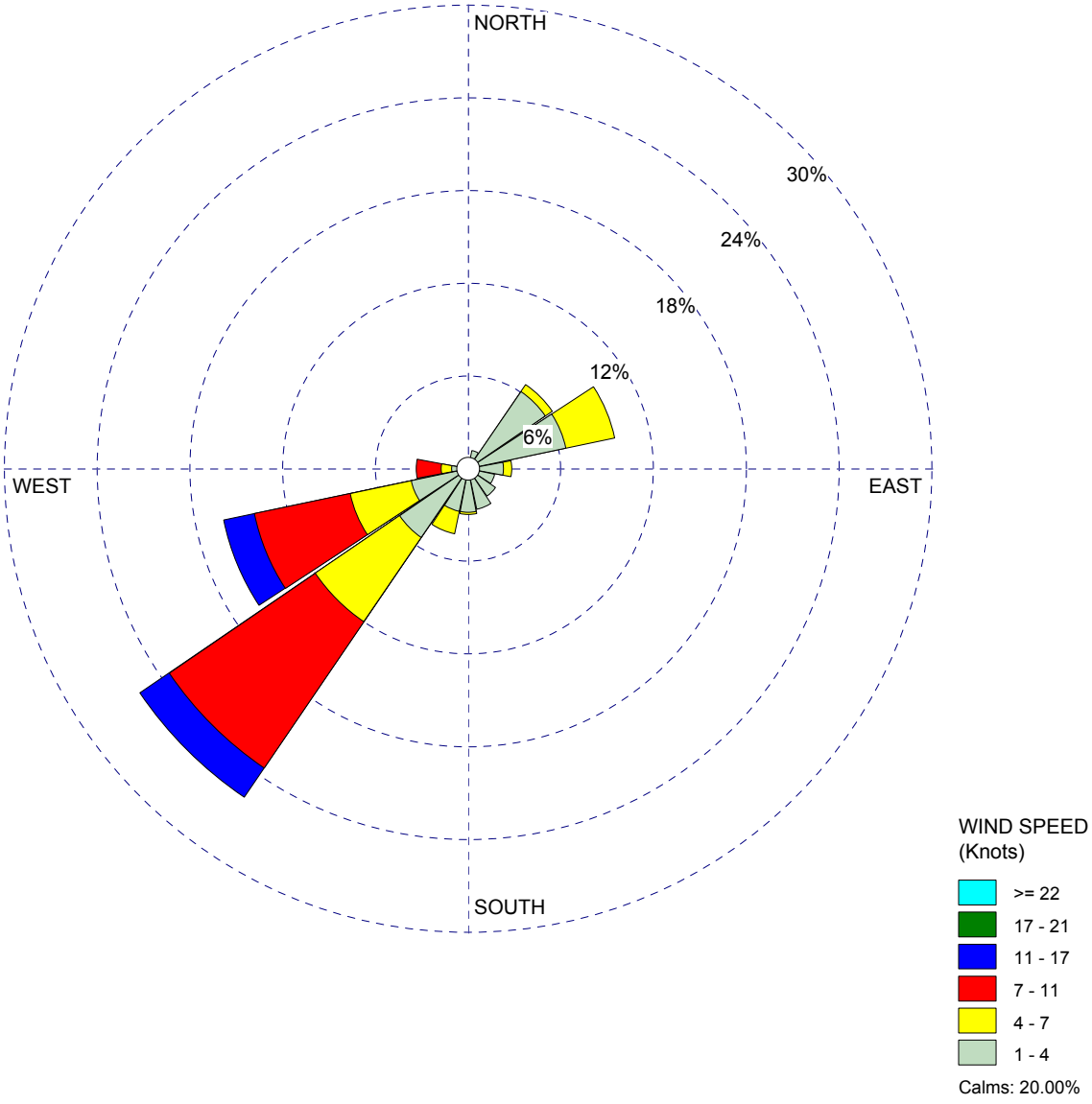
	CALM WINDS: **20.11%**	TOTAL COUNT: **720 hrs**	
	AVG. WIND SPEED: **3.15 Knots**	DATE: **22/01/2016**	PROJECT NO.: **A399-D01**

WIND ROSE PLOT:

INVINCIBLE COLLIERY: LITH002

DISPLAY:

Wind Speed
Direction (blowing from)



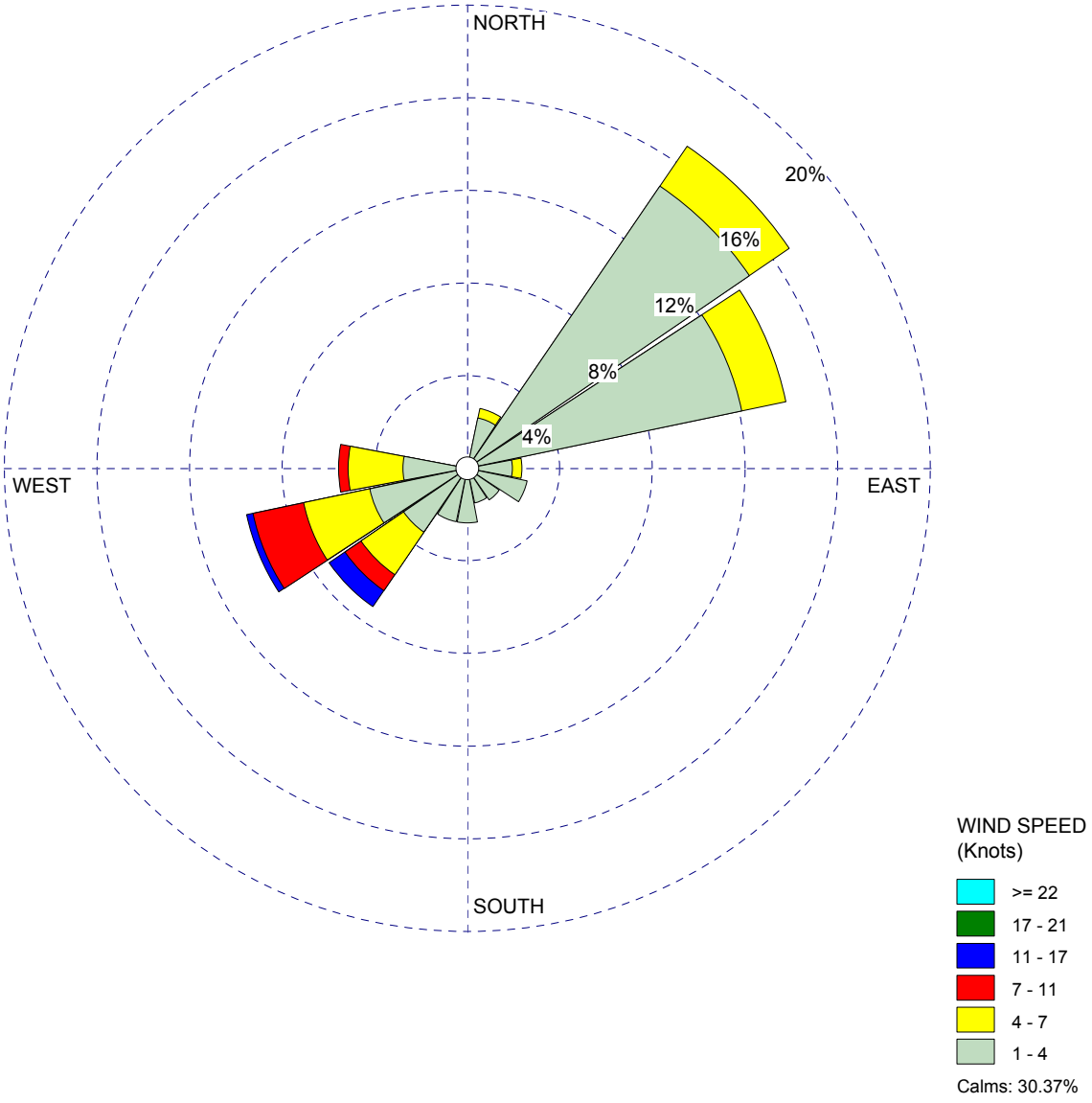
COMMENTS:	DATA PERIOD:	COMPANY NAME:	
	Start Date: 1/05/2015 - 00:00 **End Date: 31/05/2015 - 23:00**	MODELER:	
	CALM WINDS: **20.00%**	TOTAL COUNT: **744 hrs**	
	AVG. WIND SPEED: **4.01 Knots**	DATE: **22/01/2016**	PROJECT NO.: **A399-D01**

WIND ROSE PLOT:

INVINCIBLE COLLIERY: LITH002

DISPLAY:

Wind Speed
Direction (blowing from)



COMMENTS:	DATA PERIOD:	COMPANY NAME:	
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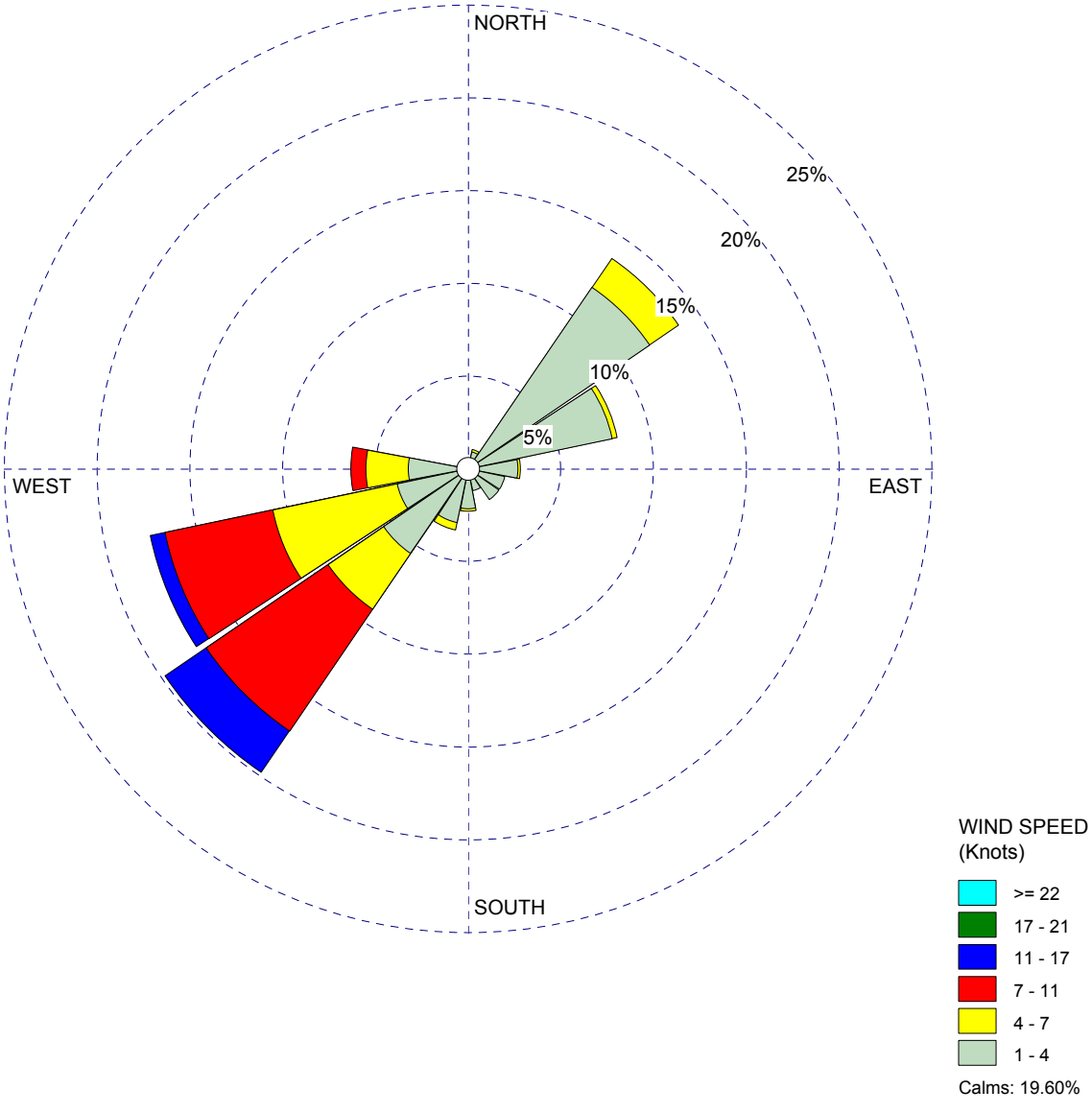
	AVG. WIND SPEED: **2.20 Knots**	DATE: **22/01/2016**	PROJECT NO.: **A399-D01**

WIND ROSE PLOT:

INVINCIBLE COLLIERY: LITH002

DISPLAY:

Wind Speed
Direction (blowing from)



COMMENTS:	DATA PERIOD:	COMPANY NAME:	
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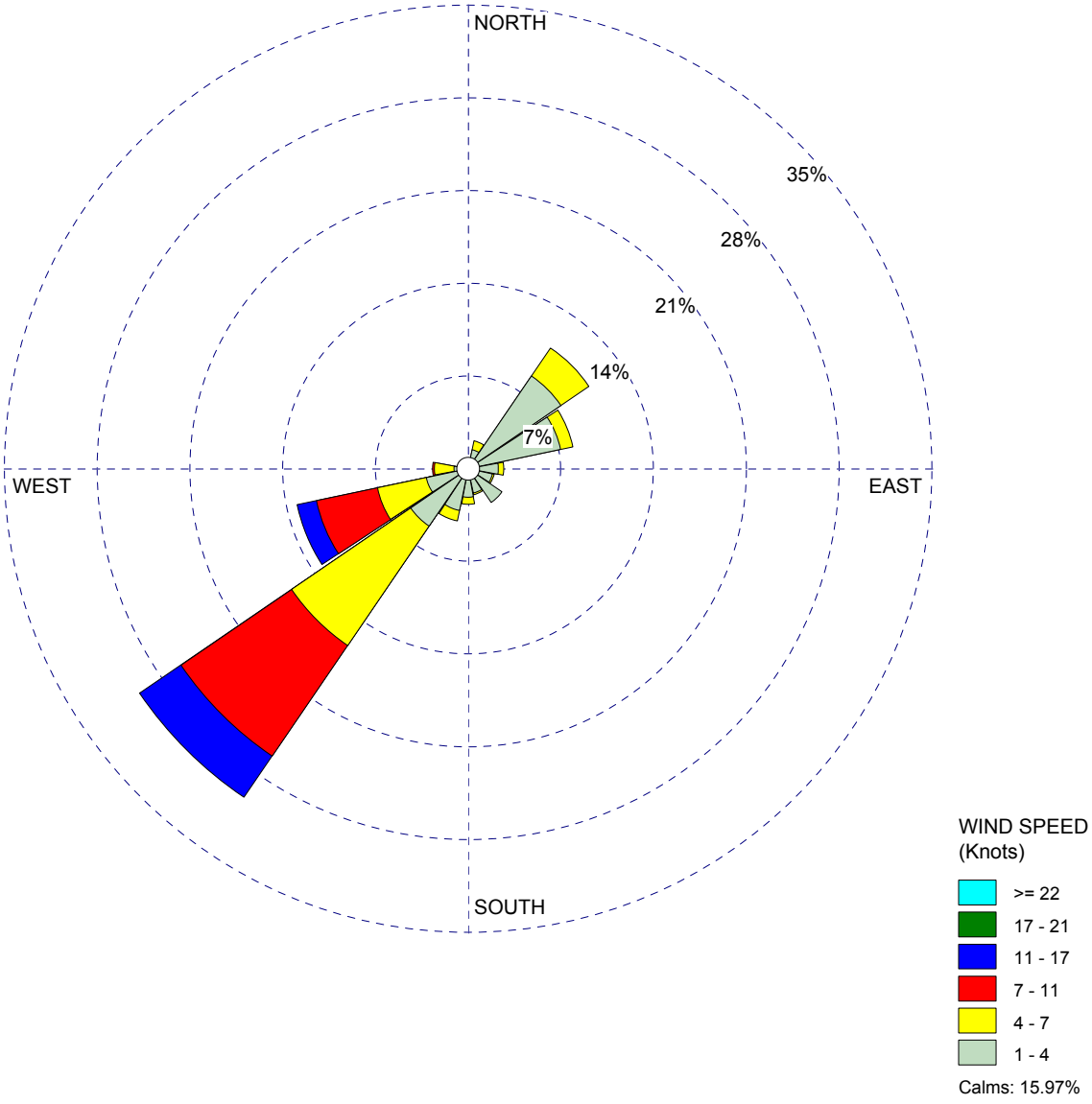
	AVG. WIND SPEED: **3.61 Knots**	DATE: **22/01/2016**	PROJECT NO.: **A399-D01**

WIND ROSE PLOT:

INVINCIBLE COLLIERY: LITH002

DISPLAY:

Wind Speed
Direction (blowing from)



COMMENTS:	DATA PERIOD:	COMPANY NAME:	
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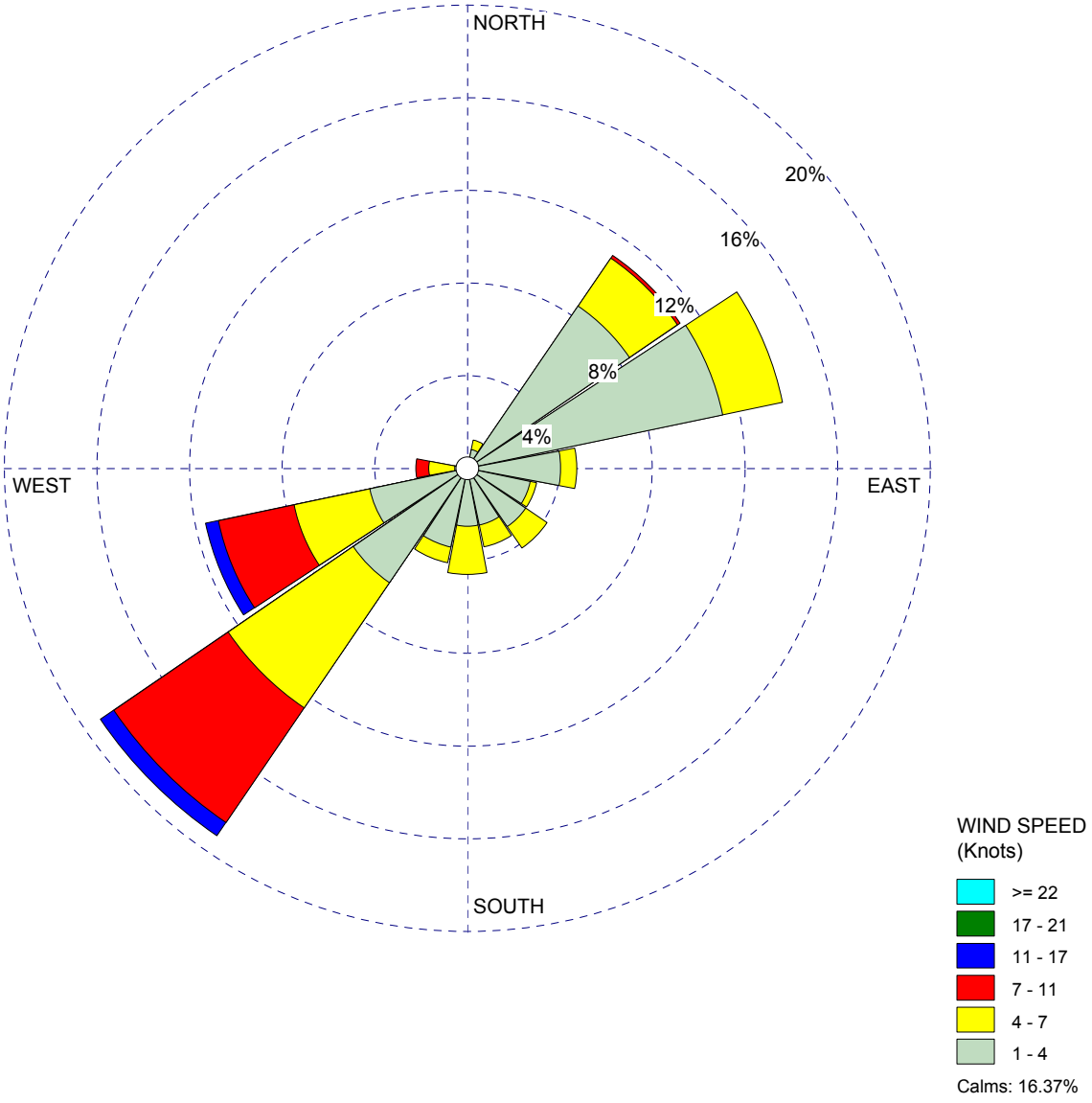
	AVG. WIND SPEED: **4.08 Knots**	DATE: **22/01/2016**	PROJECT NO.: **A399-D01**

WIND ROSE PLOT:

INVINCIBLE COLLIERY: LITH002

DISPLAY:

Wind Speed
Direction (blowing from)



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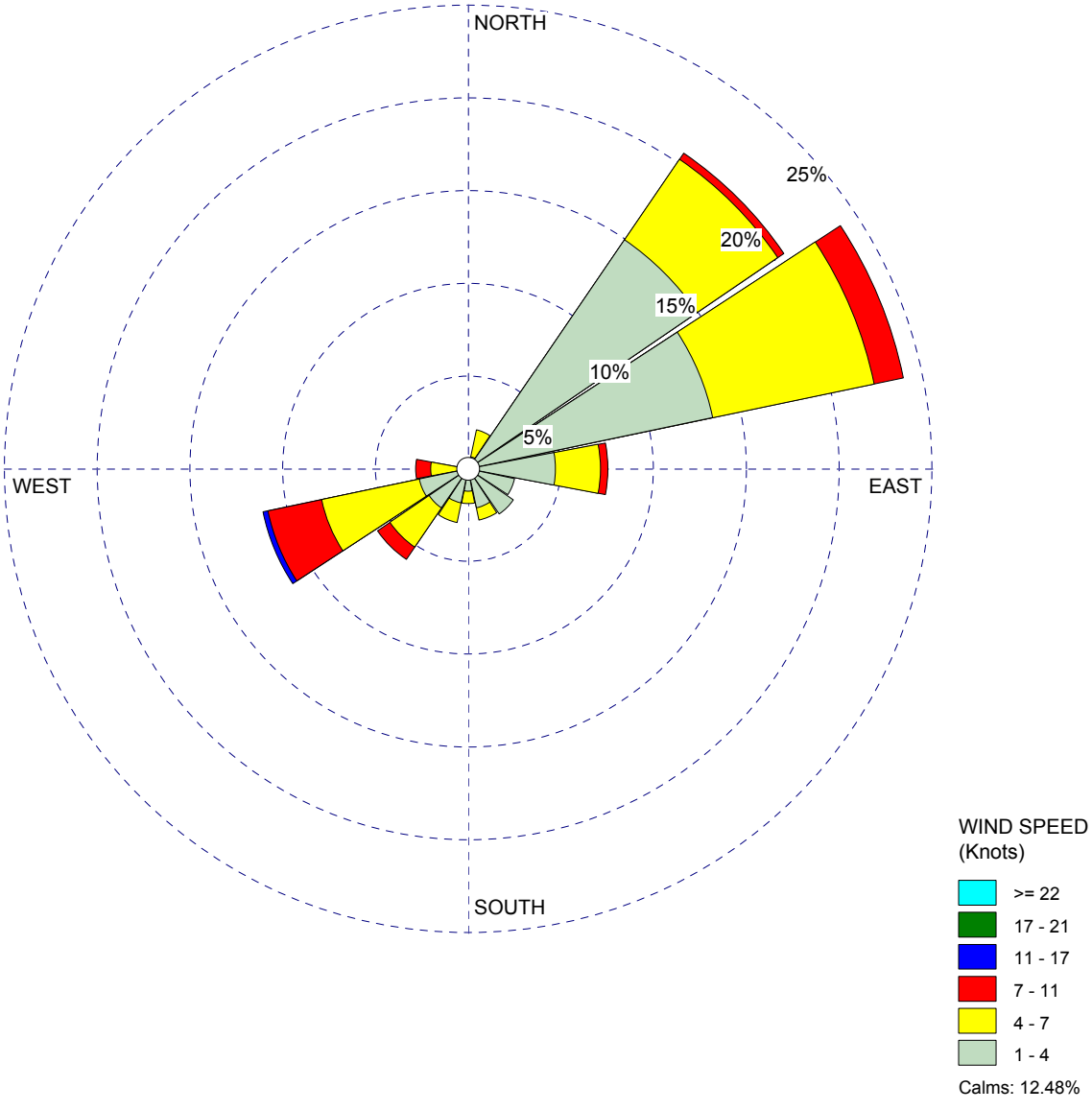
		MODELER:	
	CALM WINDS: **16.37%**	TOTAL COUNT: **720 hrs**	
	AVG. WIND SPEED: **3.29 Knots**	DATE: **22/01/2016**	PROJECT NO.: **A399-D01**

WIND ROSE PLOT:

INVINCIBLE COLLIERY: LITH002

DISPLAY:

Wind Speed
Direction (blowing from)



COMMENTS:	DATA PERIOD:	COMPANY NAME:	
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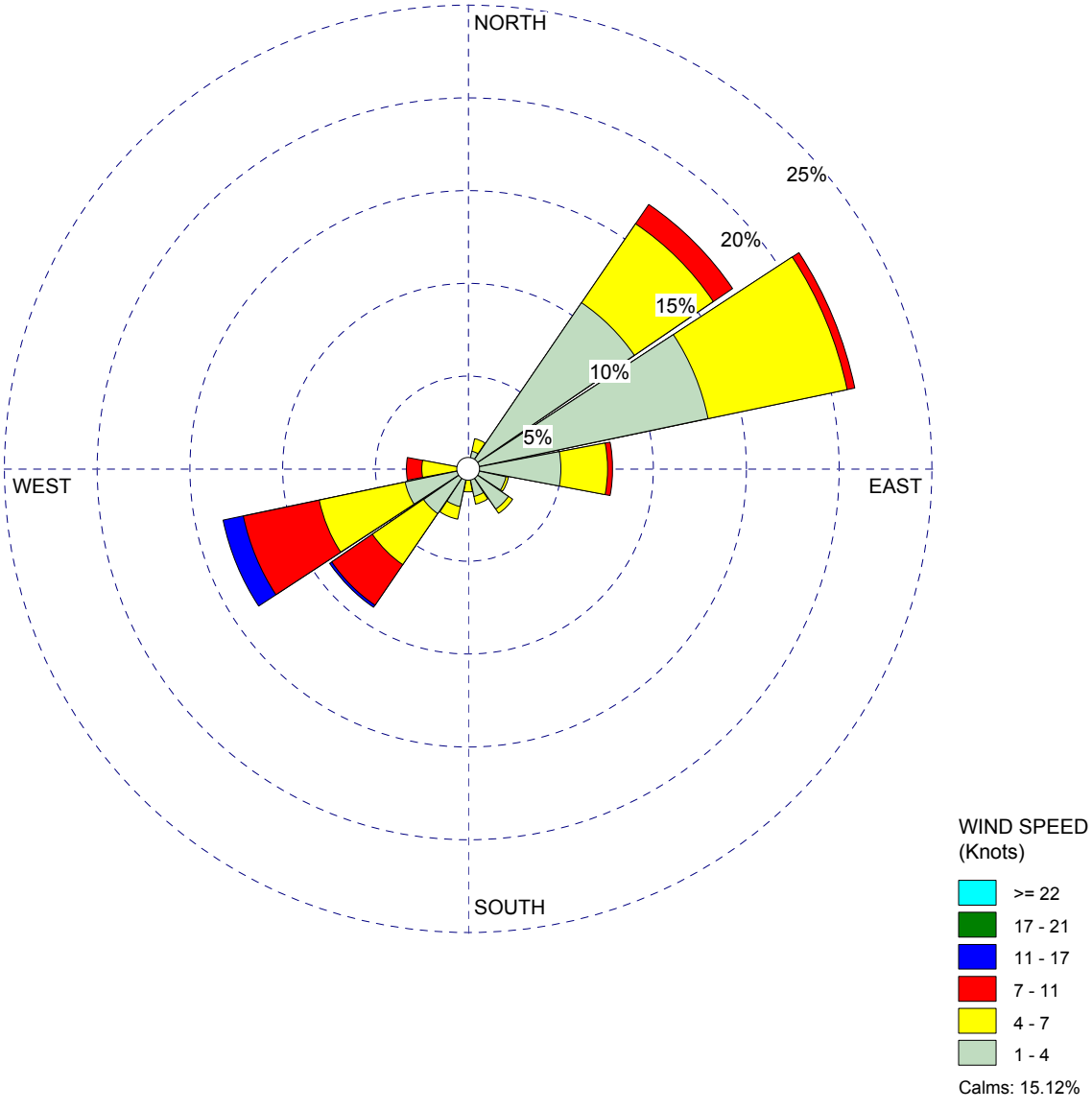
	CALM WINDS: **12.48%**	TOTAL COUNT: **744 hrs**	
	AVG. WIND SPEED: **3.27 Knots**	DATE: **22/01/2016**	PROJECT NO.: **A399-D01**

WIND ROSE PLOT:

INVINCIBLE COLLIERY: LITH002

DISPLAY:

Wind Speed
Direction (blowing from)



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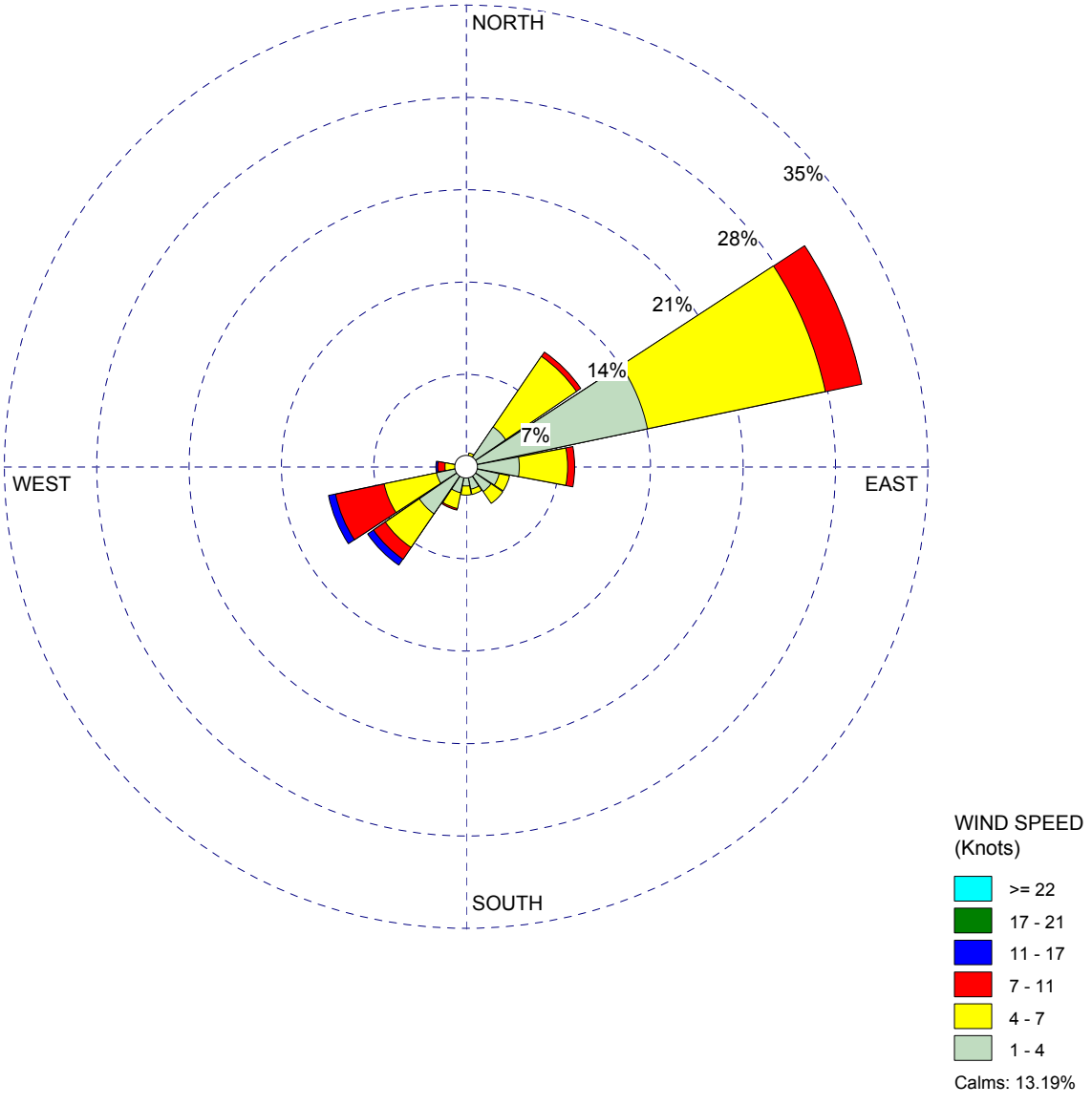
WIND ROSE PLOT:

INVINCIBLE COLLIERY: LITH002

DISPLAY:

Wind Speed
Direction (blowing from)



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	AVG. WIND SPEED: **3.85 Knots**	DATE: **22/01/2016**	PROJECT NO.: **A399-D01**