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Appendices

Appendix 1 - Dust Deposition
1 INTRODUCTION

1.1 Scope of AEMR

This Annual Environmental Management Report (AEMR) refers to the environment and community performance of Cristal Mining Australia Limited (Cristal) Broken Hill Mineral Separation Plant (MSP). Figure 1 shows the general location of the project. This report has been prepared generally in accordance with guidelines published by the Department of Resources & Energy NSW (DRE NSW). This AEMR describes environment and community performance from the 1st January to the 31st December, 2016.

The report is intended to satisfy requirements of the Broken Hill Mineral Separation Plant Development Consent (DA 345-11-01) Conditions issued by the Department of Planning under Part IV of the Environmental Planning & Assessment Act 1979.

1.2 Key Statutory Approvals

The key statutory approvals that apply to operations of the Broken Hill Mineral Separation Plant are listed below in Table 1:

Table 1 - Main Development Approvals as at 31/12/16

<table>
<thead>
<tr>
<th>Statutory Approval</th>
<th>Approval Authority</th>
<th>Granted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Development Consent DA 345-11-01</td>
<td>Dept. of Planning &amp; Environment</td>
<td>May 2002</td>
</tr>
<tr>
<td></td>
<td></td>
<td>February 2006</td>
</tr>
<tr>
<td></td>
<td></td>
<td>July 2007</td>
</tr>
<tr>
<td></td>
<td></td>
<td>December 2008</td>
</tr>
<tr>
<td></td>
<td></td>
<td>November 2014</td>
</tr>
<tr>
<td>Environment Protection Licence No. 12314</td>
<td>NSW Environmental Protection Authority</td>
<td>May 2005</td>
</tr>
<tr>
<td></td>
<td></td>
<td>February 2006</td>
</tr>
<tr>
<td></td>
<td></td>
<td>October 2006</td>
</tr>
<tr>
<td></td>
<td></td>
<td>December 2007</td>
</tr>
<tr>
<td></td>
<td></td>
<td>August 2009</td>
</tr>
<tr>
<td></td>
<td></td>
<td>April 2010</td>
</tr>
<tr>
<td></td>
<td></td>
<td>September 2013</td>
</tr>
<tr>
<td></td>
<td></td>
<td>February 2013</td>
</tr>
<tr>
<td></td>
<td></td>
<td>December 2015</td>
</tr>
</tbody>
</table>
Figure 1 - Regional Location
1.3 Ancillary Statutory Approvals

Additional approvals have also been granted to allow specific activities to be undertaken at or in relation to the mine sites. These approvals in addition to the relevant legislation and the approval authority are listed below.

Office of Environment and Heritage

Section 90 Consent (National Parks & Wildlife Act 1974)
Section 87 Permit (National Parks & Wildlife Act 1974)

1.4 Amendment to Development Consent

Development Consent for the Broken Hill Mineral Separation Plant was granted by NSW Department of Planning (formerly Planning NSW) in May 2002. Since the issue of the consent and up to the end of this reporting period, four amendments have been made to the development.

February 2006 Modification

During 2005 - 2006, modifications were made to the project as described in the Broken Hill MSP EIS. The modified Project includes a staged development approach with three distinct stages that are directly linked to the MSP processing requirements. The modifications relate to:

- Adjustments in the infrastructure requirements and/or site layout;
- An increase of the HMC processing rate (from 450,000 tonnes per annum [tpa] to approximately 576,000 tpa);
- Addition of a specific leucoxene separation circuit;
- Double road train transportation of material between the Ginkgo Mine and the MSP;
- Staged transportation of product;
- The addition of coal as well as LPG as a fuel type during Stages 2 and 3;
- Production, storage, transport and disposal of waste material classified as hazardous\(^1\);
- and
- Reduction in water demand.

Changes to the infrastructure requirements and/or site layout include:

- Removal of the salt washing circuit and wet high intensity magnetic separator (WHIMS) from the MSP until Stage 3 when the WHIMS (but not the salt washing circuit) is relocated from the Ginkgo Mine to the MSP;
- Addition of the leucoxene circuit components;
- An additional three stacks;
- The arrangement of the stockpiling and train loading facilities;
- Removal of the evaporation ponds and settling dams due to the salt washing circuit being located at the Ginkgo Mine;
- The addition of a sulphate ilmenite stockpile;
- The addition of coal container storage;

\(^1\) Classification in accordance with the EPA Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-liquid Wastes (EPA, 1999).
- Replacement of product storage bins with sheds;
- Minor realignment of the water supply pipeline;
- Minor realignment of the electricity transmission line in the MSP site boundary; and
- Modification to the MSP access road alignment.

**July 2007 Modification**

During 2007, modifications were made to the project as described in the Broken Hill MSP EIS. The modification was required to permit the increase in the mineral concentrate processing rate required to process mineral concentrate from the Snapper Mine and to revise the staged development of the MSP. The proposed modification included:

- Processing of mineral concentrate from the proposed Snapper Mine;
- Changed timing of MSP stages (i.e. rutile and zircon circuits would be added to the MSP prior to the ilmenite circuit);
- An increase in the mineral concentrate processing rate;
- An increase in the capacity of the rutile and zircon circuits;
- An increase in the volume and back loading of process waste produced;
- Transportation of mineral concentrates and MSP process waste between the proposed Snapper Mine and the MSP;
- An increase in the frequency of double road train movements;
- An increase in the amount of mineral product railed from the MSP;
- An increase in the amount of coal to be railed to the MSP;
- An increase in the capacity of coal container storages; and
- An increase in water demand.

Changes to the infrastructure requirements and/or site layout include an increase in the size of the rutile circuit feed stockpile, zircon circuit feed stockpile, ilmenite circuit feed stockpile, non-magnetic concentrate/heavy mineral concentrate receival area, reject stockpile and the capacity of coal container storages.

**December 2008 Modification**

During 2008, five development consent conditions required amendment as the conditions were either identified during an Independent Environmental Audit as requiring amendment, or were to reflect variations with the MSP Environment Protection Licence (EPL 12314).

**November 2014 Modification**

During 2014, modifications were made to the project as described in the Broken Hill MSP EIS. The modification was required to permit the increase in the mineral concentrate processing rate required to process mineral concentrate from the Atlas-Campaspe Mine

In summary, the modifications involve:
- an increase in the capacity at the MSP from 650,000 tpa to 1.2 Mtpa;
- an increase in the life of the MSP by 7 years (i.e. from 2025 to 2032); and
- planning approval for the:
  - receipt of 450,000 tpa of concentrate from the Atlas-Campaspe project at the MSP;
  - receipt of any additional concentrate produced by the Ginkgo and Snapper mines; and
  - receipt of the additional waste material generated by the Atlas-Campaspe project at the
Ginkgo and Snapper mine.

1.5 Amendments to Environment Protection Licence

In February 2006 a variation was made to the EP Licence (No. 12314) to incorporate the Development Consent modifications made during 2005 as detailed in Section 1.4.

In October 2006 a variation was made to the EP Licence to incorporate a change to the ‘Schedule Activity’ and ‘Fee Based Activity’ classifications for the MSP operations.

In December 2007 a variation was made to the EP Licence to remove conditions relating to tracking industrial and hazardous waste. The requirement to monitor these wastes is now detailed in the Protection of the Environment (Waste) Regulation 2005.

In August 2009 a variation was made to the EP Licence to remove conditions relating to monitoring requirements. The requirements to monitor the concentration of radiation from the leucoxene dryer bag house and the concentration of Type 1 and Type 2 substances in samples of the blended waste disposed of outside the premises on a quarterly basis was removed from the licence conditions. After three years of monitoring results the data obtained had suitably characterised the respective concentrations and continued monitoring was deemed unnecessary.

In April 2010 a variation was made to the EP Licence to incorporate a change to the ‘Schedule Activity’ and ‘Fee Based Activity’ classifications for the MSP operations. Further changes include alterations to ‘Limit Conditions’, specifically ‘Waste’; and to ‘Operating Conditions’ specifically ‘Emergency response’.

In September 2013 a variation to the EP Licence was made to reflect current monitoring systems at Point 8. The variation changed the monitoring of this point from daily to monthly. In addition to these changes a current map was provided that clearly identified effluent application areas to vegetation.

In February 2015 a variation to the EP Licence was made to reflect modification 3 of the development consent (DA 345-11-01). These changes included an increase in the waste limit from 122,900 tonnes to 300,000 tonnes per year, an increase in the processing limit from 650,000 tonnes to 1,200,000 tonnes per annum and changes to veriest monitoring points for air and noise compliance.

In December 2015 a variation to the EP Licence was made to monitoring point 8 to reduce the effluent discharge from 300KL/month to 100KL/month. This was a condition imposed by the EPA if Cristal were to reduce soil monitoring frequency of effluent disposal areas from annually to every 3 years. As no significant change in soil health within disposal areas had been observed from previous monitoring the EPA agreed to the proposed changes with the above condition.
1.6 Statutory Compliance

During the 2016 AEMR period a review of compliance against statutory approval conditions for the site was conducted. This review demonstrated that, notwithstanding the identified non-compliance and areas for improvement, operations were being conducted in a manner that minimised their impact on the environment.

As required under the Broken Hill Mineral Separation Plant DA 345-11-01 Condition 4.1 (a), Cristal undertook an Independent Environmental Audit using Telford Environmental Consulting Services who were approved by the Director General of the Department of Planning. The report was submitted with a total of 192 items associated with the MSP audited. Of those 192 items, only one item was noted as non-compliant and another 6 of the conditions noted as an opportunity for improvement.

The non-compliance was issued for condition L5.2 of the development consent, where noise monitoring was not conducted to demonstrate compliance with the Environmental Protection Licence noise emission limits.

In accordance with a suggestion by the Department of Planning & Environment, Cristal has suspended noise monitoring at the nearby Smith residence, replacing it with an agreement with the residence owner to respond to any noise complaints made to Cristal by the owner. During conversations with the owner of the Smith residence, the owner indicated to Cristal that they have no concerns about noise emission from the MSP and would rather noise monitoring adjacent to his property be discontinued. An additional paragraph to this extent has been added to condition 3.6 of the development consent stating that “these criteria do not apply if the Applicant has an agreement with the relevant landowner to exceed the noise criteria, and the Applicant has advised the Department in writing of the terms of this agreement”.

Cristal has interpreted this amendment, within the context of previous correspondence with the department, as permitting suspension of the noise monitoring. Independent interpretation of the amendment may conclude that it permits MSP noise emissions to exceed the specified noise levels, however, Cristal is required to continue the noise monitoring at the residence. A recommendation for clarification of the intent of this condition with the Department of Planning & Environment, and a resultant revision of the EPL has been included as an opportunity for improvement (OfI-2-a & b) in the independent audit.

The EPA environmental protection licence, however, has not been amended to reflect these changes in the noise monitoring requirements of the development consent. As Cristal did not conduct noise monitoring during 2016 in light of the development consent changes, there is a non-compliance with the EPL noise monitoring requirement.

Cristal will consult with the Department of Planning and EPA to include a suspension of noise monitoring requirement of the licence that is consistent with that of the development consent.

The next independent audit for the MSP will be conducted at the end of the 2019 AEMR period.
1.6.1 NSW Department of Planning and Environment Compliance Audit

During 2009 an audit inspection was conducted at the MSP & Ginkgo by the Department of Planning. The inspection was conducted to determine compliance of the development approvals. The inspection found that the project is being carried out generally in accordance with development approvals.

No further audits have been requested by the DP&E.

Cristal Mining in 2016 contracted an independent auditor which was approved by the DP&E to conduct an audit and assess performance against a number of regulatory approvals. The audit found that the project is being carried out generally in accordance with development approvals.

1.7 Plant Contacts

Table 2 – MSP Contacts

<table>
<thead>
<tr>
<th>Personnel</th>
<th>Position</th>
<th>Contact No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wayne Knott</td>
<td>Operations Manager</td>
<td>(03) – 5074 8900</td>
</tr>
<tr>
<td>Clayton Trengove</td>
<td>MSP Manager</td>
<td>(08) – 8080 0800</td>
</tr>
<tr>
<td>Andrew Schweitzer</td>
<td>Environmental Superintendent</td>
<td>(03) – 5074 8955</td>
</tr>
<tr>
<td>Brendan Isaacs</td>
<td>Environmental Officer</td>
<td>(03) – 5074 8904</td>
</tr>
<tr>
<td>Sam Summers</td>
<td>Environmental Technician</td>
<td>(03) – 5074 8903</td>
</tr>
<tr>
<td>Marcus Ridgwell</td>
<td>Environmental Officer</td>
<td>(03) – 5074 8912</td>
</tr>
</tbody>
</table>
2 OPERATIONS DURING THE REPORTING PERIOD

2.1 Land Preparation

A new hard stand was constructed from bluestone road base in 2016 to improve the loading area for trains. The new surface allows purpose built container loaders and reach stackers to operate, meaning more efficient load times and safer operation. The surface has also reduced the amount of raised dust.

2.2 Operations

There are three stages of development for the Mineral Separation Plant. These stages are linked directly to the MSP processing requirements. Figure 2 shows the general site arrangement during Stage 2.

Stage 1

The completion of Stage 1 will be dependent on the prevailing market conditions, operational success, and the influence of other potential Cristal developments. Stage 1 would involve:

- the transport of Heavy Mineral concentrates from the Ginkgo Mine;
- a non-magnetic concentrate separation circuit (wet plant);
- a magnetic concentrate separation circuit (dry plant);
• the rail transport of the finished products Leucoxene, Secondary Ilmenite and non-magnetic concentrate; and
• back loading of waste material to the Ginkgo Mine.

The general site arrangement and the layout of the MSP during Stage 1 are shown on Figure 2. The relevant process flows of Stage 1 are shown on Figure 3.

**Stage 2 (Complete)**

Construction began on the Stage 2 ilmenite plant mid-2012 and was completed by third quarter 2013. The plant treats Mags 1 ilmenite from Ginkgo and Snapper operations and future Cristal operations in the Murray-Darling Basin.

The Stage 2 plant dries and heats the Mags 1 to metallurgically refine the ilmenite using electrostatic and magnetic separation techniques to produce a clean ilmenite for sales to the Titanium Market.

**Magnetic Separation**

Salt washing and magnetic separation within the WHIMS circuit is undertaken at the Ginkgo Mine (these process activities were originally proposed at the MSP and are now being undertaken at the Ginkgo Mine). The concentrates resulting from the WHIMS circuit include ilmenite, leucoxene and non-magnetic concentrates. Ilmenite (i.e. Mag 1), leucoxene (i.e. Mag 2) and non-magnetic (i.e. non-mags containing zircon and rutile) concentrates are transported to the MSP by double and triple road trains. The concentrates are stockpiled in the Mag 1 and 2 and Non-mag receival areas (Figure 2) upon delivery to the MSP.

**Mineral Processing**

The feed preparation circuit (wet plant) processes the WHIMS non-magnetic concentrate to remove a waste component and produce a non-magnetic concentrate product. The non-magnetic concentrate product is stored in a dewatering stockpile prior to rail transport to Port Adelaide then ocean delivery to Western Australia for further mineral separation to saleable products. In Western Australia, rutile, zircon and leucoxene products are produced. The waste component from the Broken Hill MSP is back loaded to the Ginkgo Mine. Further detail on waste management is provided in Section 2.5.

The dry plant processes the WHIMS magnetic concentrate to remove a waste component and separates the concentrate into two products; leucoxene and secondary ilmenite. The ilmenite, leucoxene and secondary ilmenite products are stored in a separate covered shed prior to rail transport to South Australia for export as saleable products. The waste component is back loaded to the Ginkgo Mine.

The stage 2 plant allows Cristal to electromagnetically refine the ilmenite on site. The product is stored in a covered shed until it is loaded for rail transport to South Australia. This process allows sale of a cleaner ilmenite product to the Titanium Market.
2.3 Production

For the production in this reporting period, production statistics (in tonnes) and estimates for the next AEMR period are provided in Table 3 below.

Table 3 - Production Statistics* – AEMR Period

<table>
<thead>
<tr>
<th>Material</th>
<th>AEMR Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-Magnetics</td>
<td>210,000</td>
</tr>
<tr>
<td>BH Zircon Concentrate</td>
<td>-</td>
</tr>
<tr>
<td>BHI (ilmenite)</td>
<td>95,000</td>
</tr>
<tr>
<td>BHT (ilmenite)</td>
<td>-</td>
</tr>
</tbody>
</table>

*tonnes
Figure 2 - General Arrangement
Figure 3 - MSP Process Flow Sheet
2.4 Waste Management

The Broken Hill Mineral Separation Plant commenced operations in March 2006. Transporting of production waste material from the Broken Hill MSP to the Ginkgo Mine commenced in the second quarter of 2006.

All heavy mineral sands ore bodies contain traces of the natural radioactive elements uranium and thorium together with their decay products. Waste materials generated at the MSP include silica, quartz and monazite. The only mineral sands component that is significantly radioactive is monazite. The monazite fraction of the MSP waste determines the activity levels of the MSP waste. Monazite from the Ginkgo and Snapper deposits are separated from the other heavy minerals at the Broken Hill MSP, and returned to the mine site for disposal.

Since 2009, the total activity of the combined waste materials generated at the MSP occasionally exceeded 100 Becquerel’s per gram (Bq/g). Therefore under the DEC Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-liquid Wastes (EPA, 1999), the combined waste materials produced are classified as hazardous wastes (i.e. total activity would be more than 100 Bq/g). These materials are classified as hazardous on the basis they contain radioactive material from the separation circuit and except for this radioactive component would be classified as inert waste as specified in Schedule 1 of the Protection of the Environment Operations Act (POEO).

In accordance with the DEC Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-liquid Wastes (EPA, 1999), the combined waste materials produced were classified as hazardous waste. This is based on calculation of the total activity ratio. All waste transported from the MSP to Ginkgo was transported as hazardous waste under appropriate documentation in accordance with the NSW Radiation Control Act 1990 and the Code of Practice for the Safe Transport of Radioactive Material.

The waste classification outlined above is based on the combined waste materials generated at the MSP. That is, blending of the waste generated by the non-magnetic concentrate separation circuit (wet plant) and the waste generated by the magnetic concentrate separation circuit (dry plant).

The two circuits produce separate waste streams that have different radiation activity levels due to the handling of the monazite fraction. The dry plant removes monazite and other wastes (mostly quartz) which are classified as hazardous material. The wet plant however, does not remove the monazite from the mineral concentrate and therefore the resulting waste stream is classified as inert waste in accordance with Section 3.5 and Appendix 1 of the OEH waste disposal guidelines.

On a small scale basis, the wet plant waste material is being reused as sand for making concrete that is used in shotcreting tunnels in nearby underground mine workings. In accordance with Section 4.6.3 of the OEH waste disposal guidelines, the criteria adopted for the levels of radioactivity that permit wastes to be classified in the inert waste category are recognised as being ‘below regulatory concern’, and the disposal of such material does not require formal approval.
2.5 Water Management

The water management system has been designed to contain and control stormwater run-off generated from project development and operational areas, while diverting other runoff water around such areas.

The water management system is based on the containment of site waters and on the control of sediment that may be potentially carried with runoff from disturbed areas. The key components of the strategy are:

- Separation of undisturbed area runoff from disturbed area runoff.
- Evaporation/sediment sumps to contain runoff.
- Capture and on-site containment of potentially contaminated MSP site waters.

2.6 Hazardous Material Management

Hazardous materials on-site are managed in accordance with Material Safety Data Sheets, Work Cover and OEH requirements. Due to the lack of reagents required in the separation plant, the only potentially hazardous material required in significant volume is LNG.

LNG is classified as flammable gas (Class 2) dangerous goods for the purposes of storage and handling. The project LNG storage tank has been constructed and operated in accordance with the requirements of the AS 3961-2005 – The Storage and Handling of Liquefied Natural Gas.
3 ENVIRONMENTAL MANAGEMENT AND PERFORMANCE

3.1 Air Quality

3.1.1 Management

Prior to the commencement of construction Cristal prepared an Air Quality Management Plan in accordance with Development Consent requirements for the construction and operation of the MSP and associated infrastructure. The Air Quality Management Plan prescribes the dust prevention, monitoring, assessment, control, incident response and reporting procedure for the site. Details of the air quality criteria for concentrations of various emissions are provided in Table 4.

Table 4 – Air Quality Criteria

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Location</th>
<th>Averaging Period</th>
<th>Concentration</th>
<th>Set by</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dust Deposition</td>
<td>Ground Level</td>
<td>Annual (total)</td>
<td>4 g/m²/month</td>
<td>NSW OEH*</td>
</tr>
<tr>
<td></td>
<td>Ground Level</td>
<td>Annual (increase)</td>
<td>2 g/m²/month</td>
<td>NSW OEH</td>
</tr>
<tr>
<td>Total Solid Particles</td>
<td>In-Stack</td>
<td>-</td>
<td>100 mg/m³</td>
<td>EP Licence</td>
</tr>
<tr>
<td>PM₁₀</td>
<td>Ground Level</td>
<td>1 Day (24hr)</td>
<td>50 µg/m³</td>
<td>NSW OEH</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 Day (24 hr)</td>
<td>50 µg/m³</td>
<td>NEPM (allows exceedance 5 times / yr)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Annual</td>
<td>30 µg/m³</td>
<td>NSW OEH</td>
</tr>
<tr>
<td>Nitrogen Oxides</td>
<td>In-Stack</td>
<td>-</td>
<td>350 mg/m³</td>
<td>EP Licence</td>
</tr>
</tbody>
</table>

* Formerly NSW EPA

A network of dust monitoring sites consists of 3 dust deposit gauges and a High Volume Air Sampler (HVAS). The monitoring sites consist of residential sites and locations on the MSP site. The location of the dust deposit gauge sites are listed in Table 5 below and identified in Figure 4.

Table 5 – Dust Deposit Gauge Locations

<table>
<thead>
<tr>
<th>Dust Gauge Id</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>DBH01</td>
<td>Talbot Residence</td>
</tr>
<tr>
<td>DBH02</td>
<td>Removed due to solar farm development</td>
</tr>
<tr>
<td>DBH03</td>
<td>Abattoir Boundary</td>
</tr>
<tr>
<td>DBH04</td>
<td>Western Boundary</td>
</tr>
</tbody>
</table>
Figure 4 - Location of Dust Deposit Gauges
Dust Deposition
The NSW OEH amenity criteria for dust deposition seek to limit the maximum increase in the average annual rate of dust deposition from a new development to 2 g/m²/month and total dust deposition to 4 g/m²/month. The nominal background dust deposition levels (as per Broken Hill MSP EIS 2001) were estimated to be approximately 2.4 g/m²/month.

During 2016, 36 dust samples were collected. No exceedance of the prescribed limits for 2016 was detected. Figure 5 on the following page provides a graphical representation of the 12 month rolling average of dust deposition for 2016. Tabulated summaries of dust deposition data, insoluble solids is provided in Appendix 1.
Figure 5 - Dust Deposition, 12 Month Rolling Average
The average PM10 dust levels recorded during 2016 were below the NSW OEH annual criteria of 30µg/m³ at 9.0µg/m³.

Figure 6 provides a graphical representation of the PM10 data for 2016. A tabulated summary of all PM10 dust monitoring data is provided in Appendix 1. The number of samples collected in 2016 was 59 out of a possible 60. The required sampling frequency of every six days was not achieved due to an electricity outage that was out of Cristal Mining’s control.

The PM10 24-hour level did not exceed the NSW EPA 24-hour criteria of 50µg/m³.

The NEPM 24-hour PM10 guidelines allow this limit to be exceeded 5 times per year.

The location of the HVAS is sited in accordance with the EP Licence (12314), and is located at the MSP northern boundary closest to the nearest occupied site (See Figure 4). The occupied site is an abattoir with dirt road access. As a result of the dirt road access and stock in nearby pens, dust is generated by the abattoir operations which can impact on Cristal dust monitoring results.

The location of the HVAS is situated north-east of the MSP which means winds from the southwest (210° - 250°) direction are required to propel dust towards the HVAS, and the nearest occupied site.
Stack Emissions
The Leucoxene plant has not been tested since 2013 due to the plant being shut down for an extended period of time.

Stack discharge for the Leucoxene plant recorded during 2013 was below NSW OEH criteria (see Table 6). A tabulated summary of stack emissions monitoring is provided in Table 6.

The BHT plant stack emissions testing took place in January 2016. A tabulated summary of BHT stack emissions monitoring is provided in Table 7. All pollutants measured are below the prescribed limits allowed.

Table 6 - Leucoxene Stack Emissions 2013

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Leucoxene Dryer Stack</th>
<th>Hygiene Baghouse Exhaust Stack</th>
<th>Limits</th>
<th>Units of Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Velocity</td>
<td>15</td>
<td>18</td>
<td>&gt;15</td>
<td>m/s In stack</td>
</tr>
<tr>
<td>Average Flow rate</td>
<td>NR</td>
<td>NR</td>
<td></td>
<td>m³/hr. Dry STP</td>
</tr>
<tr>
<td>Volumetric Flow rate</td>
<td>2.3</td>
<td>2.4</td>
<td></td>
<td>m³/s. Dry STP</td>
</tr>
<tr>
<td>Average Temperature</td>
<td>53</td>
<td>63</td>
<td></td>
<td>°C</td>
</tr>
<tr>
<td>Moisture</td>
<td>0.6</td>
<td>11</td>
<td></td>
<td>% v/v</td>
</tr>
<tr>
<td>Stack Gas Molecular Weight</td>
<td>29</td>
<td>28</td>
<td></td>
<td>g/g-mole</td>
</tr>
<tr>
<td>Dry Gas Density</td>
<td>1.3</td>
<td>1.2</td>
<td></td>
<td>kg/m³</td>
</tr>
<tr>
<td>Total Particulates</td>
<td>6.0</td>
<td>6.7</td>
<td>&lt;100</td>
<td>mg/m³ Dry STP</td>
</tr>
<tr>
<td>Carbon Monoxide</td>
<td>NR</td>
<td>NR</td>
<td></td>
<td>mg/m³ Dry STP</td>
</tr>
<tr>
<td>Nitrogen Oxides</td>
<td>&lt;0.002</td>
<td>0.020</td>
<td>&lt;350</td>
<td>mg/m³ Dry STP</td>
</tr>
<tr>
<td>Carbon Dioxide</td>
<td>0.1</td>
<td>1.2</td>
<td></td>
<td>% v/v</td>
</tr>
<tr>
<td>Oxygen</td>
<td>20.7</td>
<td>18.3</td>
<td></td>
<td>% v/v</td>
</tr>
</tbody>
</table>

NR – Not Recorded

Table 7 - BHT Stack Emissions 2016

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>BHT Dryer Stack</th>
<th>Hygiene Baghouse Exhaust Stack</th>
<th>Limits</th>
<th>Units of Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Velocity</td>
<td>16</td>
<td>20</td>
<td>&gt;15</td>
<td>m/s In stack</td>
</tr>
<tr>
<td>Average Flow rate</td>
<td>7.1</td>
<td>NR</td>
<td></td>
<td>m³/hr. Dry STP</td>
</tr>
<tr>
<td>Volumetric Flow rate</td>
<td>7.1</td>
<td>6.4</td>
<td></td>
<td>m³/s. Dry STP</td>
</tr>
<tr>
<td>Average Temperature</td>
<td>75</td>
<td>59</td>
<td></td>
<td>°C</td>
</tr>
<tr>
<td>Moisture</td>
<td>6.7</td>
<td>0.7</td>
<td></td>
<td>% v/v</td>
</tr>
<tr>
<td>Stack Gas Molecular Weight</td>
<td>28</td>
<td>29</td>
<td></td>
<td>g/g-mole</td>
</tr>
<tr>
<td>Dry Gas Density</td>
<td>1.3</td>
<td>1.3</td>
<td></td>
<td>kg/m³</td>
</tr>
<tr>
<td>Total Particulates</td>
<td>3.5</td>
<td>8.1</td>
<td>&lt;100</td>
<td>mg/m³ Dry STP</td>
</tr>
<tr>
<td>Carbon Monoxide</td>
<td>1.3</td>
<td>NR</td>
<td></td>
<td>mg/m³ Dry STP</td>
</tr>
<tr>
<td>Nitrogen Oxides</td>
<td>0.027</td>
<td>&lt;0.002</td>
<td>&lt;350</td>
<td>mg/m³ Dry STP</td>
</tr>
<tr>
<td>Carbon Dioxide</td>
<td>1.3</td>
<td>&lt;0.1</td>
<td></td>
<td>% v/v</td>
</tr>
<tr>
<td>Oxygen</td>
<td>18</td>
<td>20.9</td>
<td></td>
<td>% v/v</td>
</tr>
</tbody>
</table>

NR – Not Recorded

3.1.3 Incidents

No incidents were recorded during the reporting period.
3.1.4 Improvements

An Air Quality Management Plan has been prepared in accordance with Development Consent requirements for the operation of the MSP. The Air Quality Management Plan prescribes the dust prevention, monitoring, assessment, control, incident response and reporting procedure for the site.

MSP Air Quality Management Plan was last updated in October 2015.

During the month of March, Cristal electricians fitted a UPS backup system to the high volume air sampler (HVAS). The UPS has mitigated previous power outage issues, minimising the amount of times the unit has to be reset.

Measures to reduce dust emissions

The following measures / components have been introduced to minimise fugitive dust:

- Mineral concentrate and product storage sheds;
- Covered conveyors used to transfer concentrate into dry and wet plants for processing;
- Containers are filled up on the ground, lids placed on and loaded onto the train with reach stackers.
- Use of water truck to reduce wind borne dust.
- Height of the stockpiles are limited to reduce the surface area exposed to the wind.
- Stockpiles turned into the predominate wind direction to minimise frontal area to reduce dust lift off.
- Early warning dust lift off system in place.
- Natural wind breaks.

Wind Breaks

The MSP site is very exposed with little natural protection from strong winds. As a long term strategy, trees have been planted along operational boundaries to act as wind breaks to reduce wind speeds moving across the site and limit fugitive dust emissions. Over 1300 trees planted around the MSP (See Photo below). All trees are irrigated by utilising on site treated effluent water.
Cristal Mining engaged Katestone to assess the cause of the windblown dust episodes and provide recommendations for the management and reduction of these events on site. In particular, the following scope of works was completed:

- Site inspection
- An assessment of the layout and design features on site that may influence or contribute to windblown dust
- Meteorological conditions that may contribute to wind-blown dust were reviewed
- Recommendations for wind control techniques and dust minimisation strategies.

From the report Cristal has implemented an early warning dust lift off system that warms staff prior to a dust lift off event. Staff receive emails alerting them up to 4 days in advance the likelihood of a dust event. This allows staff to implement measures to reduce the severity of the event.
Additionally, Cristal has taken steps to remove all dry mineral stock piles from the MSP site to an approved area that adjoins the MSP on the south. With improved stockpile design and management it is believe the dust issues for the MSP will be minimised.
3.2 Noise

3.2.1 Management

Prior to the commencement of construction Cristal prepared a Noise Management Plan (NMP) in accordance with Development Consent requirements for the construction and operation of the mine. The NMP prescribes the frameworks to monitor, assess, investigate, mitigate, and report noise generated by the MSP operations.

During 2015 Cristal undertook noise monitoring at the Smiths residence which is located near the MSP site.

Cristal has established an agreement with Smiths residence in 2015 that no further noise monitoring is required as noise from MSP is neither a factor nor a concern. Cristal has assured the smiths residence that shall they have any concerns regarding noise from the MSP to contact Cristal and the matter will be investigated and any mitigation measures necessary will be adopted.

In the 2016 independent audit of the MSP development consent, Cristal received non-compliance relating to noise monitoring. This has been discussed in section 1.6 of this report.

3.2.2 Performance

Unattended noise monitoring was undertaken during 2015 within 30m of the Smiths Residence. The results provided below in Table 8 have been adjusted to exclude data recorded at wind speeds above 3 m/s.

Table 8 - Unattended Noise Monitoring at Smith’s Residence

<table>
<thead>
<tr>
<th>Date</th>
<th>Average Noise Level, dB(A)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Day 0700 - 1800</td>
</tr>
<tr>
<td></td>
<td>L90</td>
</tr>
<tr>
<td>30/09/15 – 07/10/15</td>
<td>30.1</td>
</tr>
<tr>
<td>Noise Limits*</td>
<td>-</td>
</tr>
</tbody>
</table>

* EPA limit except during rain and wind speeds greater than 3m/s – NSW Industrial Noise Policy (2000)

Attended noise monitoring was completed in 2015 in accordance with the Development Consent DA 345-11-01 section 3.6A Noise Monitoring, to help determine the source of any potential high noise levels. From our observations it is clear that there are multiple noise sources around the residence aside from the Mineral Separation Plant (MSP). Our observations revealed that the vast majority of machine noise received at the residence does not come from the MSP. The only noise that registered relating to Cristal operations was haul trucks entering and leaving the site. The largest sources of noise at the Smiths residence were crows and magpies within the area. The MSP noise was barely audible during lull periods.
Background noise is the term used to describe the noise measured in the absence of the noise under investigation. It is described as the average of the minimum noise levels measured exceeded for ninety percent of a sample period. This is represented as the $L_{90}$ noise level. $L_{10}$ is the sound pressure level that is exceeded for 10% of the time for which the given sound is measured. $L_{eq}$ is the equivalent sound pressure level, and is defined as the steady sound level that, over a specified period of time, would produce the same energy equivalence as the fluctuating sound level actually occurring.

To put the decibel readings in perspective the relative scale of various noise sources is provided in Table 9.

<table>
<thead>
<tr>
<th>Noise Level (dBA)</th>
<th>Relative Loudness</th>
<th>Common Indoor Noise Levels</th>
<th>Common Outdoor Noise Levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>110 – 130</td>
<td>Extremely noisy</td>
<td>Rock band</td>
<td>Jet flyover at 1,000 m</td>
</tr>
<tr>
<td>100</td>
<td>Very noisy</td>
<td>Inside subway train</td>
<td>Petrol engine lawn mower at 1 m</td>
</tr>
<tr>
<td>90</td>
<td>Very noisy</td>
<td>Food blender at 1 m</td>
<td>Diesel truck at 15 m</td>
</tr>
<tr>
<td>80</td>
<td>Loud</td>
<td>Garbage disposal at 1 m, Shouting at 1 m</td>
<td>Urban daytime noise</td>
</tr>
<tr>
<td>70</td>
<td>Loud</td>
<td>Vacuum cleaner at 3 m, Normal speech 1 m</td>
<td>Commercial area heavy traffic at 100 m</td>
</tr>
<tr>
<td>60</td>
<td>Moderate to quiet</td>
<td>Large business office</td>
<td>-</td>
</tr>
<tr>
<td>50</td>
<td>Moderate to quiet</td>
<td>Dishwasher next room, Wind in trees</td>
<td>Quiet urban daytime</td>
</tr>
<tr>
<td>40</td>
<td>Quiet to very quiet</td>
<td>Small theatre, large conference room (background), Library</td>
<td>Quiet urban night-time</td>
</tr>
<tr>
<td>30</td>
<td>Quiet to very quiet</td>
<td>Bedroom at night, Concert hall (background)</td>
<td>Quiet rural night-time</td>
</tr>
<tr>
<td>20</td>
<td>Almost silent</td>
<td>Broadcast and recording studio</td>
<td>-</td>
</tr>
<tr>
<td>10-0</td>
<td>Silent</td>
<td>Threshold of hearing</td>
<td>-</td>
</tr>
</tbody>
</table>

After United States Department of Interior (1994)

### 3.2.3 Incidents

No noise incidents were recorded during 2016.

### 3.2.4 Improvements

Cristal will consult with the Department of Planning and EPA to include a suspension of noise monitoring requirement of the licence that is consistent with that of the development consent.
3.3 Pest management

3.3.1 Weeds

During October and November 2016 spraying of the noxious weeds *Mesquite* and *African boxthorn* occurred along the railway line, Pinnacles road and lands north of the railway line. Both weeds were sprayed using glyphosate and a surfactant.

3.3.2 Performance

On returning in February 2017 it was observed that most of the African boxthorn had been killed but the majority of the Mesquite had only suffered foliage damage and were reshooting from their bases.

3.3.3 Incidents

No Incidents were recorded during 2016.

3.3.4 Improvements

The use of Access herbicide and diesel will be used on all Mesquite in 2017 as it is more effective than glyphosate. African Boxthorn will continue to be treated with glyphosate and Pulse surfactant as this has proved to be the best treatment method for this particular weed.

The control program will continue into 2017.

*Spraying the noxious Mesquite (Oct 2014)*
3.4 Indigenous Heritage

3.4.1 Management

Prior to the commencement of construction Cristal prepared an Aboriginal Heritage Management Plan in accordance with Development Consent requirements for the construction and operation of the MSP. The Aboriginal Heritage Management Plan addresses the consultation program with the local indigenous community and identification, assessment, monitoring, conservation and management of archaeological heritage.

The Plan included results of Aboriginal heritage surveys and assessments of the MSP site, rail corridor, and the process water pipeline. The surveys and assessments were undertaken in accordance with NPWS (now OEH) requirements and in consultation with representatives from local Aboriginal organisations. Details of the locations of the identified heritage sites are provided in Figure 7.

3.4.2 Performance

The objectives of the Aboriginal Heritage Management Plan (AHMP) were achieved in 2016 with impacts controlled in accordance with statutory conditions.

The sites identified during Aboriginal heritage surveys were open camp sites and quartz quarries. In all, seven quarry sites (AS1-AS4, AS12-AS14) and eight camp sites (AS5-AS11, and AS15) were identified within the MSP site. Another quartz quarry site (AS16) was identified in the adjacent rail corridor. In 2005, sites located within the disturbance area for construction of the MSP were removed in accordance with the AHMP and the permits and consents issued by OEH under Sections 87 and 90 respectively of the National Parks and Wildlife Act 1974.

Sites located outside the disturbance area are managed and protected in accordance with the Aboriginal Heritage Management Plan.

3.4.3 Incidents

No incidents regarding Aboriginal archaeology were recorded in 2016.

3.4.4 Improvements

In 2017, management of Aboriginal heritage will continue to be undertaken in accordance with the Aboriginal Heritage Management Plan, Section 87 permit and Section 90 consent.
Figure 7 - Aboriginal Heritage Sites
3.5 Waste

3.5.1 Management

Prior to the commencement of operations Cristal prepared a Waste Management Plan and an Effluent Management Plan both of which are in accordance with Development Consent requirements for the operation of the MSP. The Plans detail the segregation, storage, transportation, disposal and tracking requirements of wastes generated at the MSP site.

3.5.2 Performance

The objectives of the management plans were achieved in 2016.

Production Waste

A description of the production waste classification is outlined in Section 2.4.3. The total tonnage of MSP production waste disposed of at the Ginkgo Mine for 2016 is provided in Table 10 below.

Table 10 - MSP Waste Disposed of at Ginkgo

<table>
<thead>
<tr>
<th>EP Licence No. Development Approval No.</th>
<th>Approved Waste Limit (t) per annum</th>
<th>Waste Disposed (t)</th>
</tr>
</thead>
<tbody>
<tr>
<td>EPL 12314</td>
<td>300,000</td>
<td>104,319</td>
</tr>
<tr>
<td>DA 345-11-01</td>
<td>300,000</td>
<td>104,319</td>
</tr>
</tbody>
</table>

In 2008 the total activity of production waste occasionally exceeded the 100 Bq/g cut off concentration (NSW Radiation Control Act 1990 (RCA) and the Radiation Control Regulation 2003 (RCR)) above which bulk material is defined as radioactive. Under the Protection of the Environment Operations Act 1997 (POEO), its Schedule 1 and its Guideline Assessment and Classification of Wastes, a waste material which is radioactive under the RCA is thus a hazardous waste.

Waste material is temporarily stored in a concrete storage bay prior to haulage via double road train for back loading at the Ginkgo Mine. All waste material transported is done so in accordance with the Code of Practice for the Safe Transport of Radioactive Materials, 2001 and the NSW Road and Rail Transport (Dangerous Goods) Act 1997.

Effluent Management System

The main element of the effluent management system is an aerated treatment system. The system consists of primary (anaerobic) treatment, an aeration unit, a clarifier unit and a disinfection and irrigation unit. The aerated treatment system accepts sewage from the plant amenities buildings and water backwashed from the on-site tertiary treatment system. The
tertiary treatment system treats recycled water from Essential Water for use as process water in the MSP. Water from the on-site tertiary treatment system is backwashed to clean the filter of algae and other contaminants that may be in the water sourced from Essential Water.

Approximately one third of the effluent from the aerated treatment system is reused on site as irrigation water for over 1300 trees planted around the site during 2006 and 2007. The volume of effluent discharge applied to the effluent discharge area is monitored via a meter. Average daily discharge during 2016 was 1389 litres.

Table 11 below summarises the discharge of nutrients and other pollutants during 2016. Average E. coli, BOD and Suspended Solids were all under the prescribed limits. Only on a couple occasions did the BOD and Suspended Solids go over the BHCC limits. These elevated readings are a result of the system requiring a de-sludge.

A groundwater monitoring bore installed down slope from the discharge area to monitor discharge is dry indicating no groundwater in the vicinity. Effluent water has since been relocated to watering road side native trees.

**Table 11 - Effluent Discharge Monitoring 2016**

<table>
<thead>
<tr>
<th>Date</th>
<th><em>E. Coli</em> Organisms/100ml</th>
<th>BOD (mg/L)</th>
<th>Suspended Solids (mg/L)</th>
<th>Total Nitrogen (mg/L)</th>
<th>Total Phosphorous (mg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan-16</td>
<td>0</td>
<td>5</td>
<td>5</td>
<td>33.2</td>
<td>14.3</td>
</tr>
<tr>
<td>Feb-16</td>
<td>0</td>
<td>20</td>
<td>11</td>
<td>18</td>
<td>10.5</td>
</tr>
<tr>
<td>Mar-16</td>
<td>18</td>
<td>3</td>
<td>&lt;1</td>
<td>4.23</td>
<td>3.7</td>
</tr>
<tr>
<td>Apr-16</td>
<td>0</td>
<td>&lt;2</td>
<td>&lt;1</td>
<td>14</td>
<td>4.67</td>
</tr>
<tr>
<td>May-16</td>
<td>1</td>
<td>&lt;8</td>
<td>2</td>
<td>12.4</td>
<td>10.9</td>
</tr>
<tr>
<td>Jun-16</td>
<td>0</td>
<td>&lt;2</td>
<td>10</td>
<td>30.9</td>
<td>22</td>
</tr>
<tr>
<td>Jul-16</td>
<td>0</td>
<td>6</td>
<td>3</td>
<td>32.8</td>
<td>24.3</td>
</tr>
<tr>
<td>Aug-16</td>
<td>6</td>
<td>11</td>
<td>&lt;1</td>
<td>24.6</td>
<td>7.39</td>
</tr>
<tr>
<td>Sep-16</td>
<td>0</td>
<td>4</td>
<td>11</td>
<td>35.6</td>
<td>14.1</td>
</tr>
<tr>
<td>Oct-16</td>
<td>0</td>
<td>4</td>
<td>10</td>
<td>37.1</td>
<td>18.4</td>
</tr>
<tr>
<td>Nov-16</td>
<td>5</td>
<td>4</td>
<td>8</td>
<td>37</td>
<td>22</td>
</tr>
<tr>
<td>Dec-16</td>
<td>0</td>
<td>8</td>
<td>8</td>
<td>33.2</td>
<td>20.9</td>
</tr>
<tr>
<td>Average</td>
<td>2.5</td>
<td>7.2</td>
<td>7.5</td>
<td>26.08</td>
<td>14.43</td>
</tr>
<tr>
<td>Limits*</td>
<td>&lt;1000</td>
<td>&lt;10</td>
<td>&lt;10</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

* BHCC set limits

**Recycling**

The objective of the waste management program is to minimise the production and impact of general waste (all waste other than process waste) produced at the MSP through the implementation of the waste minimisation hierarchy:

Avoid/Reduce \(\Rightarrow\) Reuse/Recycle \(\Rightarrow\) Treat \(\Rightarrow\) Dispose

Waste avoidance is a priority, followed by reuse and recycling/ reprocessing, with disposal as the last resort. Where appropriate, scrap metal was reused on site. During 2016 recycling included:

- 3.5 t of scrap metal;
• 1000 L of waste oil;
• 27m of cardboard;

3.5.3 Incidents

No incidents regarding waste management were recorded during 2016.

3.5.4 Improvements

Monitoring of waste disposal will continue in 2017.

Both the MSP Waste Management Plan and the Effluent Management Plan were updated in late 2015 and are reviewed annually.

Since 2012 Cristal has taken annual soil samples of the baseline soil where effluent water is discharged. Soil pits were dug using a backhoe and samples taken at three depths to 1 m, roughly corresponding to observed changes in the soil horizon. Analysis so far shows no decline in soil health. EPA has granted approval in 2015 to reduce the frequency of soil analysis from annually to every three years.

The next round of soil monitoring will take place in November 2017.

A new waste oil storage facility has been setup to improve the management of hydrocarbons onsite.
3.6  Erosion and Sediment Control

3.6.1 Management

A Water Management Plan (WMP) has been prepared as a requirement of Development Consent Condition 6.4(c)iii for the MSP. The WMP outlines measures for controlling and managing water resources including surface water, stormwater and process water associated with the operation of the MSP. The MSP comprises the separation plant and associated ancillary infrastructure including an electricity transmission line and a water supply line.

The WMP includes:

• the requirements for environmental management of water for operations at MSP as stipulated by regulatory approvals (See Section 2.2) for the project;
• the roles and responsibilities for implementing the WMP;
• a description of the environmental mitigation measures and associated limits to meet objectives, targets and regulatory approval requirements; and
• an overview of the environmental monitoring programs and contingency plans associated with environmental mitigation measures.

3.6.2 Performance

Based on monitoring, sediment and erosion control in accordance with the objectives of the WMP was achieved in 2016. Sediment and erosion control methods are listed in Section 2.5.

Surface water run-off is generated off compacted areas such as loading and storage pads, and roads etc. This run-off is managed with the construction of drains and sediment dams.

In 2016, diversion drains and sedimentation dams were regularly inspected to ensure sufficient capacity remained to accommodate run-off from future rainfall events. This inspection program helps to identify sedimentation dams and drains that require de-silting. Inspections after rainfall events also identify where additional capacity may be required.

3.6.3 Incidents

No incidents occurred during the reporting period.

3.6.4 Improvements

Monitoring and maintenance programs consistent with 2016 will be continued in 2017 in accordance with statutory and WMP requirements.
4 COMMUNITY RELATIONS

4.1 Environmental Complaints

Under the Cristal EMS, all sites have implemented a procedure for receiving, investigating, responding to and reporting complaints received from the community.

No complaints were received during the reporting period.

4.2 Community Liaison

The Cristal Community Investment Committee’s vision is to make a positive and lasting difference to the communities where we operate by supporting projects that are closely aligned with Cristal’s core values.

The Cristal Mining Community Committee offers local communities the opportunity to apply for grants up to the value of $2,000 per project/group. Grants closed on the 15th July 2016. A total of 53 applicants were received.

Committee members reviewed all applicants against committee guidelines and selected the community projects they felt meet the selection criteria, all of which have been approved by Management. The committee is pleased to announce that the following community groups have been successful in their application:

1. Men-in-dee Shed Incorporated
2. Broken Hill Public School Parents & Citizens Association
3. Menindee Charities Incorporated
4. Happy Day Preschool Kindergarten
5. Morgan Street Public School
6. Broken Hill Repertory Society
7. Burke Ward Public School
8. Broken Hill Basketball Association
9. Far West HACC Service
10. Maari Ma Health Aboriginal Corporation
11. Playtime Preschool
12. Alma Public School
13. Willyama High School Robotics Team
14. Silverlea Early Childhood Service
15. Railway Town Public School
16. Broken Hill Pet Rescue
17. The Lake Primary School
18. Mildura Make a Wish
19. Mildura South Primary School
20. Mildura South Kindergarten
21. Red Cliffs Secondary College
22. Red Cliffs Star Spirits Netball Club
23. Slow Food Mildura
24. Wentworth Public School P&C Association Incorporated
25. The Smith family Christmas appeal

Cristal Mining’s MSP manager donating Christmas gifts for the Smith family Christmas appeal.