1. Executive Summary

On 19 November 2010 the Pike River Coal Mine suffered the first of a series of catastrophic explosions that resulted in the death of 29 employees and contractors. In response to this disaster, on 29 November 2010, the New Zealand Cabinet required that the Department of Labour arrange a safety audit of all other coal mines, to be undertaken as a matter of urgency using an international expert.

Auditors were subsequently engaged to assure the Department of Labour and the Government that underground coal mines in New Zealand are operating safely and that they have robust and effective health and safety systems to ensure the safe operation of the mines.

This report outlines the findings of an independent audit of Spring Creek mine conducted for the Department of Labour.

1.1. Summary of Audit findings

This audit did not reveal that a dangerous situation was imminent at this mine. The audit did however identify areas for improvement to be addressed by the mine operator, including:

a. Establish an internal audit function in all management systems to ensure the requirements of the system are met in a timely manner.

b. Establish further Lead and Lag indicators for specific parts of the safety management system that will allow for the effectiveness of the system to be better understood and to allow for the continuous improvement phase of the development of the systems to begin.

c. Review the current roles and responsibilities of the management team to ensure that the current management structure is mapped against the safety management system. This will ensure that personnel clearly understand their responsibilities and accountabilities within the safety management system.

d. Address the areas for development identified from this audit (summarised in 1.4 below).
1.2  Key observations

The Spring Creek Mine demonstrated that work had been undertaken over a period of time to improve management processes for identifying and controlling hazards and risks. The mine is operating with several key hazards that promote critical risks that must continue to be controlled to ensure ongoing safety of the mine and the personnel. These are:

- The propensity for spontaneous combustion of the seam being worked
- The presence of methane as a seam gas
- The geological and strata control complexity of the deposit

1.3  Strengths

The company, the management team and the workforce demonstrated throughout the audit that there is a commitment to continue the improvement process that had been put in place by the company before the audit commenced. The mines management provided access to a wide range of documents and employees to assist the audit.

In instances where non-conformance with either internal or external standards was identified there was an immediate intervention to either remedy the matter or to investigate the cause.

Spring Creek mine had proactively commissioned a review of the risk of an ignition in a flammable environment underground following the Pikes River event.

1.4  Areas for Development

There is an opportunity to improve the mine sites document control and document quality control.

There is scope for self auditing practices to be introduced at this mine.
2. Audit Approach

2.1. Terms of Reference

2.1.1. Purpose

The purpose of the audit is to assure the Department of Labour and the Government that underground coal mines in New Zealand are operating safely and that they have robust and effective health and safety systems in regard to the major hazards that are inherent in underground coal mines.

2.1.2. Areas of Focus

The focus areas for the audit were:

a. Mine Gas management.
b. Ventilation Control.
c. Strata control.
d. Methane drainage.
e. Spontaneous combustion.
f. Mechanical and electrical (management of sources of ignition).
g. Emergency response/ preparedness.
h. Management of methane outbursts (if a potential for such exists).
i. Explosive management.

Other matters that came to the attention of the auditors could be discussed in the audit findings. With regard to the focus areas the audit team considered:

- Sufficiency of documented processes and systems
- Design and Planning
- Performance of plant
- Maintenance programs
- Work method and control
- Inspection monitoring and testing
- Handling and storage (hazardous products)

In the first instance the audit considered the risk/hazard identification and management processes that are used in the coal mining operation. The Mine management have conducted a risk assessment of the total operation and identified the principal hazards (those with the potential to cause multiple fatalities) and they have developed specific strategies through risk assessment to manage and mitigate the risks. The flow on from this is that the risks with a lesser risk are also identified and that there is a structured process in place for identification and the subsequent management and control of these risks also.

Given that the Risk Management Standard AS/NZ ISO 31000:2009 and the preceding standard AS/NZ 4360 are common across Australia and New Zealand the expectation is that the mines in NZ are applying the standard as a basic tool and that there is at least a basic Hazard Identification /Risk Assessment Process in place at the mine.
2.2. **The Audit Approach**

2.2.1. **Familiarisation visit**
An initial familiarisation visit to the mine was undertaken by Brett Garland (Auditor) accompanied by Alan Cooper (Department of Labour) and Johan Booyse, Senior Adviser, Extractives (Department of Labour). This involved a discussion with the mine manager regarding the approach to systems and risk management and an underground inspection.

2.2.2. **Document Request**
Before the onsite audit each mine was asked to provide the following documents:

a. Details of the system or process for identifying key risks/ significant hazards associated with the underground mining operation.

b. Details of the system or process for managing change of process or infrastructure in the underground mining operations.

c. A copy of the hazard/risk register relating to underground mining activities (this should include details of the controls that are in place to manage the individual risks/ hazards). In particular please provide detail with regard to the management of:
   - Spontaneous combustion
   - Strata control
   - Mine gas management
   - Methane drainage
   - Ventilation control
   - Outbursts management
   - Explosives management
   - Mechanical and Electrical (management of sources of ignition)

Note: If these hazards/ risks were not considered as relevant to the mining operation the mine operator was asked to explain the basis on which this has been determined.

d. A plan of the underground coal mine.

e. Copies of reports, data and information describing the geotechnical conditions at the mine.

f. A detailed ventilation plan (including ventilation infrastructure, mine volume and ventilation performance data).

g. Copies of emergency response plans (including details of refuge areas, self rescue caches, CABA re-fill stations etc).

Documents provided in advance of the onsite audit are listed at Appendix One.
2.2.3. Onsite audit

Audit tools were developed for the scope of the audit against the audit criteria and with current legislative requirements in New Zealand.

The Minex Health and Safety Council Industry Code of Practice was referred to by the auditors, but it was recognised that following this code of practice is not a mandatory requirement for New Zealand mines.

Given the background of the auditors it would be fair to say that comparisons with Queensland practice and legislation were made despite this was not being a specific requirement of the audit. The audit findings are based on objective evidence found and not reliant on hearsay.

An entry meeting was held at the start of the onsite audit process. This was to outline the scope and method to those in attendance. It was stressed in this meeting that the confidentiality of interviewees would be maintained in as far as specific observation and comments would not be attributed to any individual employee of the mine. It was also stressed that the audit report would be delivered to the Department of Labour and that any subsequent release would be at the Department's discretion.

The onsite audit involved a mix of document reviews interviews and observations. During this stage of the audit a number of documents were collected and reviewed by the auditors. The documents collected from onsite are listed in Appendix Two.

The Exit Meeting was held at the end of the onsite audit. At this meeting the purpose of the audit was restated and a provisional findings of the auditors regarding strengths and opportunities for improvement and were presented by PowerPoint.

2.2.4. Feedback on provisional findings

A draft audit report was produced and discussed with representatives of Solid Energy by telephone conference before this final audit report was completed.

2.3. Audit Limitations

Auditing is a sampling process which aims to verify the adequacy of systems and processes that are in place and to verify the extent to which those systems and processes are put into practice. This is achieved by reviewing the documented processes and systems, interviewing staff to determine the degree to which systems are understood and followed. Observations of practice and conditions at the mine also occur to verify that the mine is actively applying its own systems. The onsite components of this audit were conducted over a total of four days. During the period of this audit the mine was not in production so only development and maintenance work could directly observed.

As a sampling exercise an audit will not identify all weaknesses or non-conformance within a system. Equally, an audit will not identify all of the system and process strengths that exist at a mine. The findings are based on the documents provided, the
information disclosed in interviews and the observations of the auditors during the period of the audit.

Underground coal mining is a complex industry within which there is a range of technical and professional disciplines. This includes specialists in disciplines such as ventilation engineering, electrical engineering and geotechnical services. This audit has been conducted to the best of the ability of the assigned auditors within the limit of their professional skills and experience. The experience and qualifications of the auditors is set out below.

Accordingly, it is recommended that the mine operator take this opportunity to review all of the systems that are in place rather than focusing only on the specific findings of this audit.

2.4. **The audit team**

2.4.1. **Auditors**

Mr Brett Garland BE (Mining) Hons, MBA, FAusIMM, CP (Mining), RPEQ. Mr Garland is employed as the Chief Operating Officer of Caledon Resources Plc and has been employed in the Australian Coal Industry for 34 years. He is the holder of a 1st Class Mine Managers Certificate. Mr Garland is currently a member of the Coal Mine Safety & Health Act Advisory Committee and a Director of Queensland Mines Rescue Pty Ltd.

Mr Tim Watson is currently employed as a Mines Inspector by the Queensland Government. Mr Watson has been employed in the Australian Coal Industry for 20 years and is the holder of a 1st Class Mine Managers Certificate. Mr Watson is currently a member of the Coal Mines safety and Health Act Advisory Committee and is a member of the Technical Advisory Committee for Queensland Mines Rescue Pty Ltd.

2.4.2. **Audit Support**

Mr Alan Cooper is currently employed by the Department of Labour in New Zealand as a Practice Leader - Health and Safety Practice Development. His role during the inspections was to co-ordinate the audits and the supply of documentation and to provide a working knowledge of New Zealand legislation.

2.5. **Key Audit Dates**

<table>
<thead>
<tr>
<th>Familiarisation Visit, Spring Creek Mine</th>
<th>20 December 2010</th>
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</thead>
<tbody>
<tr>
<td>Onsite Audit, Spring Creek Mine</td>
<td>Tuesday 1&lt;sup&gt;st&lt;/sup&gt; March – Thursday 3&lt;sup&gt;rd&lt;/sup&gt; March 2011</td>
</tr>
<tr>
<td>Draft Report - telephone conference</td>
<td>8&lt;sup&gt;th&lt;/sup&gt; April 2011</td>
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3. Background to Spring Creek Mine

Spring Creek Mine was purchased by Solid Energy in 2002 and is located approximately 15km north of Greymouth on the West Coast of the South Island. It is a joint venture between Solid Energy 51% and Cargill 49%. Cargill is a US based company, the largest privately owned in the world. Spring Creek Mine has an estimated reserve of 250 million tonnes made up of semi soft coking and thermal coal. Solid Energy is the operator of the mine and supplies 90% of the coal to the international market with the remaining 10% sold into the domestic market.

The coal is contained within the Rewanui Coal measures and exists in seams generally 12-20 m thick with a dip south west at 15-20 degrees. The depth of cover ranges from 250 – 400 metres. Spring Creek Mine is currently mining coal in the main upper seam of the Upper Rewanui coal measures. It is likely this coal seam corresponds to either C seam or D seam at Strongman No1 Mine.

Spring Creek Mine has a workforce of 200 people, employees and contractors with an annualised mining rate of 700k tonnes.

Development headings and sub-levels are developed with continuous miners and road headers, with driveages in coal and stone where necessary. Panels are extracted using a high pressure hydraulic monitor, (high pressure monitor of 2,500psi or 6.5m3 of water per minute) which is used to cut and flush the coal from the goaf. The coal is then directed along flume roads to a collection point at the Rapahoe Pump Station, where the slurry is screened and conveyed to the surface on conveyors or in a fines slurry pipe line.

Spring Creek Mine had voluntarily stopped their operations following a spontaneous combustion event in early November 2010. Immediately following this event the mines resources had been placed under significant stress;

a. To assist with the rescue efforts underway at the Pike River Mine; and
b. Due to the emotions associated with the loss of life at the Pikes River Mine and the close knit nature of the Grey District Community.

The decision was made by the company to suspend operations until such time that it was deemed that the mine could confidently return to full production safely. At the time of the audit, the mine had recommenced development production but the hydraulic mining extraction phase was yet to recommence. It was stated by the management that Government Inspectors had played no role in the cessation of mining and had conducted only one inspection of the mine during the timeframe that the mine had been out of production.

The organisation is demonstrating its commitment to safety and examples of this include the purchase of a new compliant underground diesel Load Haul Dump (LHD) fleet, and the implementation of the Canary underground training package.

In the Introduction meeting, the Operations Manager, Mr Greg Duncan presented an overview of the mine and the current state of the Safety Management process.
Statistics detailing both lead and lag indicators are recorded. These include:

- LTI Numbers and Frequency rates
- Hazards Reported v Incidents, and
- Overdue corrective actions

This gave the auditors an insight into the level of maturity of the safety management system. The recording and analysing this data allows for the process of continuous improvement to be established. The Operations Manager, through these statistics, was also able to demonstrate that the mine had also achieved improvements in the reporting culture.
4. Audit Findings

4.1. Risk/Hazard Identification and Management Processes

Spring Creek Mine is a mine that is embracing the need for Risk / Hazard Identification and Management. Of the four operations audited in New Zealand, Spring Creek was the only mine that had proactively commissioned a review of the risk of an ignition in a flammable environment underground following the Pikes River event. Spring Creek had completed a Fault Tree Analysis supported by a WRAC of the potential for ignition at the mine and was implementing the controls through the use of a Safety Improvement Plan.

A full review of all outstanding actions from was being conducted on a regular basis to ensure the corrective actions were being closed out. During the audit it became apparent that some key actions such as the implementation of a tube bundle system were not recorded in the IMPAC system. It should be noted that the Tube Bundle system had been delayed due to a significant increase in costs caused by changes in the design of the monitoring room enclosure.

A Broad Brush Risk Assessment had been conducted in 2009. The potential for inrush through flooding of the portals had not been identified. In the opinion of the auditors this is an existing risk. The management plan for inrush failed to consider any other inrush sources apart from gas. The mine infrastructure is located in a valley formed by a relatively fast flowing stream. History has identified the risk of flash flooding as evidenced by the existence of a memorial to victims of a prior event further upstream. Water inflow is identified in the BBRA.

The Inrush Management Plan referred to windblast or collapsed goaf TARPs. These TARPs were unable to be located until the end of the audit.

The risk register document provided had no date and no list of people involved. This information is critical in ensuring the validity of a document.

The hot work procedure was reviewed and referred to QLD legislation. No risk assessment had been conducted to conduct hot work underground. The procedure was located under the ventilation heading in the management system even though this is undoubtedly an engineering task.

During the entry meeting the auditors asked if the mine automatically received QLD, NSW or MSHA Safety Alerts / Bulletins. This material can help to ensure recent incidents are shared and that mines with similar hazards are aware of the events. This then presents the opportunity to address the implementation of appropriate controls for their operation. Evidence of the effectiveness of these alerts has been demonstrated in the development of “No Go Zones” around equipment in Queensland mines.

The Auditors also asked key people within the management team if they were familiar with the Minex Code of Practice. This document is referred to in the site risk register but knowledge of the document and the content was poor.
The site risk register lists the Frictional Ignition Management Plan as one of the treatments for controlling the risk at the site. At the time of the Audit, the Auditors could find no reference to this plan on the Safety Management System Intranet Portal.

Other plans displayed on the Management System Intranet Portal include Strata, Surface Mobile Plant, Underground General Hazards, and Ventilation Management. Spontaneous Combustion Management Plan is included under the Ventilation Management folder and follows the guide of the pg 24 of the Minex code of practice.

A critical task of all successful Safety Management Systems is the Document Control System. This had been realised by Technical Services Manager who stated “stakes are to high to be casual”. Although this individual has realised the importance of document control, it is not supported by the rest of the system. A Document Control process needs to be recorded and training developed and put in place. The system should then be regularly audited in order to ensure compliance.

4.1.1. **Strengths:**

The following were observed during the audit process;

a. A good safety culture is being developed by all involved at this operation. This is demonstrated by a commitment to stop the operations in order to have a detailed process of mine improvement methods being implemented at the highest level. While this work is ongoing the mine is proactively implementing a safety health management system

b. The mine is adopting proven risk management practices through the use of the Solid Energy Health and Safety Manual as demonstrated by the fault tree conducted into an ignition of a flammable environment underground.

c. The Management commitment to actively rectifying deficiencies identified in the audit. (Borehole intersection investigation)

4.1.2. **Areas for development**

a. Opportunities exist for the mine to stringently follow elements 6.1 and 6.2 (These elements relate to the management of risk) of the Spring Creek Mine Health & Safety Management System particularly for all potential principal hazards and ensure the entire workforce understands these requirements.

b. There is an opportunity to improve the mine sites document control and document quality control. Eg correspondence from Inspectorate, document control procedure,

c. Self Auditing procedures need to be evaluated and introduced where it is believed that this function will add value.
d. Use of a similar process to the Ignition Explosion Fault Tree analysis is desirable for other principal hazards

c. Noticeboards underground / Control room be used to display critical information. TARPS etc

4.2. **Mine Gas Management**

The mine uses a combination of real time and tube bundle gas monitoring systems to ensure a comprehensive knowledge of the mine environment. The mine also utilises the gas chromatograph available at the Mines Rescue Station to analyse gas samples.

Some monitors are interlocked with electrical equipment and other monitors are used to activate compressed air operated dilution louver doors. These doors are used to ensure gas levels remain below critical levels (1.25%) in the return roadways. This helps to reduce electrical interlock trips on the conveyors.

A sample of the gas monitors was selected by the auditors to determine the currency of the calibration of the instruments. The mine was able to show that these instruments were entered into the maintenance work order system and that these were compliant.

A Ventilation Management Plan for Gas detection systems exists. The setting of gas monitor trip levels and alarms are determined by legislation and through the site TARPs.

The mine uses real time anemometers and this allows the Carbon Monoxide (CO) make calculations to be automatically calculated.

A mine plan was available showing the locations of all gas monitoring locations.

Hand held instruments are available to all statutory officials and mine workers operating diesel equipment. QLD legislation requires diesel equipment to be fitted with interlocking gas monitors. This is not a requirement of the ASNZ standards.

4.2.1. **Strengths**

a. Tube bundle system concreted into the rib 7B extraction

b. Use of engineering controls to manage hazards E.g: dilution doors

4.2.2. **Areas for development**

a. An opportunity exists to ensure reference to AS/NZS 2290.3 Part 3 for maintenance of gas detecting and monitoring equipment is incorporated into the management of the gas monitoring system. Clause 1.4.5.2 and 2.5.2 refer specifically to tube bundle systems.
b. Determinations of the gas monitoring locations lie entirely with the Ventilation Engineer. An opportunity exists to apply rigour to the determination of gas monitoring locations. This could include consulting key personnel such as Deputies, Mine Manager, Control Room Operator, and Rescue Trainees in a documented process.

c. Deputies should be encouraged to fully understand the composition of goaf gases in sealed areas within their districts.

4.3. Ventilation Control

The mine is currently ventilated using two Richardson fans delivering a ventilation flow of 160 cubic meters per second. The pressure at the coffin seal currently 1.8KPa. The number of development panels is limited due to capacity of the main fans and the ventilation network.

Spring Creek Mine plan to upgrade the ventilation network by increasing the number of intakes from one to two through, either, an additional shaft or drift entry. In the interim period, until a second intake is established, the mine is considering using an underground booster fan.

Currently the trunk conveyor is located in the return roadways.

The ventilation model is updated monthly.

4.3.1. Strengths

a. The mine realises it is going to be ventilation constrained and is working towards a plan which will not only increase mine ventilation but will also allow for an additional escapeway in fresh air to be established.

b. A plan exists to update VCDs in the mine to the QLD standards

4.3.2. Areas for development

a. Opportunities exist for the mine to apply risk management principals when these major ventilation changes occur in order to achieve the best possible outcome.

b. Develop a main fan start up procedure.

4.4. Strata Control

The mine has a robust geological model developed from data gathered from exploration and the data collected from the existing workings. As a result of the
model, geological features are well understood and mapped accordingly. The size and prevalence of geological structures and low coal strength presents challenges in terms of strata control and roadway development rates. To manage the risks identified from the mining operation associated with the extraction of coal, the mine has developed a detailed Strata Management Plan. This plan is well developed and is a practical management tool. The plan has been developed through the application of the Risk Management process by classifying the risks according to severity and applying Trigger Action Responses (TARPs) to ensure the elevated risks are appropriately managed.

Design criteria for roadway dimensions and for pillar design are available and have been developed in conjunction with external expertise. Strata control specialists have a clear role within the management process and are called on to provide expert advise when necessary.

The Strata Management Plan is supervised and coordinated by appropriately qualified staff and is under the control of the Senior Management of the mine.

The practical application of the strata management is demonstrated in the daily reporting process filled out by the face supervisors. These reports clearly show that the face supervisors understand and use the management plan to ensure strata control is effective.

Roadways underground were observed to be stable and well supported using full mesh with combinations of 2.4 metre fully encapsulated bolts and tendons. The mine has established a monitoring program that is in place to help to determine the effectiveness of the ground support being used. This program is monitored closely and is supported by supplier based test programs. In one area observed during the underground visit a number of bolts had been installed by Jenmar for testing.

In regard to training of mine personnel in strata control, the Mine was able to demonstrate that all personnel undertake the relevant EXITO units of competency for strata control. The theoretical training is supported by detailed practical training that is recorded by each individual in a training log book. It should be noted that this training was generic and no site specific training was carried out. This is noted as it is an inconsistency with the companies actions that are in place at the East Mine where a Training module is in place that has been developed around site specific issues related to strata control. It was stated that the Mine was currently developing specific training packages for supervisory personnel.

4.4.1. Strengths

a. From observation strata support appeared to be managed well with minimal deformation to the roof and ribs.

b. Robust strata control hazard management plan

c. Training and Development of personnel at all levels in strata control is evident
d. The use of higher level expertise is used appropriately

e. Detailed investigations are completed for strata control failures.

4.4.2. **Areas for development**

a. In the BBRA Strata failure had been identified but was limited to mine entry
collapse and fall in development. In QLD a failure of a roadway directly behind
a development crew occurred potentially trapping the crew at the mining face
with no ventilation. An opportunity exists to apply the learning’s from this
incident at Spring Creek.

b. The opportunity to formally review and audit the effectiveness of the Strata
Control Management Plan on a regular basis or triggered by certain events.

c. Established a Change Management process is established to ensure critical
variations are identified in a timely manner.

d. Implement the Site Specific training in Strata Control.

4.5. **Methane Drainage**

The Mine is moderately gassy. Exploration drilling and testing has been used to
establish that the insitu methane content of the seam is 3.5 – 4.0 m³/tonne. It has been
determined that at this level the seam gas does not require methane drainage.
Exploration utilising in-seam drilling is also carried out. These inseam holes have the
ability to drain methane and can become pressurised if blocked.

During the underground visit an in-seam hole was found in the rib behind the
continuous miner in West X-Cut 7 between West belt Road and West M&M Road.
Procedure TS_GEO_PROC_019, Intersecting Boreholes in Mine Workings and the
Permit to Mine for West Headings & Panel 9 were reviewed with regard to the
intersection of this borehole. This showed that the mine procedures had not been
adhered to.

4.5.1. **Strengths**

a. The mine immediately initiated an investigation when it became aware of a
breach of procedure with regard to intersecting boreholes.

4.5.2. **Areas for development**

a. Opportunities exist to conduct this investigation at a high level paying particular
attention to system failures and implementing appropriate control measures.
Once implemented these controls need to be audited for effectiveness.
4.6. **Spontaneous Combustion**

A Spontaneous Combustion Management Plan is in place and the coal is prone to spontaneous combustion. The R70 value of the coal ranges from 4.71 to 4.87°C/hour. Coals with a higher value than 0.8°C/hour are considered to be highly prone to spontaneous combustion (Beamish 2005).

Section 4.5.4 of the Spontaneous Combustion Management Plan states; “Self-inertisation is when the natural conditions in the goaf or waste workings cause the exclusion of oxygen”. This method places a reliance on the ability of the strata in the goaf area to produce sufficient methane to achieve an inert atmosphere. This practice is used at Spring Creek mine.

Section 3.2 (d) states “Gas emissions from drill core have been measured at 3.5 to 4m³/insitu tonne”. While experience to date indicates that the porosity of the coal seam is such that a significant diminution of seam gas is achieved on first workings, there remains sufficient methane in the subjacent and super adjacent strata to generate an inert atmosphere in any unventilated area over a short time frame.

Clearly if this situation is not managed diligently and adequate TARPs allowing for sample delay times in tubes and evacuation times from the mine are not stringently implemented the risk of an ignition source and an explosive atmosphere combining are very high especially given the barometer can vary up to 20HPa within 24 hrs.

4.6.1. **Strengths**

a. The mine actively uses Nitrogen injection into sealed chambers to ensure positive pressure seals. Seals are built to a rated design and are grouted around the perimeter to improve integrity.

b. The mine has conducted analysis of the coal to determine the propensity of spontaneous combustion.

c. Ability to seal each panel rapidly with the use of preinstalled prep seals and inertise each panel.

4.6.2. **Areas for development**

a. Recommend the mine investigate using thermal imaging to look for spon com around seals.

b. The use of using seal chambers, rated seals, grouting around seals have not been implemented into the spontaneous combustion management plan.
c. An opportunity also exists to review the adequacy of the TARP for spontaneous combustion.

4.7. Mechanical and Electrical - Management of sources of ignition

The mine has an extensive diesel fleet including:
- Drifrunners,
- 5 x Eimco 913,
- 1 x EJC 130
- 2 x hire machines being a 913-6 and an ED7.

It should be noted that the 5 x Eimco 913’s are not being used.

The face equipment includes:
- A series of different continuous miners and road headers including
  - 1 x 12CM 5,
  - 1 x 12CM 11
  - Wirth Roadheader.
- Shuttle cars are used in conjunction with the above equipment

The mine has an Engineering Management Plan dated 1.01.2010.

The Mechanical Engineering Manager had only taken on the role a couple of weeks prior to the audit.

A work order system (Oracle) was able to be demonstrated to the auditors when specific maintenance examples were asked for.

No copies of AS/NZS 3584 suite of standards were available from the Mechanical Engineering Manager.

When conducting the onsite audit underground observations were made specifically being that two methane sensors were fitted to the Wirth Roadheader. The picks in the machine were all in good condition.

The daily cards where checked on two diesel machines and found to be in date. It was noted that the daily card did not require a low water to be done.

An observation of an Eimco loader and the operator that had recently come from underground and was being operated on the surface, showed that the operator did not have a handheld methane monitor in his possession.
4.7.1. Strengths

a. The mine has committed to six new Load Haul Dump machines fully compliant with AS/NZS to replace the existing 913 LHD fleet.

b. A documented Engineering Management Plan is in place with associated work order system.

c. An Electrical Systems Compliance Review report dated 28.02.2011 and an Audit Report of Electrical Management Systems at Solid Energy Spring Creek Mine was supplied to the auditors.

d. Note: This audit did not establish if the recommendations from the review and audit reports had been entered into the IMPAC system and are being acted on.

e. Positive isolation is used in the form of padlocks for equipment isolation.

4.7.2. Areas for development

a. Implement recommendations from the electrical systems compliance audit.

b. Ensure low water shutdowns are conducted in accordance with AS/NZS 3584.3 Appendix E.

c. Implement interlocked methane monitoring systems on all underground diesel equipment.

d. Review all equipment compliance with AS/NZS to ensure maintenance to control ignition sources on equipment in hazardous areas is compliant.

e. Ensure electricians are trained to the AS/NZS 4761 standard for electrical competencies in hazardous areas.

f. Continue on with Fault tree developed for fire and explosion and ensure maintenance system is updated with all necessary actions identified from this process. It would be expected that water flow interlock switches that have been fitted to each continuous miner and that these would require testing at least on a weekly interval.

g. Ensure external workshops conducting work on equipment for the mine have a quality control system in place.

h. Ensure mechanical tradesmen are trained and assessed in requirements for maintaining flameproof equipment.
4.8. **Emergency Response/ Preparedness**

The Spring Creek Mine has in place an Emergency Response Plan that details the duties of the personnel charged with managing the situation. The Emergency Response Plan for Spring Creek has been developed in line with the New Zealand Coordinated Incident Management System (CIMS). The plan is also developed in conjunction with the New Zealand Mines Rescue and includes all aspect of emergency management including first response capabilities.

Simulated emergencies are conducted to test the system, the people and the equipment. The most recent exercise had been conducted in March 2010 and the corrective actions developed from this exercise were being worked through.

Regular training of personnel is completed with all underground mineworkers having to complete a full walk out. This training is completed on an annual basis and is supported by 6 monthly refresher training on the CABA apparatus. This training is most relevant due to the steep dip associated with this mine and the increased level of fitness required by workers to enable self-escape. All employees have recently completed the walk out. Records of this were supplied to the Auditors.

It was stated that CIMS training has been completed by the Control Room Operators at the mine but at the time of the audit no Senior Management has completed this training.

During the Audit it was identified that the Operations Manager’s position did not appear in the Emergency response document. It is believed that this anomaly has occurred due to recent changes in the titles in the Management and the format of the Management Structure. Further the plan identified the role of a Duty Manager for periods when the full management team was not on site, such as weekends. This role requires a formal roster to be established to identify who the Duty Manager is in the event of an emergency. At the time of the audit no Duty Manager Roster had been established.

The mine has one fresh air escape way and utilises a CABA escape system. New fresh air bases being installed.

The mine also utilises the information supplied from the annual Level 1 Exercise staged in Queensland to ensure the mine is up to date with current issues.

### 4.8.1. **Strengths**

a. Emergency exercises have been conducted

b. Introduction of the CABA System

c. Involvement with Outside Emergency Response Agencies is undertaken
4.8.2. Areas for development

The following opportunities exist;

a. Document Control of the Emergency Response Plan was a clear area for improvement.

b. The need to ensure that there is a "Change Management" process adopted was evident in that the current Management Structure had not been mapped against this Management Plan and gaps identified in the audit process should be corrected.

c. Training of Senior management in the CIMS

4.9. Explosive Management

Spring Creek has established a Shotfiring Management Plan. The plan details the following;

- The transport, storage and use of explosives and detonators
- The use of shot firing apparatus
- Shot firing in stone
- Shot firing in coal

The plan requires the appointment of personnel by the Mine Manager to undertake specific duties associated with the shotfiring practices. Evidence was sighted that the required appointments were in place.

The Explosives Magazine at Spring Creek was inspected with a member of the staff. The standard of the magazine was in line with standard required by New Zealand law. The current procedure for issuing the key to the magazine needs to be reviewed to reflect the current site practices, particularly the issue of the key to the exploration geologist. This issue was identified in reviewing the authorisations of personnel with access to the magazine.

It should be noted that at the time of the audit the certification of the magazine had lapsed. The certification had expired on the 27th November 2010. It was stated that the Company had booked the certifier but this booking had been cancelled due to the Pikes River event. The magazine was continuing to be used and it was stated that certifier was booked to complete the certification in the coming week following the audit.

During the course of the audit process of other mines the auditors had been made aware of correspondence from the Department of Labour Inspector issued to the respective mine managers restricting the use of multi shotfiring practices. A request was made by the auditors to the management for a copy of any correspondence received from the Inspectorate in regard to shotfiring. This issue demonstrated the
lack of document control in place at the mine. The relevant paperwork could not be located although staff who were interviewed knew of the correspondence. There was no formal process for recording or controlling correspondence of this nature.

The auditors requested copies of any internal audits undertaken of the Shotfiring Management Plan but it was stated that no such audits existed.

4.9.1.  Strengths

a. The Mine has developed a sound management plan

b. Magazine standard is in line with NZ requirements

4.9.2.  Areas for development

a. Shotfiring Management Plan needs to be reviewed to reflect current practices

b. Certification of the magazine needs to be completed

c. The development of a Corporate calendar that has all licences and permits that require renewal entered and that the appropriate timeframe to ensure these licences and permits do not lapse is included.

d. Establish an internal audit / review of the Shotfiring Management Plan to ensure the controls in place in the document are being put in place.

4.10.  Fire and Explosion

The mine has followed a sound process to identify all the causes through the use of Fault tree analysis. The respective corrective actions were being completed on a priority basis and were being monitored for completion.

Stonedust standards underground appeared to be to a reasonable standard. Stonedust barriers were observed to be in place.

The Mine has established an inertisation capability to proactively manage sealing. This is achieved by transporting liquid nitrogen to the site. This inertisation equipment was in the process of being upgraded to a nitrogen generating unit due for delivery in the near future.

4.10.1.  Strengths

a. The proactive application of the fault tree process

b. The use and application of Inertisation
4.10.2. Areas for development

Continue to monitor and review the primary hazards identified in the Fault Tree Analysis.

Brett Garland  
Date: 3/5/2011.

Tim Watson  
Date: 3/05/2011
APPENDIX ONE

List of documents reviewed prior to the onsite audit

Documents provided prior to the onsite audit component

- 1a. SC Health & Safety Management System.pdf
- 1b. SC Site Risk Register_2010 08 05.pdf
- 1c. SC BBRA.pdf
- 2a. SC Changing of Mine Ventilation (Form & Proc).pdf
- 2b. SC Changing of Mine Plans (Form ).pdf
- 2c. SC Changing of Mine Plans (Procedure).pdf
- 3a. SC Spontaneous Combustion Management Plan (VMP).pdf
- 3b. SC Strata Management Plan.pdf
- 3c. SC Gas Detection Systems (VMP).pdf
- 3g(i) SC Shot Firing (Procedure).pdf
- 3g(ii) SC Shot Firing Management Plan.pdf
- 4a. SC Current Workings A0 scale.pdf
- 4b. SC Panels 9 to 13 A0 scale.pdf
- 5a. SC PAG4 Panel 9 to 12 Geotechnical Report.pdf
- 5b. SC PAG5_Spring Creek Mine Panels 9_13.pdf
- 5c. SC Independant Geotechnical Peer Review.pdf
- 6a. SC Ventilation A0 scale1500 2011-02-03.pdf
- 7a. SC Emergency Response Plan.pdf
- 7b. SC Emergency A0 scale1500.pdf
- Spring Creek Engineering Management Plan_Final.pdf
APPENDIX TWO

Documents obtained onsite

- Electrical Compliance Progress report final.pdf
- Spring creek audit Final.pdf

<table>
<thead>
<tr>
<th>Ref No</th>
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<th>Auditor (holding document)</th>
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<td>S1301-T</td>
<td>Operations Manager – Reporting Line – <em>Organisation Chart</em></td>
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<td>S1302-T</td>
<td>Mine Manager – Reporting Line – <em>Organisation Chart</em></td>
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<td>S1303-T</td>
<td>Visitors H&amp;S Brochure</td>
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<td>General Surface Safety Induction</td>
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<td>Underground Telephone/Intercom/DAC</td>
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<td>Development Mine Worker Pre Shift Inspection – <em>Card</em></td>
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<td>Solid Energy Visitor – <em>Tag</em></td>
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<td>Operators prestart checklist version 005 – <em>Blue card</em></td>
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<td>Operators prestart checklist version 002 – <em>White card</em></td>
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<td>Work Order Report (CM001) Joy Continuous Miner – Mechanical Service</td>
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<td>Maintenance Work Order (SMV003) SMV Drifterunner Mine Transport VE - Diesel Code “A”</td>
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<td>SANDVIK Technical Bulletins - miscellaneous</td>
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<td>Testing of Diesel Engine – Anderson EI/MCO 913-6</td>
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<td>Methane Ignition Prevention in Development Faces</td>
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<td>Methane Ignition Prevention – TS.VEN.PROC.011</td>
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<td>Intersecting Boreholes in Mine Workings</td>
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<td>Permit to Mine for West Headings &amp; Panel 9</td>
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<td>Risk Assessment: Multi-shot blasting in New South headings Development.</td>
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<td>S1330-B</td>
<td>Email Kevin Patterson / Kevin Poynter – Multi Shot Firing</td>
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<td>Organisation charts by Cost Centre</td>
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<td>Report on Surface Controllers Responsibilities During a Site Emergency at Spring Creek Mine</td>
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<td>S1333-B</td>
<td>Spring Creek Mining Company – Health &amp; Safety Annual Operating Plan – 2010-2011</td>
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<td>Roof Support Plans - various</td>
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<td>S1336-B</td>
<td>Permit to Mine for West Headings &amp; Panel 9 (Note: possible duplication of S1327-T)</td>
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<td>Schedule A - Position Description: Senior Mining Geologist</td>
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<td>Schedule A – Position Description: Operations Manager Spring Creek Mine</td>
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