CANADIAN ZINC CORPORATION

January 13, 2006

Sarah Baines
Regulatory Officer
Mackenzie Valley Land and Water Board
7th Floor-4910 50th Avenue,
Yellowknife, NT
X1A 2P6

Dear Ms. Baines:

RE: Effluent Treatment Options Plan, MV2001L2-0003

I refer to your letter dated December 8, 2005 on the above noted subject. CZN has reviewed the comments made by the review parties on the Effluent Treatment Options Plan (ETOP) dated October 20, 2005.

As discussed with you prior to the completion of the October 20 ETOP, CZN's opinion is that an ETOP independent of the previously completed Mine Water Contingency Plan (MCP) is largely unnecessary since the information required was effectively covered in the MCP. The principal potential contaminants of concern are metals, notably zinc and cadmium. The MCP describes a treatment process to remove these and other metals from solution. The effluent from this treatment will be sent to a polishing pond for the final settling of suspended matter. This approach to effluent management was also explained in the MCP, and has been accepted. Hence, we feel an ETOP is unnecessary. Nevertheless, as per your direction, CZN provided a short summary of our intended effluent management approach in the October 20 document. Based on the comments received by review parties, it appears that there were expectations that the ETOP would contain information on additional effluent management actions. As noted above, CZN feels that all necessary actions have been described in the MCP.

We believe we understand the source of the confusion. Part D, Item 6 of the Water License calls for an ETOP. We believe the authors of the License were thinking of the effluent from the possible pilot plant when this requirement was written. This effluent would be from the pilot plant circuit, and would be supernatant separated from tailings followed by lime addition to adjust pH. This explains why options for treating an effluent are sought, which is an incongruity in itself. Later in Part D (Item 12), the MCP is called for, and CZN is asked to provide "contingencies for the treatment of Minewater in the event it does not meet discharge criteria". We believe the authors of the License were thinking of mine water from the 905 Level, and possibly also the 870 Level, when this requirement was written. Note that it comes after the ETOP requirement in Part D, which would not be logical if the effluent from mine water

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treatment were also to be considered in the ETOP. As you know, CZN's water management strategy is to combine the effluent from mine water treatment and any pilot plant effluent in the Polishing Pond. Technical details for the Polishing Pond were given in the MCP, and more up-to-date information is given in the attached material. Hence, we re-iterate that we feel an ETOP was essentially presented in the MCP, and another independent version is unnecessary.

CZN recognizes that the removal of ammonia from mine water would pose some difficulties. For this reason, CZN will focus on explosives management to avoid the liberation of ammonia at source. Our contingency if this approach is not successful is to direct any affected water to the Mill for temporary storage. We do not anticipate such quantities of water to be significant relative to the storage capacity of the tanks in the Mill. We recognize that it may take some time for ammonia levels in the water to decline. In the very unlikely event that explosives management strategies prove not to be effective such that the affected water volume meets the storage capacity in the Mill tanks, CZN will revert to the contingency measures described in the MCP. In reality, CZN will explore other strategies for ammonia management long before this occurs, such as changes to explosives management or a change in explosives. Ultimately, if CZN is not able to manage the volume of ammonia affected water, underground pumping and operations in the Decline will have to be suspended until a solution is found.

Consistent with the requests in your letter, CZN has provided responses to the review comments in the table format you provided (attached). A revised ETOP incorporating these responses is also attached.

If you have any questions, please contact us.

Yours truly,
CANADIAN ZINC CORPORATION

David P. Harpley, P. Geo.
Environmental Coordinator

Encl.

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CANADIAN ZINC CORPORATION (CZN)
EFFLUENT TREATMENT OPTIONS PLAN (ETOP)
JANUARY 13, 2006

Introduction

Part D, Item 6 of Water License MV2001L2-0003 requires the submission of an Effluent Treatment Options Plan (ETOP) in support of the Underground Decline Development and Metallurgical Pilot Plant projects planned by Canadian Zinc Corporation (CZN) at its Prairie Creek property. The effluent referred to is believed to be that which could emanate from the Pilot Plant. The effluent would be directed to a polishing pond being built near the 870 Level adit for settling of metal carbonates. Details of the polishing pond, and water management in general, are discussed below.

Mine Water Contingency Plan

CZN produced a Mine Water Contingency Plan (MCP) in November, 2004. As stated in the MCP, CZN plans to treat mine water in the final sump on the 870 m level. This will be accomplished by dosing influent flows to the final sump with soda ash to raise the pH and precipitate metals, primarily zinc. The majority of metal precipitate is expected to settle in the sump. Treated water from the sump will be one of two effluent streams that discharge to a new Polishing Pond that will be built near the Mill.

CZN may operate a Pilot Plant in the Mill to simulate the metallurgical process for an intended mining operation. Process water will either be recycled or, following neutralization by lime addition, discharged to the Polishing Pond. This water represents a second effluent stream.

CZN plans to closely monitor metals and suspended solids levels, at least at the outset of treatment of mine water using soda ash, to confirm metals removal is occurring as expected. CZN hired Laurion Engineering to design the treatment circuit. The circuit consists of a solution feed tank, a pH-controlled dosing meter, and a propeller-type mixer. This circuit has been installed, and is effectively a small treatment system package. Laurion concluded that because of the slightly alkaline pH of existing mine water, and prevailing alkalinity levels, only relatively minor additions of soda ash will be needed to raise the water pH to 9.1, and at that pH, the precipitation of zinc and co-precipitation of other metals should be sufficient to comply with the prescribed SNP concentrations. A need to lower pH to meet the 9.5 discharge criterion is not expected to be necessary. More information on particulates management is given below.

Polishing Pond

Construction of the new Polishing Pond is a condition of the Water License. The primary purpose of the pond is to provide polishing of effluent from mine water treatment and the Pilot Plant. The Pond will provide additional retention time for the settlement of finer particles, followed by discharge to the main Catchment Pond, prior to final disposal to Harrison Creek via the primary discharge point.

The Polishing Pond has been sized based on flow volumes reporting to it to allow sufficient retention time to effect settling. Provision will also be included for the use of settling aids, such as flocculants, if necessary to facilitate settling of solids. Water discharged from the new Polishing Pond (SNP Station No. 3-4), will be monitored in accordance with the Water License and must comply with the effluent quality requirements specified in Part D, Section 5 prior to

discharge to the existing Catchment Pond. The discharge from the Catchment Pond (SNP Station No. 3-5) into Harrison Creek (SNP Station No. 3-6) and subsequently Prairie Creek downstream of the confluence with Harrison Creek (SNP Station No. 3-11), will also be monitored as per the Water License.

EBA (May 10, 2004) previously recommended a polishing pond with an approximate capacity of 1400 m^3 to treat and polish mine water and effluent from the Pilot Plant to meet Water License limits. CZN subsequently modified its water management plans, and proposed a superior solution consisting of treatment in the final sump underground (with a capacity of 360 m^3), and polishing in a new pond. The design specifications for the new pond were specified as a capacity of 900 m^3 for the design maximum inflow of 0.0124 m^3/sec. (EBA, April 26, 2005). This capacity would provide a 20-hour retention time. The pond dikes that have been built will provide a pond capacity of 1500 m^3, which by correlation will mean a 33-hour retention time (see construction activity report attached).

Contaminants of Concern

CZN believes that there are potentially three main types of contaminants that could exist in the water inflowing to the Polishing Pond, metals, ammonia and hydrocarbons. As discussed above, CZN will treat mine water to raise the pH and precipitate zinc and co-precipitate other metals, such as cadmium.

Underground development will involve the use of ANFO (ammonium nitrate-fuel oil) as the explosive of choice. ANFO is soluble, potentially leading to elevated ammonia concentrations in mine water. CZN will seek to avoid this by minimizing explosive use and ensuring proper handling and housekeeping with respect to explosive use. CZN will monitor mine water before the final sump, and if a positive indication of ammonia presence is indicated, sump water will be pumped to the Mill for temporary storage. When testing has confirmed that ammonia concentrations have dissipated, the water will be pumped back underground to the 870 m level. CZN has the ability to pump any affected water to tanks in the Mill, and between tanks. Any ammonia is expected to oxidize to less toxic nitrate. This process could be enhanced by pumping water from tank to tank. These measures, along with source controls, are expected to effectively manage the potential for ammonia production from explosives use. Other management alternatives, such as biological treatment, are not expected to be needed, but will be considered if necessary.

In the very unlikely event that explosives management strategies prove not to be effective such that the affected water volume meets the storage capacity in the Mill tanks, CZN will revert to the contingency measures described in the MCP. In reality, CZN will explore other strategies for ammonia management long before this occurs, such as changes to explosives management or a change in explosives. Ultimately, if CZN is not able to manage the volume of ammonia affected water, underground pumping and operations in the Decline will have to be suspended until a solution is found.

Only relatively small amounts of fuel and oil will be taken underground, associated with vehicles and equipment. Any spills will be minor and will be mopped-up with absorbants. Absorbent booms will be installed at the final sump on the 870 Level as a precaution. An underflow weir can also be installed if necessary. If a significant spill occurs, mine water can be recycled underground until response measures have been implemented. An oil-water separator is not expected to be needed, but one will be used if necessary. CZN will have a vessel filled with granular activated carbon on site for the Phase 3 drilling program. This vessel will be portable, and can be used to treat mine water contaminated with hydrocarbons if necessary.

Oil absorbent pads and/or booms will be inspected regularly and replaced as required. Used items will be incinerated on site.

Monitoring

CZN is required to report the monthly quantities of mine water and any pilot plant effluent. CZN will monitor inflows to the final sump on the 870 Level at least weekly, and probably at least daily during the start-up of operations. CZN is also required to sample mine water and Polishing Pond discharge flows weekly for a range of parameters. Again, this frequency will be exceeded initially to ensure the treatment and water management system is operating as intended. No risk-based analysis, or toxicity testing, is required.

With the water treatment and effluent management described above, CZN is confident that it will be able to meet the effluent quality requirements listed in the License.

Response to Review Party Comments - January 13, 2006
Canadian Zinc Corporation (CZN) – Effluent Treatment Options Plan (ETOP)

Reviewing Agency, Date Comments Received	Comments	CZN's Response
Environment Canada, November 21, 2005	1. The Effluent Treatment Options Plan (ETOP) submitted by Canadian Zinc Corporation (CZN) does not provide any information beyond what has been outlined in the Mine Water Contingency Plan.	As explained in the cover letter, CZN feels that the MCP has adequately addressed effluent management.
	2. Options for the treatment of ammonia are limited, and if mine water or effluent is pumped to the mill tanks the ammonia will not simply dissipate (very high pHs are required for volatization). There may be the opportunity for the company to use a pilot scale biological treatment plant for ammonia removal, given that discharge volumes should not be large.	CZN has the ability to pump any affected water to tanks in the Mill, and between tanks. Any ammonia is expected to oxidize to less toxic nitrate. This process could be enhanced by pumping water from tank to tank. These measures, along with source controls, are expected to effectively manage the potential for ammonia production from explosives use. Other management alternatives, such as biological treatment, are not expected to be needed, but will be considered if necessary.
	3. As the storage capacity in the mill tanks is only 732 m^2 the company must be prepared to retain process and/or mine water in the sumps and/or decline (and stop operations) if it does not meet the discharge criteria of 5 mg/L average maximum concentration or 10 mg/L grab concentration of ammonia.	Agreed.
	4. Levels of metals and suspended solids would need to be closely monitored to gain an understanding of the range of concentrations which are likely to occur. Metals may or may not be sufficiently precipitated by the addition of soda ash without exceeding the licence criteria for pH of 9.5. This will have to be established by sampling and analysis. The company may need to plan for pH adjustment as well. It would be prudent for the company to research small treatment system packages which can treat for metals and particulates.	CZN plans to closely monitor metals and suspended solids levels, at least at the outset of treatment using soda ash, to confirm metals removal is occurring as expected. CZN hired Laurion Engineering to design the treatment circuit. The circuit consists of a solution feed tank, a pH-controlled dosing meter, and a propeller-type mixer. This circuit has been installed, and is effectively a small treatment system package. Laurion concluded that because of the slightly alkaline pH of existing mine water, and prevailing alkalinity levels, only relatively minor additions of soda ash will be needed to raise the water pH to 9.1, and at that pH, the precipitation of zinc and co-precipitation of other metals

		should be sufficient to comply with the prescribed SNP concentrations. Hence, the need to lower pH to meet the 9.5 criterion is not expected to be necessary. More information on particulates management is given below.
	5. If hydrocarbons are an issue then the "treatment" may need to range from booms and absorbents, to use of an underflow weir and running a treatment system to recover hydrocarbons (e.g. in the event of a spill). In the course of normal operations, absorbents and booms should be adequate to capture/contain small volumes, but the plan should look further.	Only relatively small amounts of fuel and oil will be taken underground, associated with vehicles and equipment. Any spills will be minor and will be mopped-up with absorbants. Absorbent booms will be installed at the final sump on the 870 Level as a precaution. An underflow weir can also be installed if necessary. If a significant spill occurs, mine water can be recycled underground until response measures have been implemented. CZN will have a vessel filled with granular activated carbon on site for the Phase 3 drilling program. This vessel will be portable, and can be used to treat mine water contaminated with hydrocarbons if necessary.
	6. The method for disposal of absorbents should be identified.	Any contaminated absorbent material will be incinerated on site.
Department of Fisheries and Oceans, November 22, 2005	1. DFO has no concerns regarding the above mentioned material at this time. Please note that Subsection 36(3) of the Fisheries Act, which deals with the deposit of deleterious substances, is administered by Environment Canada.	Duly noted.
Water Resources Division, INAC, August 20, 2004	1. Rationales for the proposed options should be provided.	As discussed in the MCP, treatment of mine water in the final sump on the 870 Level will produce an effluent containing some suspended metal carbonate precipitates. CZN is constructing a polishing pond to settle out this precipitate to ensure the effluent meets the water quality requirements specified in the Water License.
	2. Any relevant information from the Minewater Contingency Plan should be included in the Effluent Treatment Options Plan such that it can be referred to as a stand alone document. Diagrams or maps outlining the location of the polishing pond and the locations of any inflow and outflow structures should also be included in the Plan.	A November 2005 Activity Report relating to the construction of the Polishing Pond is provided with this submission. This report provides the design documents supplied to CZN by EBA and Golder Associates, and gives as-built details for the dikes of the pond. An as-built report for the completed structure will be provided at a later date.

	3. Design specifications on the polishing pond should be included such as its capacity (volume) and predicted inflow volumes.	EBA (May 10, 2004) previously recommended a pond with an approximate capacity of 1400 m^3 to treat AND polish mine water and effluent from a metallurgical pilot plant to meet Water License limits. CZN subsequently modified its water management plans, and proposed a superior solution consisting of treatment in the final sump underground (with a capacity of 360 m^3), and polishing in a new pond. The design specifications for the new pond were specified as a capacity of 900 m^3 for the design maximum inflow of 0.0124 m^3/sec. (EBA, April 26, 2005). This capacity would provide a 20-hour retention time. The pond dikes as built will provide a pond capacity of 1500 m^3, which by correlation will mean a 33-hour retention time.
	4. What is the predicted retention time in the polishing pond that will be required to meet water licence limits?	See 3. above.
	5. Details such as number, capacity and predictions of flow volumes into the sumps should also be included in the Plan.	Explained in detail in the MCP. Note, the sumps manage raw water, except for the final sump on the 870 Level. Effluent (maximum flow given above) from this sump (capacity given above) is discharged to the Polishing Pond.
	6. Contaminants of Concern a) What are the contaminants of concern besides zinc? b) How were the contaminants of concern identified or what studies have been done to identify them? c) How will each contaminant of concern be treated? d) What options for treating each contaminant of concern have been considered? e) What are the preferred options for treating each contaminants of concern and what are the rationales for choosing the preferred option? f) What monitoring will take place (frequency, location and procedures for monitoring	The treatment of raw water was detailed in the MCP. The treatment of effluent, the subject of the ETOP, was also explained in the MCP and consists of settling in the Polishing Pond. Based on the database of mine water quality data, the contaminants of concern are zinc and cadmium. Both are expected to readily precipitate with soda ash dosing. The Polishing Pond is to ensure suspended metal carbonate particulates settle out sufficiently so that pond discharge meets Water License limits. CZN is required to report the monthly quantities of mine water and any pilot plant effluent. CZN will monitor inflows to the final sump on the 870 Level at least weekly, and probably at least daily during the start-up of operations. CZN is also required to sample mine water and Polishing Pond discharge flows weekly for a range of parameters. Again, this frequency will be exceeded initially to ensure the

	water quality and quantity)? g) Has there been any risk-based analysis or other studies conducted on the treatment options selected? h) Has any toxicity testing been done or will any be done?	treatment and water management system is operating as intended. No risk-based analysis, or toxicity testing, is deemed to be necessary.
	7. Considerable retention time is required for ammonia to convert into less toxic forms such as nitrite and nitrate. More evidence showing that there is enough capacity to offer sufficient retention time should be provided (time required to treat for ammonia and volumes of effluent requiring treatment).	See Environment Canada points 2. and 3. above.
	8. Details should be provided on how hydrocarbon contaminated water will be collected and intercepted, treated and discharged. Consideration of an oil/water separator or land farm should be made and discussed in the Plan.	See Environment Canada point 5. above. An oil-water separator is not expected to be needed, but one will be used if necessary.
Canadian Parks and Wilderness Society (CPAWS), November 22, 2005	1. CPAWS recommends that specific testing for metals, ammonia and hydrocarbons be conducted at specific regular intervals (e.g. once per week or prior to each polishing pond discharge).	The frequency and requirements for Polishing Pond discharge sampling are prescribed in the Water License.
	2. Other alternatives for the treatment for ammonia should be considered.	See Environment Canada points 2. and 3. above.
	3. How will used absorbent pads and/or booms be disposed (incineration, landfill, treatment at a hazardous waste facility)?	They will be incinerated on site.

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STAFF REPORT

Company: Canadian Zinc Corporation (CZN)	
Location: Prairie Creek Mine	**Application:** MV2001L2-0003
Date Prepared: May 25, 2006	**Meeting Date:** June 8, 2006
Subject: Plan approval – January 2006 Effluent Treatment Options Plan	

1. Purpose/Report Summary

The purpose of this report is to the present to the Board for review and approval the January 2006 Effluent Treatment Options Plan (January 2006 ETOP) submitted by Canadian Zinc Corporation (CZN).

2. Background

CZN submitted the ETOP to fulfill the requirements of part D, item 6 in WL MV2001L2-0003 for the underground decline and pilot plant project at the Prairie Creek Mine. Part D, item 6 reads as follows:

> *The Licensee shall submit to the Board for approval an Effluent Treatment Options Plan outlining options to meet the effluent quality requirements from Part D, Item 5 for the water discharged from SNP Station 3-4. This plan shall be implemented before discharge of water to Prairie Creek, Harrison Creek or the Catchment Pond.*

SNP Station 3-4 is located at the discharge point from the polishing pond to the receiving environment and is the compliance point for WL MV2001L2-0003.

Chronology of Events

October 20, 2005 – Receipt of the October 2005 ETOP.

October 26, 2005 – Distribution of October 2005 ETOP to reviewers. The comment deadline was set for November 18, 2005.

December 8, 2005 – Review comments forwarded to CZN for a response. Due date for their response set for January 27, 2006.

January 13, 2006 – Receipt of CZN's response to review comments and the January 2006 ETOP (updated to reflect responses to review comments).

February 6, 2006 – Distribution of CZN's response to review comments and January 2006 ETOP to reviewers.

February to April 2006 – Gartner Lee Limited (GLL) reviews and prepares comments on the 2006 ETOP on behalf of the Board.

May 2006 – Board staff seeks clarification from Environment Canada on their comments pertaining to ammonia.

June 8, 2006 – Board meeting.

3. Discussion

Relationship with the Minewater Contingency Plan

CZN indicated that in their opinion the ETOP overlaps with parts of their Minewater Contingency Plan (MCP) that the Board approved in July 2005. The MCP was meant to describe contingencies for the treatment of minewater (water that flows out of underground workings) in the event that it does not meet the effluent quality criteria set out in WL MV2001L2-0003 and there is a risk of the polishing pond freeboard limit being exceeded. CZN expanded on this scope of the MCP to include water treatment processes that will be conducted underground and on the surface.

Board staff agree that the MCP addresses components of the ETOP. Therefore, Board staff recommend that the MCP and ETOP be considered in tandem to determine if the requirements of part D, item 6 of WL MV2001L2-0003 have been satisfied. Both plans are attached for the Board's review.

Summary of Water Treatment Paths

Although the operation of a pilot plant is within the scope of CZN's water licence, CZN indicated that a pilot plant will not be operated on site at this time. Instead, ore will be shipped to Vancouver for processing and testing. A water licence is still required as water flowing from the underground works (minewater) may be contaminated with heavy metals, ammonia and hydrocarbons.

CZN plans to treat minewater underground in a series of sumps with the final sump located near the 870 m portal:

- Metals will be precipitated by addition of soda ash in the sumps
- Hydrocarbons will be dealt with using absorbent materials, by a boom at the 870 m portal, use of an underflow weir, and an activated carbon vessel.

- Ammonia will be primarily controlled by using best handling and storage practices. Minewater will be tested for ammonia underground, and if the water licence limit is exceeded, CZN will direct the minewater to the mill tanks where volatization will be encouraged by pumping the water between the tanks.

Minewater treated underground will be directed to the polishing pond or the mill tanks where further settling of heavy metals can occur through increased retention times and the addition of flocculents. Water may also be redirected back to the mill tanks or to the underground sumps for further treatment if necessary. CZN commits to storing minewater within the mill tanks and underground and ultimately stopping operations, if the effluent quality criteria cannot be met.

Please see the review comments discussed below and in the Comment Summary Table for reactions to this proposed water treatment system.

4. Review comments

Comments were received from Environment Canada; DFO; Water Resources Division, INAC; and CPAWS. For a complete list of their comments, please see the attached Comment Summary Table. GLL's comments are attached under confidential cover.

Items of primary concern to the reviewers and GLL that remain outstanding are the:

(a) treatment of ammonia;

(b) uncertainty related to the sufficient precipitation of metals by the addition of soda ash without exceeding the licence limit for pH of 9.5; and

(c) proof of calibration of the ammonia strips and zinc colorimeter prior to the start of operations.

Items (a) and (b) are discussed more fully below under Section 5 – Comments.

5. Comments

Item (a) – Treatment of ammonia

Board staff discussed the treatment of ammonia with Anne Wilson of Environment Canada. Ms. Wilson indicated that the potential for volatization of ammonia by just pumping water between tanks is probably low. However, she also indicated that ammonia treatment options are limited and so recommended that, if ammonia limits cannot be met, CZN be required to store water in the mill tanks or underground until such time that the water can be treated to reduce ammonia. If suitable treatment cannot be found, CZN should shut down operations prior to the release of any water to the receiving environment.

Item (b) – Metal precipitation with soda ash and pH levels

Predicted levels of soda ash addition to settle metals without exceeding licence limits for pH are currently based on theoretical and generic calculations. Both GLL and Environment Canada recommend that CZN undertake tests to determine the effectiveness of this treatment option. If the pH limit is exceeded then CZN should plan for pH adjustment prior to the release of water to the receiving environment.

SNP references in the July 2005 MCP

Although the July 2005 MCP was approved by the Board on August 24, 2005, the sampling frequency identified for SNP Stations 3-2 and 3-7 is incorrect. These SNP Stations should be sampled weekly during operations and twice in the summer after operations cease, not monthly as indicated in the MCP.

6. Security

Not applicable.

7. Conclusion

The three outstanding concerns identified by reviewers can be mitigated by requiring CZN to undertake certain task and to honour its commitments.

8. Recommendation

I recommend that the January 2006 ETOP be approved contingent upon the following:

(a) CZN honour its commitment to store any water that does not meet the effluent quality criteria listed in the water licence in either the mill tanks or underground. Storage should continue until the water is treated to meet the criteria using suitable methods. If treatment is unsuccessful and the storage capacity of the mill tanks and the underground is reached, operations should stop.

(b) CZN conduct tests to verify that the predicted levels of soda ash addition will sufficiently precipitate metals without exceeding the licence limit for pH of 9.5. CZN should submit to the Board a report describing these tests prior to conducting the tests and the results of the tests once they are completed.

(c) CZN calibrate the ammonia strips and zinc colourimeter and submit the calibration tests to the Board prior to the start of operations.

(d) CZN should correct the July 2005 MCP (page 10) to be in accordance with the SNP attached to WL MV2001L2-0003. Sampling at SNP Stations 3-2 and 3-7 is to occur weekly during active operations in the decline and twice during the summer months when operations have ceased.

9. Attachments

- Comment Summary Table
- GLL's comments (under confidential cover)
- January 2006 ETOP
- Minewater Contingency Plan as approved by the Board in July 2005
- Activity Report on the Polishing Pond

Respectfully submitted,

S Baines

Sarah Baines
Regulatory Officer

Comment Summary Table
Canadian Zinc Corporation (CZN) – Effluent Treatment Options Plan (ETOP)

Reviewing Agency, Date Comments Received	Comments	CZN's Response *(Board Staff's comments in red italics)*
Environment Canada, November 21, 2005	1. The Effluent Treatment Options Plan (ETOP) submitted by Canadian Zinc Corporation (CZN) does not provide any information beyond what has been outlined in the Mine Water Contingency Plan.	As explained in the cover letter, CZN feels that the MCP has adequately addressed effluent management. *Board staff agrees that there is overlap between the ETOP and the MCP.*
	2. Options for the treatment of ammonia are limited, and if mine water or effluent is pumped to the mill tanks the ammonia will not simply dissipate (very high pHs are required for volatization). There may be the opportunity for the company to use a pilot scale biological treatment plant for ammonia removal, given that discharge volumes should not be large.	CZN has the ability to pump any affected water to tanks in the Mill, and between tanks. Any ammonia is expected to oxidize to less toxic nitrate. This process could be enhanced by pumping water from tank to tank. These measures, along with source controls, are expected to effectively manage the potential for ammonia production from explosives use. Other management alternatives, such as biological treatment, are not expected to be needed, but will be considered if necessary. *Please see the Review Comments and Comments sections of the Staff Report.*
	3. As the storage capacity in the mill tanks is only 732 m^2 the company must be prepared to retain process and/or mine water in the sumps and/or decline (and stop operations) if it does not meet the discharge criteria of 5 mg/L average maximum concentration or 10 mg/L grab concentration of ammonia.	Agreed. *CZN should be made to honour these commitments.*
	4. Levels of metals and suspended solids would need to be closely monitored to gain an understanding of the range of concentrations which are likely to occur. Metals may or may not be sufficiently precipitated by the addition of soda ash without exceeding the licence criteria for pH of 9.5. This will have to be established by sampling and analysis. The company may need to plan for pH adjustment as well. It would be prudent for the company to research small treatment system packages which can treat for metals and	CZN plans to closely monitor metals and suspended solids levels, at least at the outset of treatment using soda ash, to confirm metals removal is occurring as expected. CZN hired Laurion Engineering to design the treatment circuit. The circuit consists of a solution feed tank, a pH-controlled dosing meter, and a propeller-type mixer. This circuit has been installed, and is effectively a small treatment system package. Laurion concluded that because of the slightly alkaline pH of existing mine water, and prevailing alkalinity levels, only relatively minor additions of soda ash will be needed to raise the water pH to 9.1, and at that pH, the precipitation of zinc and co-precipitation of other metals should be sufficient to comply with the

	particulates.	prescribed SNP concentrations. Hence, the need to lower pH to meet the 9.5 criterion is not expected to be necessary. More information on particulates management is given below. *Please see the Review Comments and Comments sections of the Staff Report.*
	5. If hydrocarbons are an issue then the "treatment" may need to range from booms and absorbents, to use of an underflow weir and running a treatment system to recover hydrocarbons (e.g. in the event of a spill). In the course of normal operations, absorbents and booms should be adequate to capture/contain small volumes, but the plan should look further.	Only relatively small amounts of fuel and oil will be taken underground, associated with vehicles and equipment. Any spills will be minor and will be mopped-up with absorbants. Absorbent booms will be installed at the final sump on the 870 Level as a precaution. An underflow weir can also be installed if necessary. If a significant spill occurs, mine water can be recycled underground until response measures have been implemented. CZN will have a vessel filled with granular activated carbon on site for the Phase 3 drilling program. This vessel will be portable, and can be used to treat mine water contaminated with hydrocarbons if necessary. *CZN committed to using an oil/water separator if necessary in the ETOP. Board staff confirmed with Environment Canada that this commitment addresses their concern.*
	6. The method for disposal of absorbents should be identified.	Any contaminated absorbent material will be incinerated on site. *Presented to the Board.*
Department of Fisheries and Oceans, November 22, 2005	1. DFO has no concerns regarding the above mentioned material at this time. Please note that Subsection 36(3) of the Fisheries Act, which deals with the deposit of deleterious substances, is administered by Environment Canada.	Duly noted. *Presented to the Board.*
Water Resources Division, INAC, August 20, 2004	1. Rationales for the proposed options should be provided.	As discussed in the MCP, treatment of mine water in the final sump on the 870 Level will produce an effluent containing some suspended metal carbonate precipitates. CZN is constructing a polishing pond to settle out this precipitate to ensure the effluent meets the water quality requirements specified in the Water License. *Board staff agrees that there is overlap between the ETOP and the MCP.*

	2. Any relevant information from the Minewater Contingency Plan should be included in the Effluent Treatment Options Plan such that it can be referred to as a stand alone document. Diagrams or maps outlining the location of the polishing pond and the locations of any inflow and outflow structures should also be included in the Plan.	A November 2005 Activity Report relating to the construction of the Polishing Pond is provided with this submission. This report provides the design documents supplied to CZN by EBA and Golder Associates, and gives as-built details for the dikes of the pond. An as-built report for the completed structure will be provided at a later date. *This report was provided to the reviewers. CZN is required to have a geotechnical engineer certify the integrity and capacity of the polishing pond prior to its use.*
	3. Design specifications on the polishing pond should be included such as its capacity (volume) and predicted inflow volumes.	EBA (May 10, 2004) previously recommended a pond with an approximate capacity of 1400 m^3 to treat AND polish mine water and effluent from a metallurgical pilot plant to meet Water License limits. CZN subsequently modified its water management plans, and proposed a superior solution consisting of treatment in the final sump underground (with a capacity of 360 m^3), and polishing in a new pond. The design specifications for the new pond were specified as a capacity of 900 m^3 for the design maximum inflow of 0.0124 m^3/sec. (EBA, April 26, 2005). This capacity would provide a 20-hour retention time. The pond dikes as built will provide a pond capacity of 1500 m^3, which by correlation will mean a 33-hour retention time. *This information was provided to the reviewers. CZN is required to have a geotechnical engineer certify the integrity and capacity of the polishing pond prior to its use.*
	4. What is the predicted retention time in the polishing pond that will be required to meet water licence limits?	See point 3 above. *This information was provided to the reviewers. CZN is required to have a geotechnical engineer certify the integrity and capacity of the polishing pond prior to its use.*
	5. Details such as number, capacity and predictions of flow volumes into the sumps should also be included in the Plan.	Explained in detail in the MCP. Note, the sumps manage raw water, except for the final sump on the 870 Level. Effluent (maximum flow given above) from this sump (capacity given above) is discharged to the Polishing Pond. *The main sumps located at the 870 m portal and the 905 m portal must be monitored (volumes and water quality) under part B, items 4(d) and (e) and under the SNP.*

	6. Contaminants of Concern a) What are the contaminants of concern besides zinc? b) How were the contaminants of concern identified or what studies have been done to identify them? c) How will each contaminant of concern be treated? d) What options for treating each contaminant of e) concern have been considered? f) What are the preferred options for treating each contaminants of concern and what are the rationales for choosing the preferred option? g) What monitoring will take place (frequency, location and procedures for monitoring water quality and quantity)? h) Has there been any risk-based analysis or other studies conducted on the treatment options selected? i) Has any toxicity testing been done or will any be done?	The treatment of raw water was detailed in the MCP. The treatment of effluent, the subject of the ETOP, was also explained in the MCP and consists of settling in the Polishing Pond. Based on the database of mine water quality data, the contaminants of concern are zinc and cadmium. Both are expected to readily precipitate with soda ash dosing. The Polishing Pond is to ensure suspended metal carbonate particulates settle out sufficiently so that pond discharge meets Water License limits. CZN is required to report the monthly quantities of mine water and any pilot plant effluent. CZN will monitor inflows to the final sump on the 870 Level at least weekly, and probably at least daily during the start-up of operations. CZN is also required to sample mine water and Polishing Pond discharge flows weekly for a range of parameters. Again, this frequency will be exceeded initially to ensure the treatment and water management system is operating as intended. No risk-based analysis, or toxicity testing, is deemed to be necessary. *The report published by Water Resources Division, 'Historical Water Quality of the Prairie Creek Project Area' and the Pahse 1 Environmental Site Assessment produced by GLL on behalf of Water Resources Division both report that zinc and cadmium are historically the most significant contaminates of concern.* *GLL confirmed that soda ash can be used to treat for multiple metals so individual treatments for each metal are not necessarily required.* *Ammonia treatment is discussed under the Review Comments and Comments sections of the Staff Report.* *Hydrocarbons are discussed under Environment Canada point 5.*
	Considerable retention time is required for ammonia to convert into less toxic forms such as nitrite and nitrate. More evidence showing that there is enough capacity to offer sufficient retention time should be provided (time required to treat for ammonia and volumes of effluent requiring treatment).	See Environment Canada points 2 and 3 above. *Environment Canada confirmed that there are limited options for treating for ammonia. Please see the Review Comments and Comments sections of the Staff Report.*

	7. Details should be provided on how hydrocarbon contaminated water will be collected and intercepted, treated and discharged. Consideration of an oil/water separator or land farm should be made and discussed in the Plan.	See Environment Canada point 5 above. An oil-water separator is not expected to be needed, but one will be used if necessary. *CZN incorporated this commitment in the January 2006 ETOP.*
Canadian Parks and Wilderness Society (CPAWS), November 22, 2005	1. CPAWS recommends that specific testing for metals, ammonia and hydrocarbons be conducted at specific regular intervals (e.g. once per week or prior to each polishing pond discharge).	The frequency and requirements for Polishing Pond discharge sampling are prescribed in the water licence. *Presented to the Board.*
	2. Other alternatives for the treatment for ammonia should be considered.	See Environment Canada points 2 and 3 above. *Environment Canada confirmed that there are limited options for treating for ammonia. Please see the Review Comments and Comments sections of the Staff Report.*
	3. How will used absorbent pads and/or booms be disposed (incineration, landfill, treatment at a hazardous waste facility)?	They will be incinerated on site. *Presented to the Board.*