



## FINAL

*Abel Underground Coal (Integrated with Donaldson Open Cut, Tasman Underground and Bloomfield Open Cut Coal Mines)*

### Integrated Environmental Monitoring Program



**December 2007**

DON3-07-03 Integrated Monitoring Plan



**GSS ENVIRONMENTAL**  
Environmental, Land and Project  
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# TABLE OF CONTENTS

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1.0	INTRODUCTION	1
2.0	BACKGROUND AND OVERVIEW	2
3.0	PURPOSE AND OBJECTIVES	3
4.0	MONITORING PROGRAMS	4
4.1	NOISE MONITORING	4
4.2	BLASTING	5
4.3	AIR QUALITY MONITORING	6
4.4	SURFACE WATER MONITORING	7
4.5	GROUNDWATER MONITORING	8
4.6	ABORIGINAL AND CULTURAL HERITAGE MONITORING	9
4.7	FLORA AND FAUNA MONITORING	10
4.8	METEOROLOGICAL MONITORING	10
5.0	INTEGRATION OF MONITORING RESULTS	11
6.0	REPORTING AND REVIEWING	12
6.1	REPORTING	12
6.2	REVIEW	12

## TABLES

---

**Table 1 – Noise Monitoring**

**Table 2 – Blast Monitoring**

**Table 3 – Air Quality Monitoring**

**Table 4 – Surface Water Monitoring**

**Table 5 – Groundwater Monitoring**

**Table 6 – Aboriginal and Cultural Heritage Monitoring**

**Table 7 – Flora and Fauna Monitoring**

## FIGURES

---

**Figure 1 – Aerial Site Plan**

**Figure 2 – Total Project Area**

**Figure 3 – All Monitoring Locations**

**Figure 4 – Noise Monitoring Locations**

**Figure 5 – Blast Monitoring Sites**

**Figure 6 – Air Sampling Locations**

**Figure 7 – Surface Water Monitoring Sites**

**Figure 8 – Piezometer Locations**

**Figure 9 – Archaeological Sites**

**Figure 10 - Flora and Fauna Monitoring Locations**

## 1.0 INTRODUCTION

The Abel Underground Coal Mine ('Abel') is owned and operated by Donaldson Coal Pty Ltd ('Donaldson') which is located approximately 23 kilometres north-west of Newcastle, south of John Renshaw Drive. The Abel site is within the eastern section of Exploration Lease 5497 (EL5497) and has a surface area of approximately 2750 hectares. Donaldson also owns and operates the adjacent Donaldson Open Cut Mine which has been operation since 2001. The Abel site lies across both the Maitland and Cessnock Local Government Areas and the operation is approved to mine up to 4.5 Million tonnes per annum (Mtpa) of Run of Mine (ROM) coal over the next 21 years.

The operation will utilise a high productivity continuous miner based bord and pillar system, using pillar extraction techniques. Mine access and associated surface infrastructure will be located within the existing Donaldson Coal Mine open cut void, with the transfer of coal to the existing Bloomfield Coal Handling and Preparation Plant immediately to the north for coal washing and rail transport to the Port of Newcastle. **Figure 1** shows the location of the site.

The Project Approval (05\_0136) was issued on the 7 June 2007 for the development of the Abel Underground Mine. The Project Approval requires the preparation of an Environmental Monitoring Program that is integrated with the monitoring programs of the adjoining Bloomfield, Donaldson and Tasman mines.

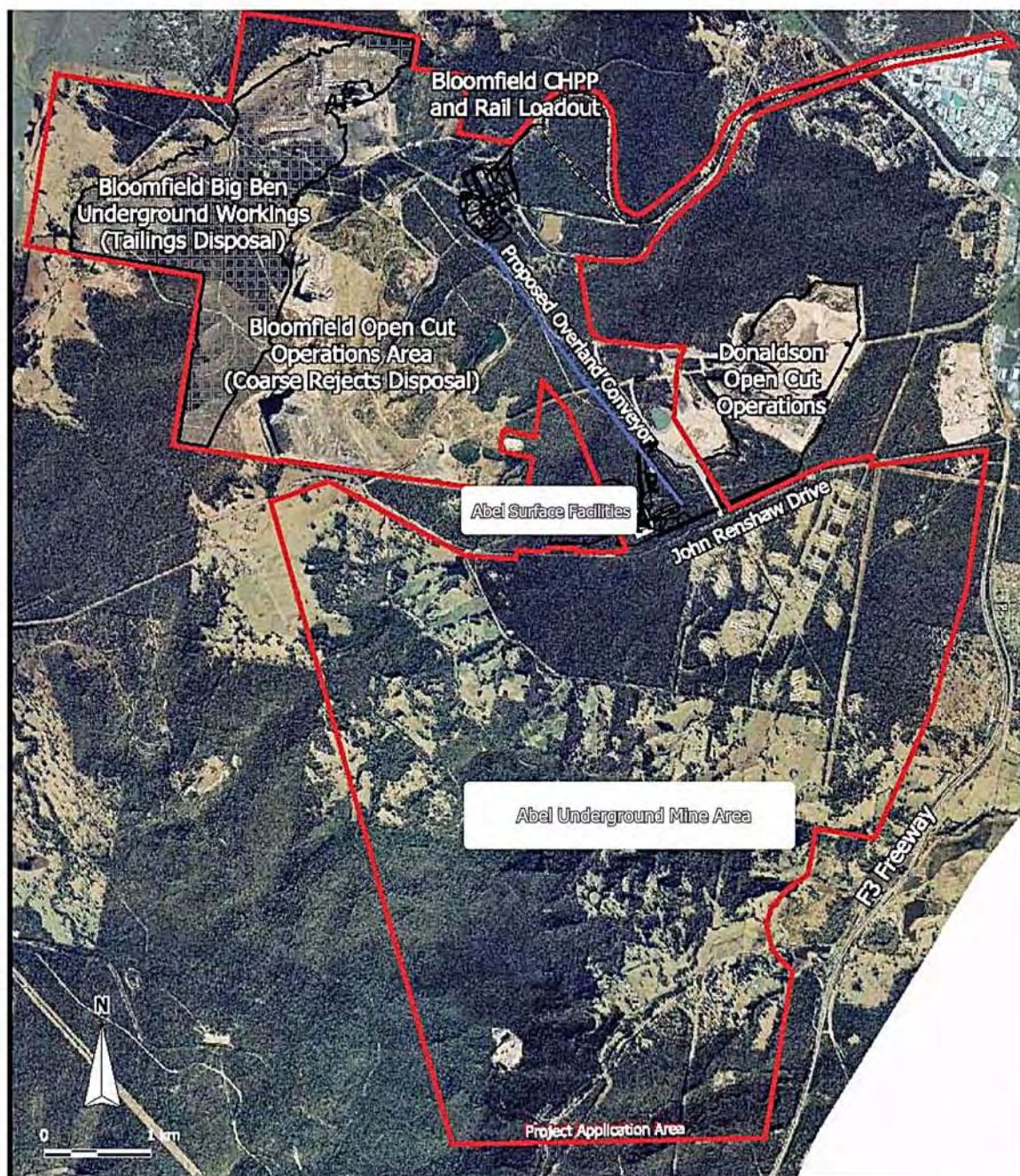
The Abel Underground Mine Part 3A Environmental Assessment (Eco Central, August 2006) also commits to the development an integrated monitoring network for the Donaldson, Abel, Tasman and Bloomfield mines.

The Integrated Environmental Monitoring Program (IEMP) will assist the development of a sub-regional model of environmental data collection from a wide area. The integrated monitoring system will reduce duplication of monitoring on individual sites and identify sensitive areas that may be between mine sites that require monitoring to enable more effective sub- regional data sets. Data sharing across sites will give a more accurate indication of the condition of the environment and will be vital in creating further management and mitigation measures for sites. The increased data set will be important in determining cumulative impacts from the four sites on the sub-regional environment.

The integrated monitoring equipment will be operated, maintained and installed by a joint arrangement between Donaldson Coal Pty Ltd and Bloomfield Collieries Pty Ltd. All data from the Integrated Environmental Monitoring Program will be made available to both parties.

This Integrated Environmental Monitoring Program, including all monitoring locations, will be reviewed prior to the commencement of Abel mining operations. The Plan will also be reviewed following approval of the Bloomfield Colliery Part 3A application and in line with the Consultant's Recommendations and the Development Approval. Each mine site will undertake Individual site reporting for the site as required by the relevant approval instruments specific to each mine.





## Abel Underground Mine Project Aerial Site Plan

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### FIGURE 1

### Abel Underground Mine Project Aerial Site Plan

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## 2.0 BACKGROUND AND OVERVIEW

The existing Donaldson Open Cut Mine has been given approval to operate until 2012 at which point the economic coal reserves will be exhausted. In September 2006, Donaldson Coal submitted an Environmental Assessment to the NSW Department of Planning for the Abel Underground Coal Mine and in June 2007 the project was given approval to develop the new underground area that will access coal reserves south of the Donaldson Open Cut Mine. A major benefit of this development is that the surface facilities area can be placed within existing areas of disturbance in the Donaldson Open Cut mine. Coal brought to the surface will be transported by truck and conveyor through the previously disturbed Donaldson mine lease area to the existing Bloomfield Coal Handling and Preparation Plant (CHPP) and Rail Loading Facility (RLF) for coal processing and loading. Bloomfield is currently approved to process 3.5 million tonnes per annum of product coal. As the Abel Underground Coal Mine starts producing coal it is expected there will be an increased in production through the Bloomfield CHPP of 30%. The development consent for Abel approves modifications to the CHPP infrastructure to facilitate this increase in production capacity. This enables the mine to access new coal resources while minimising the need for new facilities and land disturbance.

Figure 2 shows the total project area including the Abel Underground Mine area, parts of the existing Donaldson Open Cut mine that will be used for Abel surface infrastructure, and parts of the existing Bloomfield Colliery that will be used for the Abel Project, including the coal handling and preparation plant, rail loading facility and some access roads and water management structures. Underground workings and open cut areas within Bloomfield colliery are also shown in Figure 2 as some of these areas will be used for tailings disposal.

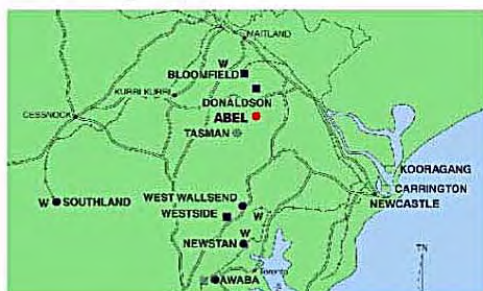
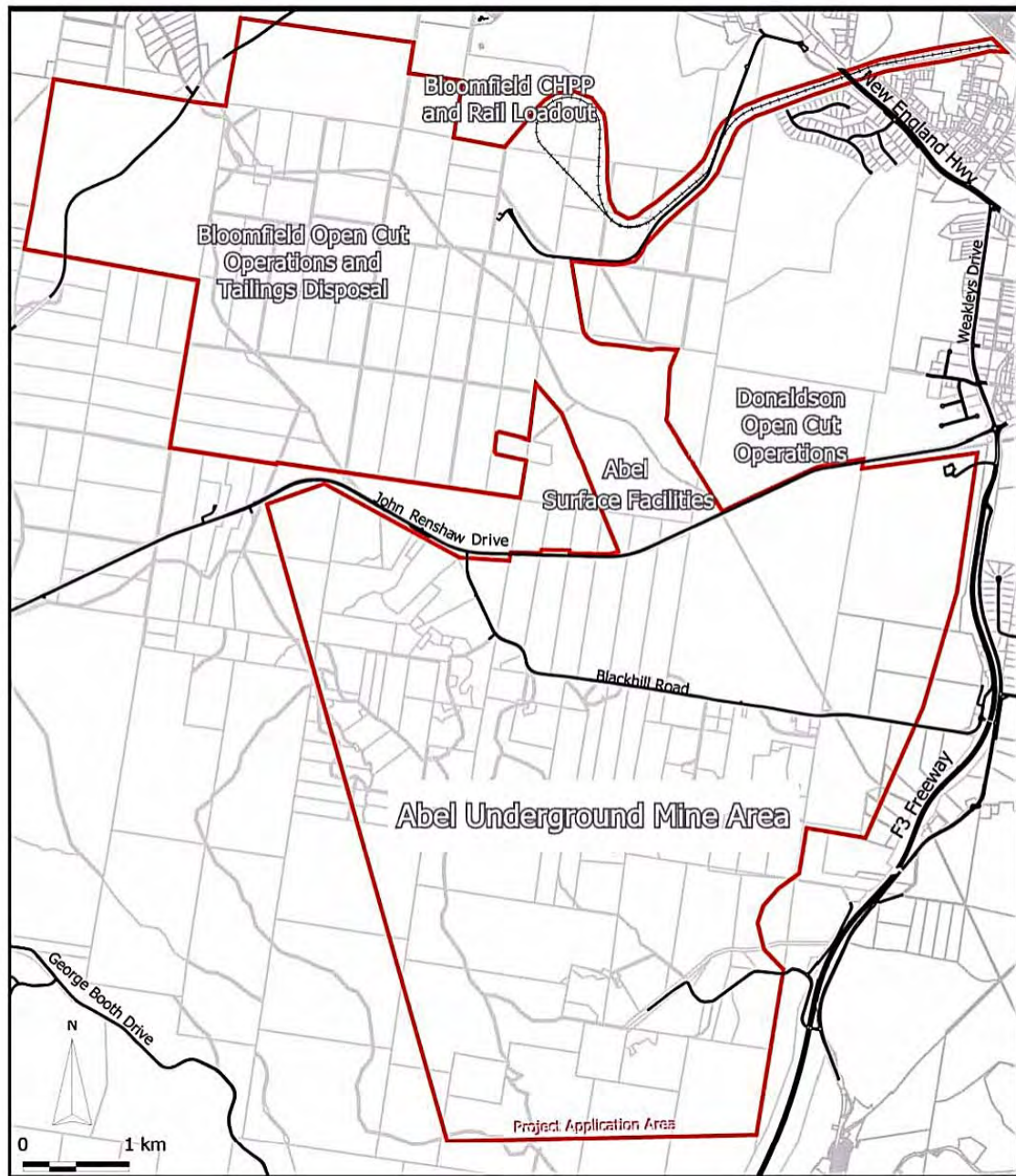
The Abel Underground Mine area, within which coal will be extracted, extends southwards from John Renshaw Drive towards Stockrington. It is bounded on the eastern side by the F3 Freeway and on the western side by a geological feature in the vicinity of Buttai Creek.


Abel Underground Coal Mine will extract coal from the Upper Donaldson and Lower Donaldson coal seams. These seams dip downwards at approximately 5 degrees towards the south of the Abel Underground Mine area, so that mining will become deeper as it progresses southwards. The depth of cover to mining ranges from 30 metres in the northern area immediately adjacent to John Renshaw Drive, to 450 metres at the southern boundary.

Access to the underground reserves will be from the Donaldson high wall north of John Renshaw Drive. A number of roadways will be driven under John Renshaw Drive with underground mining commencing on the southern side of John Renshaw Drive and progressing southwards. ROM coal will be transported via conveyor through the high wall to a stockpile located within the existing Donaldson area of disturbance. From the stockpile, coal will be transported to the existing Bloomfield CHPP, initially by truck but later by conveyor, where it will be processed and loaded onto rail.

The Project Approval (05\_0136) for Abel was issued on the 7 June 2007 under Part 3A of the *Environmental Planning and Assessment Act 1979*. **Condition 2** in Schedule 5 of the Project Approval states that:

*"The Proponent shall prepare and implement an Environmental Monitoring Program for the project to the satisfaction of the Director-General. This program must be submitted to the Director-General within 6 months of this approval, consolidate the various monitoring requirements in schedule 4 of this approval into a single document, and be integrated as far as is practicable with the monitoring programs of the adjoining Bloomfield, Donaldson and Tasman mines."*



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**FIGURE 2**  
Abel Underground Mine Project  
Total Project Area (Including Bloomfield)

### **3.0 PURPOSE AND OBJECTIVES**

The purpose of the Integrated Environmental Monitoring Program is to:

- Consolidate and integrate the monitoring programs for Abel, Donaldson, Tasman, and Bloomfield mines into one document;
- Address the relevant conditions of the Project Approval for Abel;
- Address the relevant commitments made within the Environmental Assessment for Abel; and
- Address the legislative requirements and guidelines relevant to the IEMP.

As part of the development and ongoing management of the Integrated Environmental Monitoring Program the primary objectives are to ensure that all current and proposed monitoring:

- locations provide adequate coverage when considered collectively, and are not unnecessarily duplicated;
- parameters are consistent across the sites;
- techniques are consistent across the sites; and
- frequencies are consistent across the sites, with the timing of monitoring synchronised where suitable.

The Monitoring to be included in the Integrated Environmental Monitoring Program includes:

- Noise;
- Blast;
- Air Quality;
- Surface Water;
- Groundwater;
- Meteorological;
- Flora and Fauna; and
- Aboriginal and Cultural Heritage.

The various monitoring programs that make up this IEMP have been prepared in consultation with the key government departments and agencies. These include the Department of Water and Energy (DWE), the Department of Environment and Climate Change (DECC) and the Maitland and Cessnock Councils.

## 4.0 MONITORING PROGRAMS

A summary of each of the monitoring programs is described in the sections below, including a table of the monitoring schedule and a figure showing monitoring locations. The locations of all the monitoring sites that are part of this IEMP are also shown in **Figure 3**. **Figure 3** show which monitoring sites relate to which mine, however, in many cases one monitoring location will be used for two or more sites. In these cases the monitoring site has been labelled as relating to the mine that has the primary responsibility for operation of the monitoring at that location.

The sections below provide an overview of the monitoring to be undertaken, and detailed information about any one monitoring aspect (including relevant criteria) can be found in the specific monitoring programs/plans. The relevant monitoring programs/plans for Abel are the:

- Abel Coal Project, Water Management Plan (Draft September 2007);
- Abel Underground Mine, Air Quality Monitoring Plan (Draft October 2007);
- Abel Mine Project, Noise Monitoring Program (September 2007) and Integrated Noise Monitoring Program, Donaldson Mine, Abel Mine, Tasman Mine, Bloomfield Mine and CHPP (Draft December 2007);
- Abel Underground Coal Mine, Flora and Fauna Management Plan (Draft October 2007); and
- Abel Aboriginal Heritage Management Plan (Final November 2007).

It should be noted that the monitoring outlined in the sections below is the minimum amount of monitoring to be carried out. Additional monitoring may be required from time to time, including monitoring undertaken internally for the day to day management of mine operations.

### 4.1 Noise Monitoring

Table 1 describes the noise monitoring to be undertaken for Abel, Donaldson, Tasman, and Bloomfield mines. The locations of the noise monitoring sites are shown in **Figure 4**.

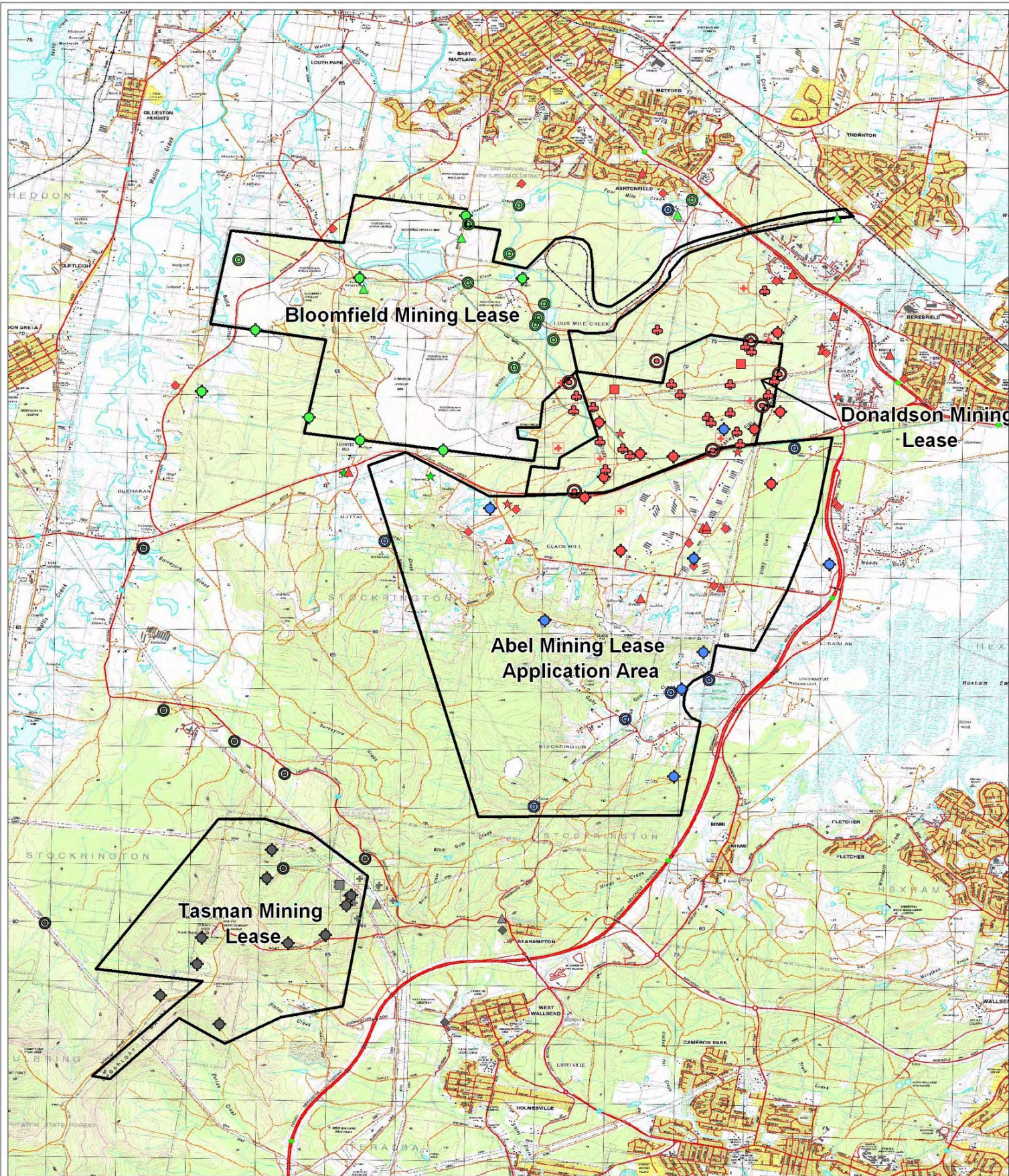
**Table 1 – Noise Monitoring**

Mine Site	Monitoring Type / Parameters	Monitoring Frequency	Monitoring Site Location / ID
<b>Abel Underground &amp; Donaldson Open Cut</b>	Attended Noise Surveys (15 min measurement period)	Quarterly	A, F, G, K and L plus variable locations selected from B, C, D, E, H, I or J. (See Note 1)
	Unattended Noise Surveys (7 days continuously)	Quarterly	
<b>Tasman Underground</b>	Attended Noise Surveys (15 min measurement period)	Quarterly	M and N
<b>Bloomfield Open Cut and CPP</b>	Data from the Abel/Donaldson monitoring network is currently used for Bloomfield. Further locations will be added upon finalisation of the approval of the Bloomfield EA.		

Note 1: Monitoring for Abel will be conducted at the four (4) potentially most affected locations, relevant to the mining operations occurring at the time

The noise measurement procedures employed throughout the monitoring program shall be guided by the requirements of AS 1055-1997 "Acoustics - Description and Measurement of Environmental Noise" and the NSW Industrial Noise Policy (INP).





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	Abel		Bloomfield
	Donaldson		Tasman
	Weather Station		Surface Water
	Dust		Blast
	Piezometer		Noise
	Flora and Fauna		Archaeological

**FIGURE 3**

All Monitoring Locations



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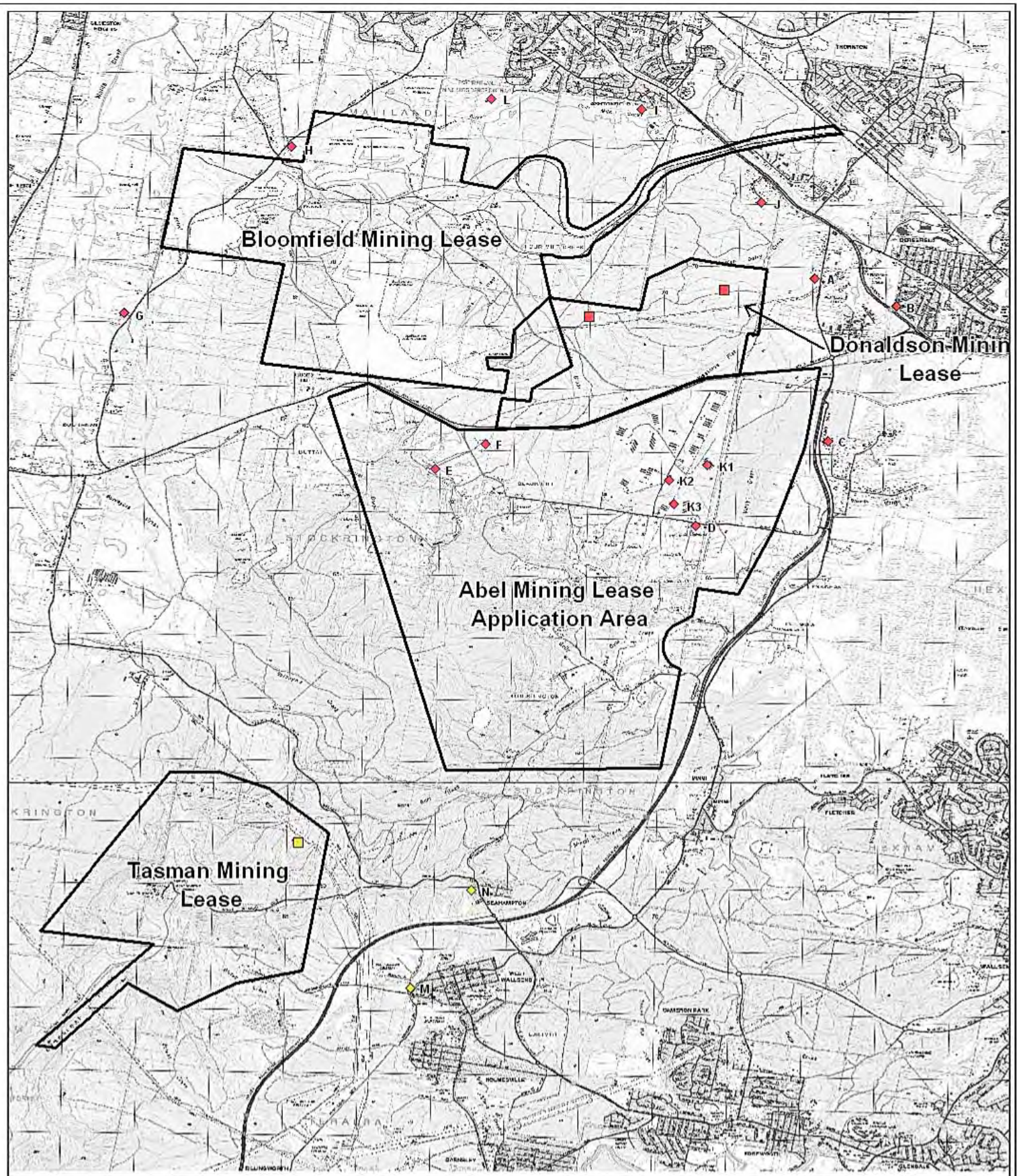
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- |  |           |   |                        |
|--|-----------|---|------------------------|
|  | Abel      |  | Bloomfield             |
|  | Donaldson |  | Tasman                 |
|  | Noise     |  | Meteorological Station |

**FIGURE 4**

Noise Monitoring Locations



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The monitoring locations chosen should be representative of noise emissions from mining operations and coal processing in order to determine compliance with the approval conditions and/ or allow the contributed noise level to be calculated at the nominated assessment locations.

#### Operator Attended Noise Surveys

Operator - attended noise measurements to quantify and characterise the maximum (L<sub>Amax</sub>), the energy equivalent (L<sub>Aeq</sub>), and background (L<sub>A90</sub>) noise levels from ambient noise sources and mining operations over a 15 minute measurement period.

Tasman amenity noise levels will be assessed in accordance with the short term monitoring methodology outlined in Appendix B2 of the INP.

The operator shall quantify noise emissions and estimate the L<sub>Aeq</sub>(Period) noise contribution from each of the mining operations for the day, evening and night time periods, as well as the overall level of ambient noise. During attended monitoring, digital recordings will be conducted to allow for additional post analysis of the mine noise levels and source identification.

#### Unattended Continuous Noise Logging

In order to supplement the operator-attended measurements, unattended continuous real time noise monitoring shall be conducted for a period of 7 days per quarter, to quantify overall ambient noise amenity levels resulting from mining, and processing emissions and other environmental noise sources. Data from unattended continuous noise logging will allow trends to be identified in ambient noise levels surrounding the mining operations and the assessment of cumulative noise impacts from all mining related noise sources in the area.

## 4.2 Blasting

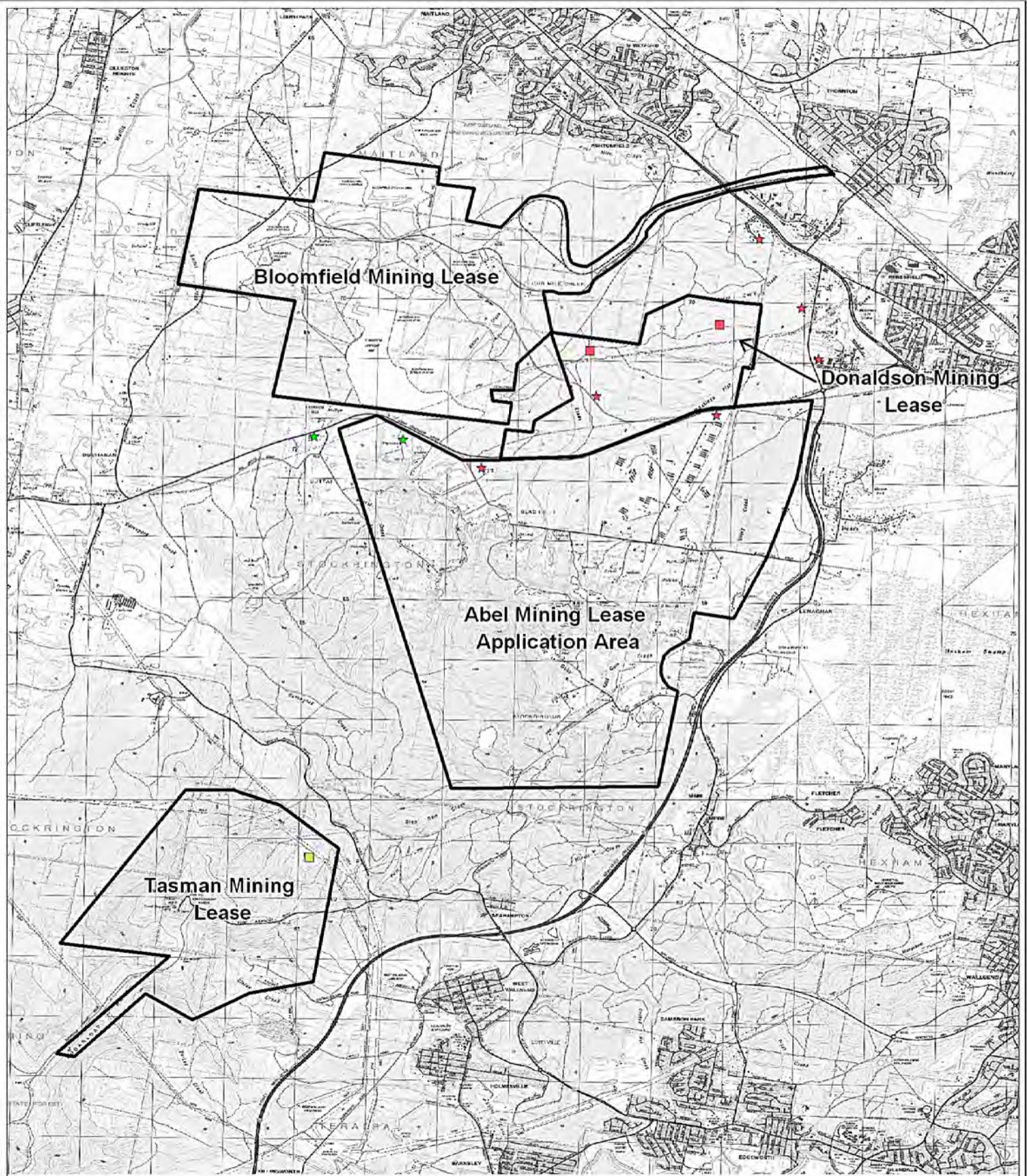
Table 2 describes the noise monitoring to be undertaken for Abel, Donaldson, Tasman, and Bloomfield mines. The locations of the blast monitoring sites are shown in Figure 5.

**Table 2 – Blast Monitoring**

Mine Site	Monitoring Type / Parameters	Monitoring Frequency	Monitoring Site Location / ID
<b>Abel Underground</b>	No blasting is undertaken and no monitoring is required		
<b>Donaldson Open Cut</b>	Vibration (Peak Particle Velocity) Overpressure (Lin Peak)	During each blasting event	Fairfax Regional Printing Facility Bartter Poultry Farm Weakleys Drive (Chidgey) ABAKK Avalon Estate (Thornton) Hunter Water Pipeline
<b>Tasman Underground</b>	Vibration (Peak Particle Velocity)	During each shotfiring event to clear dykes	At the surface, with the location determined at the time of shotfiring
<b>Bloomfield Open Cut and CPP</b>	Vibration (Peak Particle Velocity) Overpressure (Lin Peak)	During each blasting event	Elliot's (Trigger) McNaughtons

Monitoring locations are chosen to best represent the location and nature of blasting occurring at Donaldson and Bloomfield at the time.





#### LEGEND

<span style="color: blue;">■</span>	Abel	<span style="color: green;">■</span>	Bloomfield
<span style="color: red;">■</span>	Donaldson	<span style="color: yellow;">■</span>	Tasman
★	Blast	■	Meteorological Station

**FIGURE 5**

Blast Monitoring Sites



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The Donaldson monitoring equipment consists of a trigger unit and five blast monitors. The trigger unit is the closest monitor to Donaldson's blast area and is located on the Hunter Water Pipeline. When the Trigger Unit records a blast it triggers the other Donaldson monitors. All blast results are then sent to the Environment Managers Mobile Phone by SMS. The blast monitoring data is downloaded at the end of the day. Waveforms are recorded by the logger for each event. Peak Particle Velocity (ppv) and Overpressure.

The Bloomfield blast monitoring equipment consists of one trigger unit and one blast monitor. When the Elliots trigger unit records a blast it triggers the McNaughtons blast monitor.

Blast monitoring locations will be reviewed annually to determine if monitoring locations need to be changed to represent modifications to the mining operations.

### 4.3 Air Quality Monitoring

Table 3 describes the air quality monitoring to be undertaken for Abel, Donaldson, Tasman, and Bloomfield mines. The locations of the air quality monitoring sites are shown in Figure 6.

**Table 3 – Air Quality Monitoring**

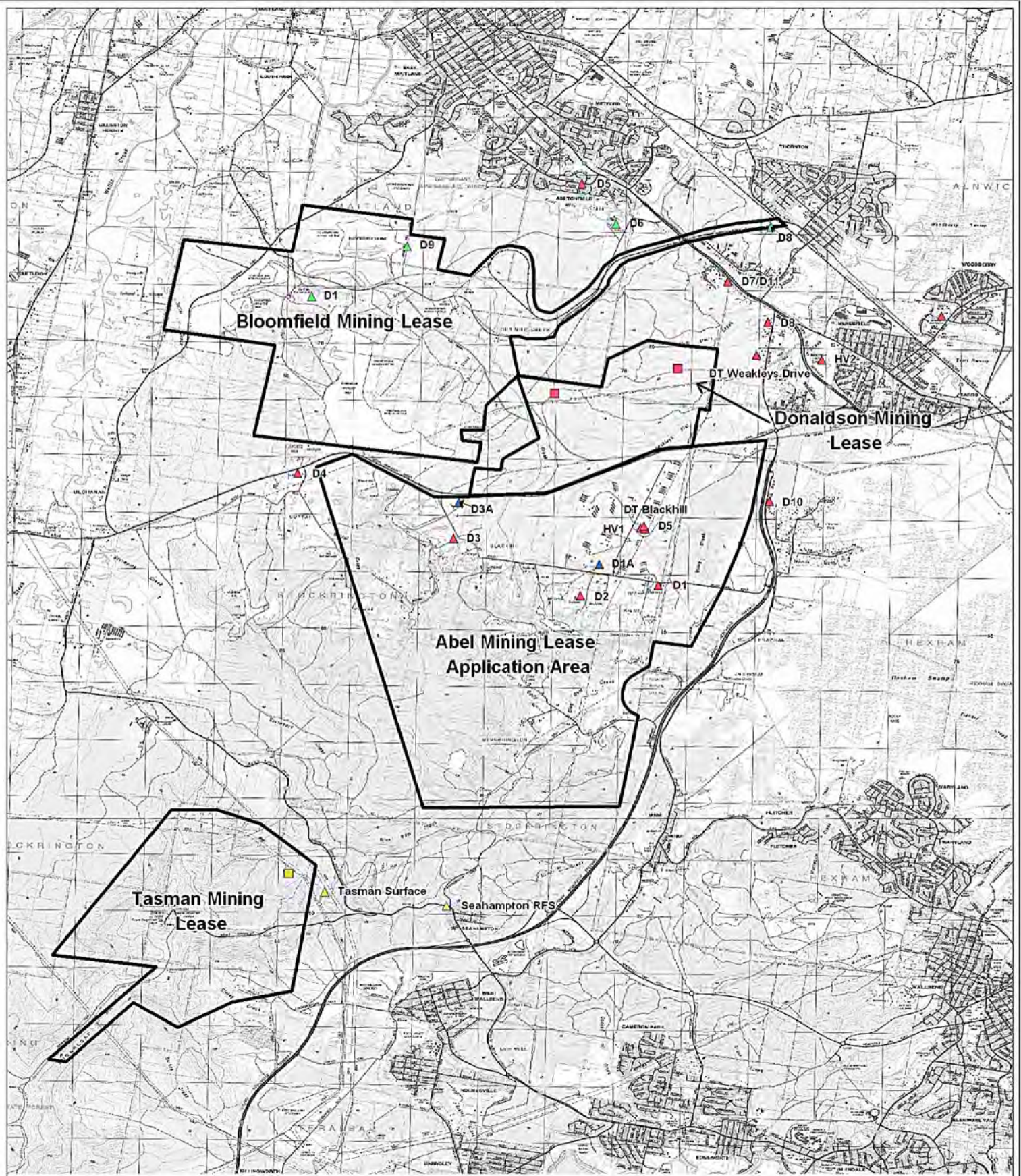
Mine Site	Monitoring Type / Parameters	Monitoring Frequency	Monitoring Site Location / ID
<b>Abel Underground &amp; Donaldson Open Cut</b>	Dust Deposition Gauges	Monthly	D1 , D1A, D2, D3, D3A, D4 D5, D7, D8, D10
	HVAS (TSP and PM <sub>10</sub> )	Continuous 6 day cycle	HV1, HV2
	Dust Traks (PM <sub>10</sub> )	Continuous 24 hour	Weakley's Drive and Bartter Site
	GRIMM (PM <sub>10</sub> and PM <sub>2.5</sub> )	Two Events Per Year	Bartter Site
<b>Tasman Underground</b>	Dust Deposition Gauges	Monthly	Tasman Surface Seahampton RFS
	HVAS (TSP and PM <sub>10</sub> )		Seahampton RFS
<b>Bloomfield Open Cut and CPP</b>	Dust Deposition Gauges	Monthly	D1, D6, D8, D9.

The dust deposition monitoring will be done in accordance with AS/NZS 3580.10.1:2003 (Methods for sampling and analysis of ambient air - Determination of particulate matter - Deposited matter - Gravimetric method).

The High Volume Air Samplers will be maintained and operated in accordance with relevant Australian Standards. The HVAS monitoring TSP will do so in accordance with AS/NZS 3580.9.3:2003 (Methods for sampling and analysis of ambient air - Determination of suspended particulate matter - Total suspended particulate matter (TSP) - High volume sampler gravimetric method). The HVAS monitoring PM<sub>10</sub> will do so over a six day continuous cycle in accordance with AS/NZS 3580.9-6:2003 (Methods for Sampling and Analysis of Ambient Air - Determination of Suspended Particulate Matter - PM<sub>10</sub> High Volume Air Sampler with size selective inlet - Gravimetric method).

Bloomfield conducts internal background dust monitoring at locations additional to those shown in Figure 6.





#### LEGEND

<span style="color: blue;">■</span> Abel	<span style="color: green;">■</span> Bloomfield
<span style="color: red;">■</span> Donaldson	<span style="color: yellow;">■</span> Tasman
<span style="color: black;">▲</span> Dust	<span style="color: black;">■</span> Meteorological Station

All dust monitoring locations include a dust depositional gauge

**FIGURE 6**

Air Sampling Locations



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## 4.4 Surface Water Monitoring

Table 4 describes the surface water monitoring to be undertaken for Abel, Donaldson, Tasman, and Bloomfield mines. The locations of the surface water monitoring sites are shown in Figure 7.

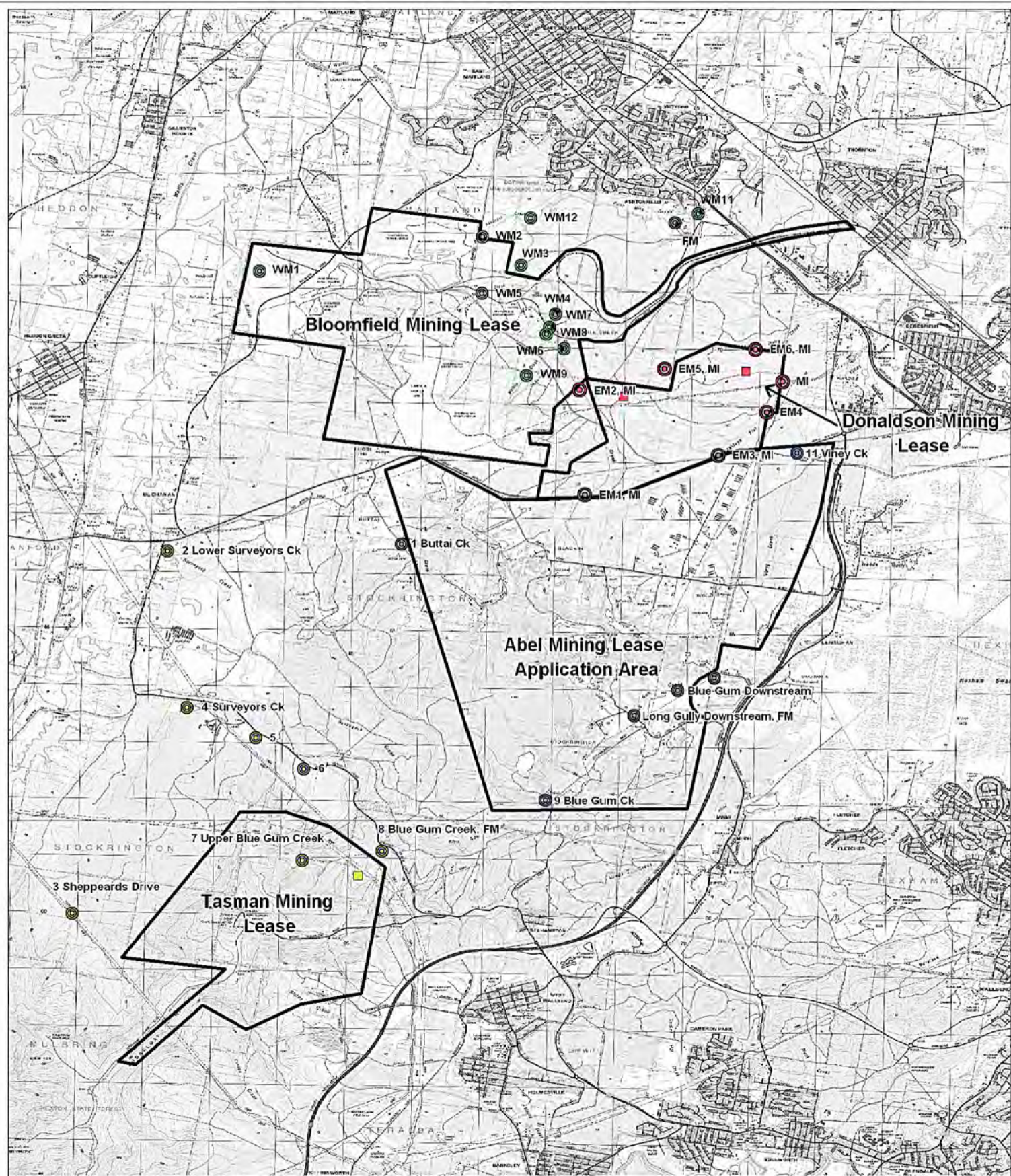
**Table 4 – Surface Water Monitoring**

Mine Site	Monitoring Type / Parameters	Monitoring Frequency	Monitoring Site Location / ID
<b>Abel Underground</b>	Water Quality - Partial Analysis	Monthly	Blue Gum Ck (Stockrington Rd) Blue Gum Ck (downstream) Long Gully (Downstream)
	Water Quality - Full Analysis	Annually	Buttai Ck (Lings Rd) Viney Ck (John Renshaw Dr) Pambalong Nature Reserve (Cedar Hill Dr)
	Macroinvertebrate monitoring	Biannually	Blue Gum Ck (Stockrington Rd) Pambalong Nature Reserve
	Flow Gauge Station (Water Level and Flow)- Automated	Continuous	Blue Gum Creek (Dog Hole Rd)
	Water Level	Monthly	Pambalong Nature Reserve (Cedar Hill Dr)
<b>Donaldson Open Cut</b>	Water Quality - Partial Analysis	Monthly	Four Mile Ck (John Renshaw Dr) – EM1 Four Mile Ck (ds Donaldson) - EM2 Weakleys Flat Ck (John Renshaw Dr) (EM3)
	Water Quality - Full Analysis	Annually	Weakleys Flat Ck (ds) (EM4) Scotch Dairy Ck (us) (EM5) Scotch Dairy (ds) (EM6)
	Macroinvertebrate monitoring	Biannually	Four Mile Ck (John Renshaw Dr) – EM1 Four Mile Ck (ds Donaldson) - EM2 Weakleys Flat Ck (John Renshaw Dr) (EM3) Weakleys Flat Ck (ds) (EM4) Scotch Dairy Ck (us) (EM5) Scotch Dairy (ds) (EM6)
<b>Tasman Underground</b>	Water Quality - Partial Analysis	Monthly	Blue Gum Ck (Tasman mine) Blue Gum Ck (George Booth Dr) Unnamed Tributaries (3 sites)
	Water Quality - Full Analysis	Annually	
	Flow Gauge Station (Water Level and Flow)- Automated	Continuous	Blue Gum Creek (George Booth Dr)
<b>Bloomfield Open Cut and Washery</b>	Water Quality - Partial Analysis (+ filterable iron)	Monthly	Elwells Creek (WM3 & WM5) Shamrock Creek (WM12) Four Mile Creek (Four Mile Workshop) (WM11)
	Water Quality - Full Analysis (+ filterable iron)	Annually	Water Storages (Possums Puddle, Possums Puddle Outflow, Lake Foster, Lake Kennerson)
	Flow Gauge Station - Automated	Continuous	Four Mile Creek (Four Mile Workshop)

Full Analysis (EC, TDS, TSS, pH, Chloride, Sulphates, Alkalinity (Bicarbonate), Alkalinity (Carbonate), Calcium, Magnesium, Sodium and Potassium)

Partial Analysis (EC, TDS, TSS, pH)





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- |   |   |
|---|---|
| <span style="display:inline-block; width:15px; height:15px; background-color:blue; border:1px solid black;"></span> Abel      | <span style="display:inline-block; width:15px; height:15px; background-color:green; border:1px solid black;"></span> Bloomfield |
| <span style="display:inline-block; width:15px; height:15px; background-color:red; border:1px solid black;"></span> Donaldson  | <span style="display:inline-block; width:15px; height:15px; background-color:yellow; border:1px solid black;"></span> Tasman    |
| <span style="display:inline-block; width:10px; height:10px; border:1px solid black; border-radius:50%;"></span> Surface Water | <span style="display:inline-block; width:10px; height:10px; background-color:black;"></span> Meteorological Station             |
| MI Macroinvertebrate Monitoring   | FM Flow Monitoring  |

All Surface water monitoring locations include water quality monitoring

**FIGURE 7**

Surface Water Monitoring Sites



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In addition to routine water quality monitoring shown in Table 4, monitoring will be undertaken in the event of any discharge. Water usage, external sourcing, rainfall on site, sediment dam overflows and discharges will also be monitored internally by the mines, with data compared to the results of the surface water monitoring program when necessary.

Water quality parameters will be measured using a combination of on-site monitoring and collection of grab samples for laboratory analysis.

Macro-invertebrates will be analysed using a system such as the SIGNAL index (especially developed for freshwaters of South Eastern Australia, with a specific index for the Hunter region) or AusRIVAS (an Australia wide index using reference sites for specific regions). On each occasion that biological monitoring is undertaken, a detailed field observation sheet is completed covering riparian (stream bank) vegetation, stream geomorphology, visual characteristics and odour to allow a Riparian-Channel-Environmental Inventory (RCE) to be calculated.

The surface water monitoring program has been designed to reduce duplication of monitoring on individual sites and identify sensitive areas that may be between mine sites that require monitoring to enable more effective subregional data sets. Monitoring will continue in areas prior to water entering these mining leases and after water passes through to determine if the mining operations are having an impact on surface water quality. Water quality impacts will be assessed in accordance with the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC).

## 4.5 Groundwater Monitoring

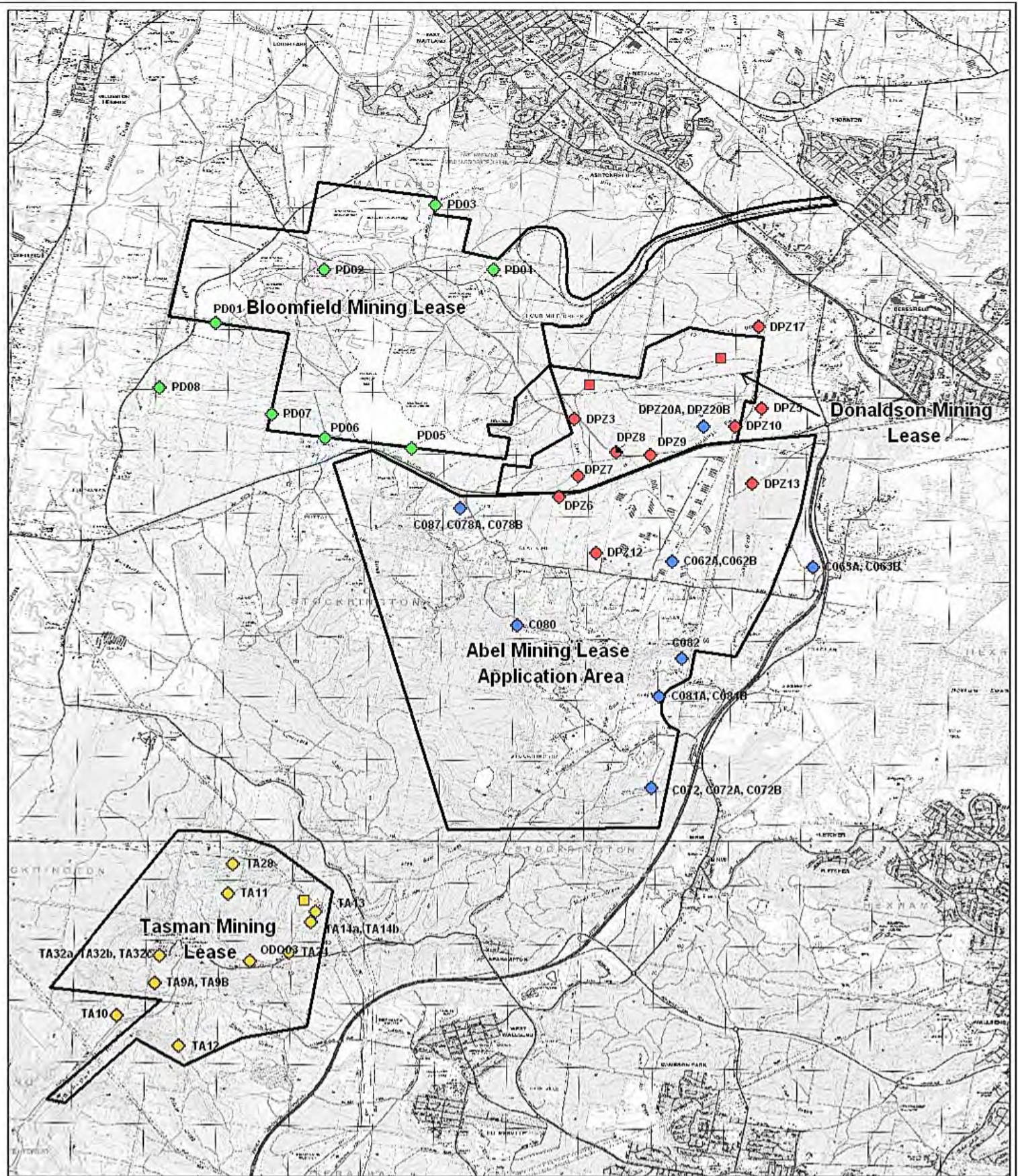
Table 5 describes the groundwater monitoring to be undertaken for Abel, Donaldson, Tasman, and Bloomfield mines. The locations of the groundwater monitoring sites are shown in Figure 8.

**Table 5 – Groundwater Monitoring**

Mine Site	Monitoring Type / Parameters	Monitoring Frequency	Monitoring Site Location / ID
<b>Abel Underground</b>	Water Quality - Partial Analysis (EC, TDS, pH)	Quarterly	All standpipe peizometers shown on <b>Figure 8</b>
<b>&amp; Donaldson Open Cut</b>	Water Quality - Full Analysis (EC, TDS, pH, Major cations and anions, Nutrients, Dissolved Metals)	Annually	
<b>&amp; Tasman Underground</b>			
<b>&amp; Bloomfield Open Cut and CPP</b>	Standing water level	Monthly	Initially all peizometer locations shown on <b>Figure 8</b> . (to be reviewed after 2 years)

In addition to routine water quality monitoring shown in Table 5, there will be weekly measurement of the volume of mine water pumped from the underground workings. Separate inflow rates should be monitored if two or more separate mining areas are active at any time. Weekly measurement on site of the EC, TDS and pH of the mine water pumped from the underground workings will also occur.





#### LEGEND

	Abel		Bloomfield
	Donaldson		Tasman
	Piezometer		Meteorological Station

FIGURE 8

Piezometer Locations



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## 4.6 Aboriginal and Cultural Heritage Monitoring

Table 6 describes the Aboriginal and Cultural Heritage monitoring to be undertaken for Abel, Donaldson, Tasman, and Bloomfield mines. The locations of the Aboriginal and Cultural Heritage monitoring sites are shown in Figure 9.

**Table 6 – Aboriginal and Cultural Heritage Monitoring**

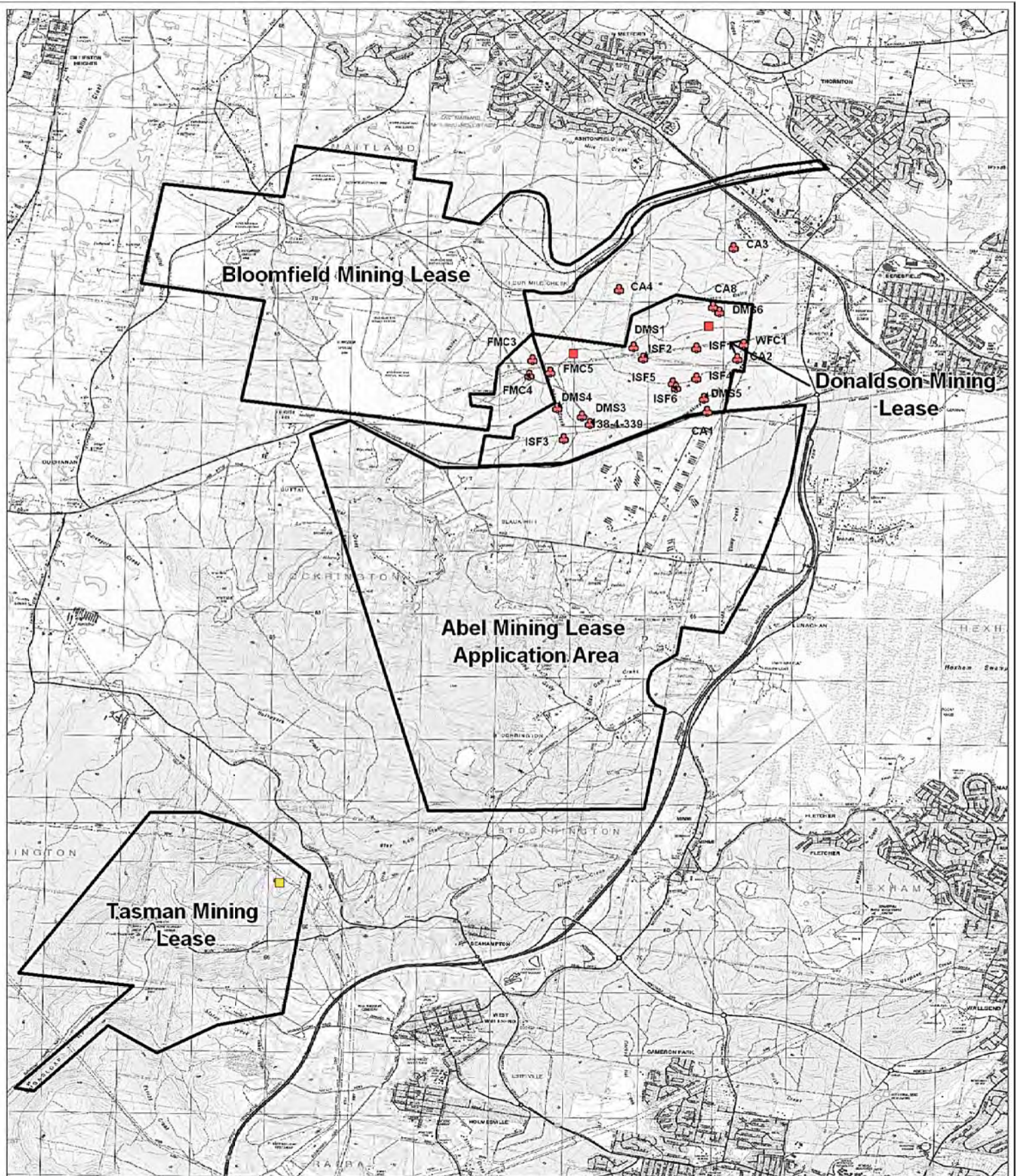
Mine Site	Monitoring Type / Parameters	Monitoring Frequency	Monitoring Site Location / ID
<b>Abel Underground</b>	Visual Inspection of site condition	Before and after mining	Not yet determined (to be within Southern investigation area)
	Pre-clearance survey	Prior to clearance	Area to be cleared
<b>Donaldson Open Cut</b>	Visual Inspection of site condition	Annual	Locations shown on <b>Figure 9</b>
	Pre-clearance survey	Prior to clearance	Area to be cleared
<b>Tasman Underground</b>	Survey	Before and after mining	Above mine panels
<b>Bloomfield Open Cut and CPP</b>	Pre-clearance survey	Prior to/during clearance	Area to be cleared

The main area of Aboriginal significance within the four sites is the Donaldson Conservation area. The Integrated Monitoring program will involve monitoring on an annual basis the existing datum points within the Conservation Area by a qualified archaeologist and representatives of the LALC.



A staged systematic archaeological survey of each section proposed to be undermined in the Abel southern investigation area will occur with the participation of the Aboriginal stakeholders prior to any underground mining in that section. The survey will sample the geographic extent of each section.

A sample of Aboriginal heritage sites within the Abel southern investigation area, comprising site types for which it is not anticipated that subsidence related impacts will occur, will be monitored before and after undermining in their vicinity to confirm the accuracy of these predictions. This will involve inspections prior to undermining then at set periods after undermining by a qualified archaeologist and representatives of the relevant LALC.





#### LEGEND

- |  |                     |   |                        |
|--|---------------------|---|------------------------|
|  | Abel                |  | Bloomfield             |
|  | Donaldson           |  | Tasman                 |
|  | Archaeological Site |  | Meteorological Station |

**FIGURE 9**

Archaeological Sites



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## 4.7 Flora and Fauna Monitoring

Table 7 describes the Flora and Fauna monitoring to be undertaken for Abel, Donaldson, Tasman, and Bloomfield mines. The locations of the Flora and Fauna monitoring sites are shown in Figure 10.

**Table 7 – Flora and Fauna Monitoring**

Mine Site	Monitoring Type / Parameters	Monitoring Frequency	Monitoring Site Location / ID
Abel Underground	Subtropical Rainforest (Floristic transects, stability of rock formations)	Not yet determined	Not yet determined
	Pambalong Nature Reserve (Annual fauna monitoring, monitoring of broad vegetation communities and their boundaries)	Not yet determined	Not yet determined
Donaldson Open Cut	Quadrats (Floristic content , vegetative structure, flora and fauna species list)	Quarterly	Locations shown on <b>Figure 10</b>
Tasman Underground	Quadrats (vegetative structure)	Annually	Locations shown on <b>Figure 10</b>
	Floristic content		
	Vertebrate fauna (trapping, recording, stagwatching, spotlighting, searches)		
Bloomfield Open Cut and CPP	Not monitored		

## 4.8 Meteorological Monitoring

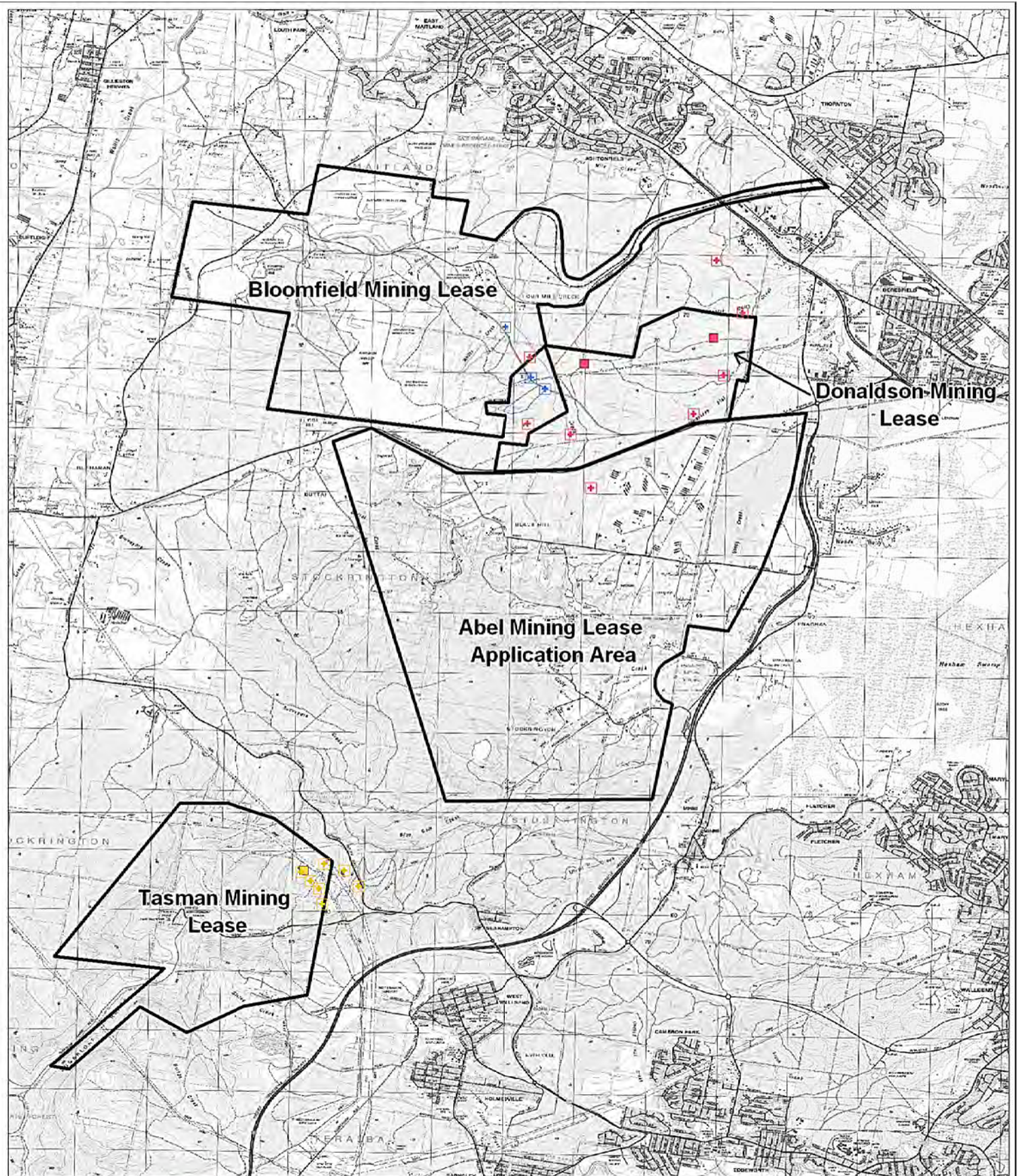
Automated weather stations are located at Tasman and Donaldson sites. The location of the meteorological stations is shown in Figure 3.

Meteorological measurements shall be guided by the requirements of AS 2923-1987 "Ambient Air-Guide for Measurements of Horizontal Wind for Air Quality Applications" and the DECC. The automatic weather station situated on the Donaldson mine site is programmed to continuously record the following meteorological parameters:

- Mean wind speed;
- Mean Wind direction;
- Aggregate Rainfall; and
- Mean air Temperature.

At the time of writing this document, Donaldson Coal were in the process comparing the data obtained from two weather stations at Donaldson in order to decide which of the weather stations Donaldson Coal would continue to monitor from.





#### LEGEND

- |  |                 |   |                        |
|--|-----------------|---|------------------------|
|  | Abel            |  | Bloomfield             |
|  | Donaldson       |  | Tasman                 |
|  | Flora and Fauna |  | Meteorological Station |

**FIGURE 10**

Flora and Fauna Monitoring Locations



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## 5.0 INTEGRATION OF MONITORING RESULTS

The monitoring equipment will be installed, operated and maintained as the case may be by a joint arrangement between Abel, Donaldson, Tasman or Bloomfield. The data from all monitoring equipment will be available to all parties, but each party will only refer to data relevant to its operations. Responsibilities for operating the monitoring equipment, collecting and recording results and responding to complaints will be the responsibility of the respective Abel, Donaldson, Tasman or Bloomfield Environmental Managers. In some cases it may not be possible, by means of monitoring alone, to identify which of the mining operations is the cause of an exceedance of assessment criteria should this occur. In these cases the operations will act co-operatively in identifying and rectifying problems should these arise. It should be noted that adequate controls and buffer zones appear to have been provided for and exceedance of assessment criteria are not expected to occur.

The Integrated Environmental Monitoring Program will reduce duplication of monitoring on individual sites and identify sensitive areas across the sub - regional area. The monitoring program has been designed to create a more meaningful data set between each site. Where practical each site will monitor the same parameters at the same frequency and will use the same environmental contractor to monitor and maintain monitoring equipment to create a more consistent dataset.

A monthly environmental monitoring report will be produced and distributed to all sites.

## **6.0 REPORTING AND REVIEWING**

### **6.1 Reporting**

A summary of environmental monitoring for Abel, Donaldson, Tasman and Bloomfield will be presented annually in respective AEMR's to government agencies and stakeholders. Due to specific regulatory requirements, the timing of the site AEMR's cannot be synchronised. Each site reports monitoring data according to site specific requirements, using data deemed to be relevant at the time of operation.

A summary of environmental monitoring for the sites will be presented quarterly on the respective websites. Web links to the other mines within the Integrated Environmental Monitoring Program will be provided on the websites.

For mine operational purposes, a monthly environmental monitoring report will be produced by the environmental contractor (who undertakes the monitoring) and distributed to all sites.

Within 7 days of detecting an exceedance of approval limits or performance criteria, or an incident causing (or threatening to cause) material harm to the environment, the exceedance/incident shall be reported to the Department of Planning and any other relevant agency.

### **6.2 Review**

The Integrated Environmental Monitoring Program, will be reviewed prior to the commencement of Abel mining operations and annually by the Abel, Donaldson, Tasman and Bloomfield Environmental Managers. The review of the IEMP will focus on monitoring locations, type of monitoring and monitoring frequency. The review of monitoring results will be used as part of a review to determine the requirements of monitoring. The IEMP will also be reviewed following approval of the Bloomfield Colliery Part 3A application and in line with the Development Approval.

The IEMP may be reviewed in a shorter time frame if monitoring results indicate a review of the monitoring program is required. The IEMP is to be reviewed upon significant changes to mining operations, such as the expansion of Bloomfield Operations, the closure of Donaldson Operations and progression of the Abel and Tasman longwall mining.