

Memorandum

To: Don Strickland, Jack Korppi.

From: Alfred Dune

CC: Procon Management.

Date: July 18, 2012

Re: Formal Mine Inspection for 2012

File: 2012 Wolverine Mine Inspection 1.doc

1) Introduction

The Author as an Employee of Yukon Zinc and a registered Professional Engineer in Yukon Territory, was requested by the General Manager at Wolverine Mine to inspect the Wolverine Mine of Yukon Zinc Corp. (YZC.) and report on the underground mine as a whole and its compliance with the Occupational Health and Safety Act; Yukon. (The “Act”.)

The Author has visited underground on regular occasions for general workplace inspections

The Author is a Mining Industry Professional with 11 years of Mining Engineering operational and management experience and is registered as a Professional Engineer in both Ontario and Yukon.

This report is split into three sections:

2. The general conditions underground.
3. Compliance with the Yukon Occupational Health and Safety Regulations.
4. Deficiencies in compliance with the Act and the Regulations.

This report was prepared at Wolverine minesite on the 18th of July by:

Alfred Dune MBA, P.Eng. (Yukon and Ontario provinces)

2) General Conditions Underground

My latest visit underground was on the 9th of July 2012 accompanied by Dr. Woo Shin, the mine geotechnical engineer of Yukon Zinc. Prior to this I have been underground at Wolverine on a number of occasions. Access to the mine is via the Main Access Ramp. The Ramp goes from Surface (1355m elevation – Mine grid,) down to the 1209 metre level approximately and is driven at minus 15%. The Ramp is driven in hangingwall rocks from surface down to 1290 elevation. The first level – 1300 in the Lynx orebody, is accessed by the 1300 Strike Attack Drive, (1300 SA.) It was originally driven around 2005 as part of the trial mining program for the Wolverine Project.

The approximate size of the Ramp is 5m wide by 6 m high. The area within 50 meters of surface is fully supported with steel sets and is topped off with a full punch-plate culvert as the Ramp exits to daylight. The actual entrance to the culvert is currently approximately 25 meters down slope from the surface proper. The Ramp is fully supported throughout using shotcrete, rockbolts. Visibly the Ramp is well supported with very few signs of deterioration in the support envelope.

The ramp currently driven down to 1170 and the leg to 1160 is in progress. In general the Ramp is well supported and the support rules as outlined in Dr. Aref's guidelines and subsequently modified in the Wolverine Mine Ground Control Management Plan, (GCMP,) are well observed and effective. Dr. Woo Shin has a good understanding of the ground conditions in the mine, as do the other mine technical and geological staff and the Procon supervision. Refuge bays are correctly driven and sign posted and clean and free of obstructions.

The Ramp itself is clearly signposted, as are the two fresh air raises, which act as a second means of escape and egress to the mine. These raises are equipped with inclined ladders and are driven at between 32 and 45 degrees. The ladders within the raises have platforms and are connected by crossovers at each Strike Attack level, giving approximate overall elevations changes between platforms of around 9-10 meters. Access to the raises is via vent doors into the cross over or the raise itself.

Services and power cables in the Ramp are generally well hung. The section of the Ramp from Surface down to 1300SA needs the pipes consolidated and re-hung over the long-term as there are a number of redundant lines hanging off the same supports. The mine is aware of this and is considering the timing of this operation.

The following is a summary of the ground conditions in stopes that are currently active as observed the inspection date:

1300 FW

- Face mapping: Ore at right top corner (Overall RMR 35 – 45)
- Support: 8' regular swellex all around / Strapping was done need to shotcrete for right side pillar nose

1278 TDB (Take back down)

- Face mapping: All face is waste (footwall and hangingwall contact). Small ore band at right side wall
- Support: Pre-screen (if required) + 12' super swellex all around

1265 FW

- Face mapping: All ore at the back. Footwall contact at left side wall 2m from the sill. Pastefill at right side wall (Overall RMR 30 – 40)
- Support: 12' super swellex for left wall, 8' regular swellex for the back, & Screen + split set for right side wall

1240 P2

- Face mapping: Hangingwall at the back & brow.
- Support: 8' Regular all around and shotcrete
- Main drift complete mining

1210 FW

- Face mapping: Fractured ore bands between HW & FW contact
- Support: Pre-SC + 12' super swellex for HW exposure, 8' regular for the rest.

1200 FW2

- Face mapping: All face is fractured ore (Overall RMR 35 – 45).
- Support: 8' Regular for all around / No shotcrete
- Direction: Need to turn left to find FW contact

1190 FW

- Face mapping: All face is highly sheared and folded footwall (Overall RMR 15 – 25).
- Support: Pre-shotcrete + 12' Super swellex all around

1180 SA

- Face mapping: All face is FW material. Ore at the back & right wall (Overall RMR 30 – 40)
- Support: 8' Regular all around / No shotcrete
- Direction: Need to turn right to back to Ore zone

1170 SA

- Face mapping: Couldn't see the face because of muck pile. Non-graphitic HW at the back.
- Support: 12' regular swellex for all around / No shotcrete for current face
- Shotcrete for the back 4m from the face by 24m from the face (longitudinal cracked back)

Main Ramp to 1160

- Face mapping: All face is hangingwall material filled by quartz. (Overall RMR 20 – 25).
- Support: Pre-shotcrete + 12' super swellex all around

2b.) General comments on conditions underground.

There has been a visible improvement in operational standards underground over the past year. Levels of ground support are good, with close adherence to the Ground Control Management Plan. Housekeeping standards are good. Operator safety and the general safety culture of the mine have significantly improved and a program of continuous safety improvement was observed.

Electrical installations are well done and observance of the Act is in general excellent. The mine is currently working on implementing a new dewatering plan, enabling elimination of pumps that are currently used for cascading water out of the mine, and use gravity to feed to the bottom of the mine (1200 sump) and have a central pumping station located there. Ventilation air underground is also good, with excess air volume available. The two ventilation raises, which eventually connect with the single down casting fan installation are clean and well supported and more than adequate for the volume of air being moved.

Ventilation survey work is carried out weekly by a Procon employee and carefully recorded. Similarly gas testing of the mobile equipment is carried out weekly and after each major service. Equipment is well maintained despite the current lack of a decent workshop.

Underground magazines for detonators and caps are clean and tidy. They are secured and generally well kept. They have however been operating under a Variance from the Inspectorate as they are too close to the main Ramp. (Less than 60 meters.) Surface magazines were also inspected and found to be in good order, tidy and well kept with the books up to date.

Fire protection underground is provided by numerous fire extinguishers, all of which are noted on the appropriate maps, as per the Act; displayed in the offices at the Portal and kept up to date. (See Map section at the back of this report.)

Underground power is provided by high and low voltage distribution systems. These systems are shown on a Plan and prominently displayed at the electrician's shop at the portal.

Portable offices at the Portal currently serve the mine. These offices are to be replaced over the next month by new permanent offices adjacent to the new workshops and close to the fresh air raise. Work is currently ongoing to clear up the Portal area to assist in this move.

Blasting is carried out twice daily at the end of each shift. The blasting circuits are well organised and the blasting procedure uses Nonel detonators and stick emulsion powder etc. plus b-line. The primary blasting cable is generally well hung, but there are a few places where this cable should be re-routed to gain greater separation from the leaky feeder cable and service pipes. The blasting operations are well and carefully carried out and surface collars of underground boreholes are guarded at each blast. Problems were experienced with sulphur blasts in 2011 and measures have been adopted to minimise the possibility of recurrence of this problem by the use of lime bags which are exploded just prior to the blast and washing down of drifts. A program of gas testing for SO₂ is in place prior to re-entry after blasting. The possibility of installing permanent SO₂ monitoring points in the main Ramp is being investigated.

Overall, the mine is being professionally operated under difficult ground conditions.

3) Compliance with the Yukon Occupational Safety and Health Regulations.

The Author assisted by the Technical and Operational Staff at the mine has reviewed the Yukon regulations pertaining to the underground operation and would comment as follows:

In general the mine is in compliance with the Regulations and also with the spirit of the Act. If there is no mention of a specific part of the Act or Regulations in the table below, it can generally be presumed that in the opinion of the Author, the operation is in compliance with this part of the Act.

In particular the following specific parts of the Regulations were checked in detail:

1.06 – Adequate Training	Procon personnel are generally well trained. A Copy of the Training Matrix for Procon personnel is provided at the end of this report.
PPE – Sections 1.08 to 1.33	Mine and Procon staff are provided with all necessary PPE and trained in their fit and use.
15.04 Plans and Sections to be available.	The mine keeps all its drawings, up to date daily, on a central server in MineCAD and Surpac. For each development, an appropriate layout is provided to the development crew and the Procon supervisors on a weekly basis. Separate larger scale plans are provided of the basic underground development, plus the location of all items as per 15.04 (2) (Updated July 2011.) Vertical cross sections are available in the main mine administration office and detailed vertical sections can be generated on request from MineCAD.
15.05 Notices of ownership	Posted in both the Main office reception and the Portal Offices.
15.06 Design Report	The Mine Development and Operation Plan published July 8, 2010 and also the Wolverine Ground Control Management Plan dated May 18, 2011 and revised June 12, 2011, cover this. (GCMP). The latest version of the GCMP is dated June 12, 2011
15.11(2) Supervisors Certificates/Blasting Tickets.	A number of provisional tickets have been issued by the mines inspector, the crews are currently training to obtain permanent tickets

	<p>The Yukon Supervisors test is on the web site. It requires updated First Aid. The Mine is currently running courses to update the first aid certificates of a number of personnel. Because of the difficulties of moving a significant number of people to Whitehorse to sit the exams, a program of onsite testing for both Supervisors tickets and Blasting Certificates would be a great benefit in bringing this into compliance.</p>
15.12 Log Books	<p>Shift log books and geological and geo-technical hazard, support and instruction log books are maintained in the Portal Office and kept up to date on a daily basis.</p>
15.13 (2) Extended hours of work.	<p>Procon works 11-hour shifts underground. This is under a Variance to this section. As part of the temporary Variance granted to the Mine on Feb 12 2010, for this purpose the Mine has been carrying out a program of industrial Health and Hygiene checks and studies under the direction of Golder Associates. This program is ongoing. No abnormalities have so far been detected.</p>
15.14 Fire Protection	<p>Sections 1-4 fully complied with. Stench gas checks carried out in mid July 2011 on each shift successfully in accordance with sections (5) and (6). Interestingly during the test of the stench gas at the fan house, it tripped the CO monitor and shut down the fan! Despite this all workers could smell the gas and exited the mine. This resulted in the extension of the stench gas discharge line down the fan drift well beyond the CO monitor. A retest is due to be carried out on the next shift rotation to ensure all workers have been exposed to the stench gas. The secondary stench gas system was also tested on the Fan Duct with success. A third system also exists on the compressed air line. Reports of the tests are on record.</p>
15.15 Refuge Station U/G	<p>In excellent condition and in full compliance.</p>
15.18 (1) Fire fighting Equipment	<p>While the underground mine is in full compliance in terms of fire extinguishers etc, no portable fire fighting equipment such as a portable fire pump or portable foam generator exists on site. The operation should have a portable foam generator and portable fire pump for U/G and site wide use. Additionally no fire engine exists on site, although a heated fire main and water cannons on the fire main cover the site. The operation expects to receive a water truck, with a pressurised water system, which could be used for fire fighting later this year.</p>
15.18 (2) plus 15.19	<p>All fire extinguishers regularly inspected. For 15.19 in compliance.</p>
15.24 Hot Work	<p>All procedures followed. Hot work certificates duly reviewed.</p>
15.26 Separate means of Escape	<p>Fully in compliance. Escapeway duly marked via both fresh air raises. Ladders installed and workers instructed. Escapeway inspected at least monthly. (Normally weekly as part of the Ventilation survey.)</p>
15.26 (4) water to flow away from the entrance to a mine	<p>The Current Portal design does not provide adequate protection against water ingress into the mine. The Punch plate cover over the decline needs to be extended up to level ground</p>

	<p>from its current position to ensure that equipment can reach surface and onto the flat before coming out of the portal. This is necessary to prevent the possibility of a runaway or sliding accident during winter operations on the Ramp and also to ensure water cannot easily enter the portal.</p>
15.28 Procedures for Fires.	<p>The mine has an Emergency Response Plan for both Surface and Underground. In addition, the mine carries out regular training in the use of fire extinguishers etc with all workers and the procedures in the event of fire. The operation as a whole is training a number of personnel as mine rescue specialists and this training includes some fire suppression etc. A list of trained personnel is held at the Portal offices and also at the Main Safety office. The U/G mine has a draft plan to deal with incidents of fires underground. This is currently circulating for approvals</p>
15.30 and 15.32 Fire doors.	<p>The underground operation does not have fire doors on the main Ramp entrance. It also does not have closable louvers on the vent fan or vent drift. The operation needs to apply for a Variance in the short term and come up with a solution to this.</p>
15.36 Mine Rescue Station	<p>The Mine Rescue Station is at the main site offices. It appears to be adequately equipped with SCBA sets, recharge pumps, icemakers etc. plus a variety of other equipment. There is no significant reserve store of fire fighting equipment at the Portal location.</p>
15.37 Training of Mine Rescue	<p>A number of workers, both from surface and underground are trained in Mine Rescue techniques and a number of others are under training. Currently the mine has a three appointed Training officers. Training facilities are available for training in Mine Rescue.</p>
15.39 Surface Pits	<p>The operation currently uses a small rock quarry at kilometre 19 for the production of Cobble. In addition there are a number of borrow-pits on site, which are currently non operational, for road construction and production of sand. The appropriate personnel have been made aware of the requirements of this portion of the Act for future borrow-pit operations.</p>
15.44 Dump areas and 15.45 dumping	<p>Not examined as carried out by Surface Services. Relevant Surface Personnel made aware of regulations in Act.</p>
15.46 and 15.47 U/G Water	<p>Generally in compliance. U/G water not a significant problem and handled by a series of cascading sumps. Two pilot holes specified in top corners of jumbo drifts to be drilled to 4 meters on a 3 metre round.</p>
15.48 (1), (2), (3). Ground Control.	<p>Fully complied with and covered by the Wolverine Ground Control Management Plan and the relevant shift Ground control book. All faces examined on a shift-by-shift basis and also daily by a competent geo-technician or geologist.</p>
15.49 Ladders and Platforms	<p>In the Fresh air raises as part of the Escape way there are ladders set at between 20 and 45 degrees. While these ladders will comply with section (3) of this section, they do not</p>

	comply with section (2) of the section. I presume that Section (2) should have said “inclined at less than 70 degrees, <i>but more than 50 degrees</i> ” otherwise this section does not make sense.
15.56 Haulage way clearances	The mine is in general compliance with this section. All travel ways and safety bays inspected during the last visit are in good order.
15.58, and 15.60 Diesel Equipment	The equipment currently in use at Wolverine is in general compliance with these sections. Ten separate items of equipment have recently undergone brake modification and sign off by an independent breaking system expert on a 60-day permit. 3 additional pieces of equipment have been similarly modified and are awaiting sign off.
15.61 Environment Also 16.08 (3) CSA Rating.	15.61(2) The surface fan provides a volume of air far greater than that required for ventilation, under a Variance issued by the Inspectorate on June 17, 2009 linked to the use of low sulphur fuels. CSA Approval was completed and in compliance
15.61 (4) and (6) Underground Vent volumes and gas testing	The measurement of ventilation air volumes and quality is carried out by Procon’s safety officer on a weekly basis. Exhaust gas tests are run on mobile equipment weekly and after all major services. A program of testing in the vicinity of the equipment operator station as required by 15.61 (4) c, d and e. This has been discussed with Procon and will be put in place immediately.
Traffic Light Signals on the main Ramp.	There is currently no system of traffic light signals on the main Ramp. Installation of traffic lights from the 1280 level to surface would greatly aid haulage by truck up the Ramp and reduce the problems encountered in fog caused by warm moist air coming up the Ramp in winter.

4) Deficiencies that need to be addressed at Wolverine Mine, in order to bring it into full compliance with the Yukon Occupational Safety and Health Regulations.

The following list represents the major areas of deficiency that need to be addressed at the mine and details the measures proposed by mine management to meet these deficiencies:

- A. **15.13 (2) Extended hours of work.** – This is currently under a temporary Variance. Industrial Hygiene testing is underway as recommended by Golder Associates.
- B. **15.18 (1) Fire fighting Equipment.** – The mine lacks portable fire fighting equipment on surface to deal with an underground fire. Ideally it should have a Foam generator, a significant number of hoses and a portable fire

pump, plus spare fire extinguishers all in a dedicated ready trailer.

- C. **15.28 Procedures for Fires.** – Detailed fire fighting plans for underground are being circulated for final approval.
- D. **15.30 and 15.32 Fire doors.** – The Mine has no fire doors. This will require a temporary Variance and will then require a solution developing. Extending the Portal punch plate to surface would allow the hanging of a fire rated roll up door on the end of the punch plate. A similar solution can be developed for the Vent Fan. Extending the punch plate to surface also removes another hazard with the formation of ice on the portal floor and also the potential for inrush.

Regards,

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