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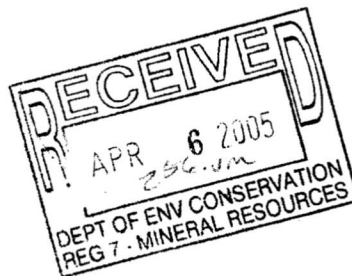
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April 4, 2005

File: 2499.4

New York State Department of Environmental Conservation  
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Division of Mineral Resources  
625 Broadway, Third Floor  
Albany, NY 12233-6500

Attention: Mr. Steven M. Potter  
Director

New York State Department of Environmental Conservation  
615 Erie Blvd. West  
Syracuse, NY 13204-2400

Attention: Mr. Joseph S. Moskiewicz Jr.  
Mined Land Reclamation Specialist II, Region 7

Subject: 2005 Annual Report Review  
Cayuga Mine, Cargill, Inc.  
Syracuse Formation  
Seneca and Tompkins Counties, New York

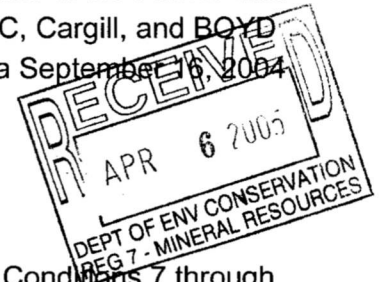
Gentlemen:

John T. Boyd Company (BOYD) received a letter<sup>1</sup> with digital data attached from Cargill Deicing Technology (Cargill) in early February as a supplement to the 2005 Annual Report. In March 2005, Mr. Steven M. Potter, Director, Bureau of Resource Management & Development of the New York State Department of Environmental Conservation (NYSDEC), requested BOYD to review this letter, digital data, and the Annual Report. The Annual Report<sup>2</sup> was received by BOYD on March 24, 2005.

<sup>1</sup> Plumeau, David, 2005, untitled letter to Vincent A. Scovazzo, John T. Boyd Company, January 28.

<sup>2</sup> Cargill Deicing Technology, 2005, "Annual Report for Mine File #709-3-29-0052; Cayuga Salt Mine, Application ID# 0-9999-00075-00001," signed by Steve Horne, to Joseph Moskiewicz, NYS Department of Environmental Conservation, January 1.

These documents were reviewed as to their adherence to conditions of the Permit<sup>3</sup> and in regard to discussions held at the Cayuga Mine among NYSDEC, Cargill, and BOYD on August 17, 2004, and subsequently summarized by BOYD in a September 16, 2004 letter.<sup>4</sup>



### **Discussion of Annual Report**

The Annual Report submitted by Cargill is in response to Special Conditions 7 through 13 of Permit Number 0-9999-0075/00001. These special conditions and Cargill's responses are summarized below:

**Special Condition 7**—requires Cargill to submit an Annual Report which is required to include items a through g of Special Condition 7.

**Special Condition 7.a.**—requires the inclusion of a Mine Manager signed certification that “all mining related activities...were in conformance with this permit and the approved plans, or that variances have been reported and managed.”

A certification dated January 1, 2005, is included in the annual report and is signed by Steven J. Horne, Mine Manager – Cargill Deicing Technology.

**Special Condition 7.b.**—requires “A summary of all non-routine mining incidents as defined in Special Condition 8. ...” Special Condition 8 defines non-routine as “incidents during mining, processing, or other mine related activities that may adversely affect mine stability, ground and surface water or other natural resources, or the health, safety, welfare of property of the general public.” Special Condition 9 expands on Special Condition 8 by requiring Cargill to submit “all correspondence with the Mine Safety and Health Administration involving non-routine mining incidents....” At the August 2004 meeting, it was agreed that statements will be included in the Annual report “to point out known, encountered, or discovered geologic and geotechnical anomalies and mine action to address such anomalies.”

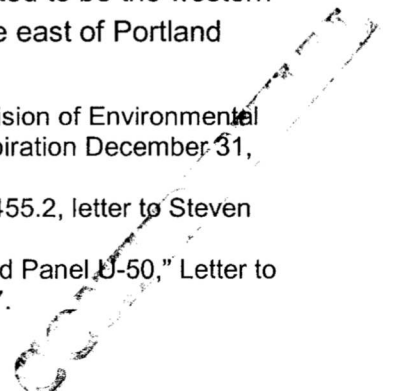
In BOYD's September 2004 letter, two specific geologic structures were noted: S-3 Tunnel and Unit 50. RESPEC addressed both of these structures in their January 2005 letter<sup>5</sup> noting that “... the structure in the S-3 tunnel is interpreted to be the western extension of more severe deformation related to the domal structure east of Portland

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<sup>3</sup> New York State Department of Environmental Conservation, Division of Environmental Permits, Region 7, 2003, “Permit” DEC Permit # 0-9999-00075/00001, expiration December 31, 2007, January 6.

<sup>4</sup> BOYD, 2004, “2004 Review of Cayuga Mine, Cargill, Inc.” File 2455.2, letter to Steven M. Potter, September 16.

<sup>5</sup> Goodman, William, 2005, “Rock-In-Salt Structure, S-3 Tunnel and Panel U-50,” Letter to Vincent Scovazzo, John T. Boyd Company, RESPEC File 541, January 27.



Point. The S-3 tunnel apparently crosses the axis of the feature so far west on the dome flank that deformed floor rock did not fully protrude into the #6 salt bed and did not significantly disrupt mining operations."

In reference to Unit 50, RESPEC describes the structure as: "The salt bed is internally sheared and folded, and blocks of floor rock and roof rock have detached and listed into, or have been thrust into, the salt bed." RESPEC concludes that these two structures do "not appear to have hydrogeological significance" because:

- "... severely deformed salt beds were mined from the mine's inception in 1922 up to 1970 without any evidence of water seepage."
- "... there are no known vertical faults in the vicinity of the Cayuga Mine that would appear to connect the salt beds directly to shallower subsurface, water-bearing formations."
- "There is still a full section (albeit, deformed) of upper Syracuse salts and low permeability Camillus Shale overlying the #6 salt level mine workings."

BOYD concurs with RESPEC's conclusions regarding these structures.

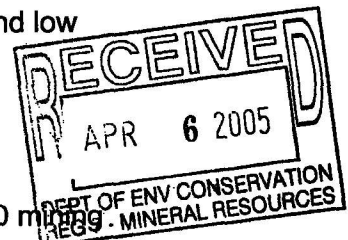
The Annual Report noted that "A large rock roll was encountered in the U50 mine panel and this panel was temporarily abandoned. Mining in U50 will likely be resumed after further investigation is completed."

The Annual Report states that Cargill "is not aware of non-routine incidents," other than geologic, as it is defined in Special Condition 7.b.

**Special Condition 7.c.**—requires "An updated Mining Plan Map depicting the current extent of mining activities, and the proposed advancement of the working face for the subsequent three years." At the August 2004 meeting, it was agreed that in addition "A mine map showing instrumentation location and type and shore line...." will be included in the Annual Report.

Mine maps (hard copy and digital) were supplied by Cargill in the Annual Report and under separate cover. The hard copy maps are:

- Cargill, 2005, "Cayuga Mine Proposed North Mining Plan," Not to Scale, January.
- Cargill, 2005, "Cayuga Mine Proposed South Mining Plan," Not to Scale, January.
- Cargill, 2005, "Cayuga Mine Proposed Mining Plan," 1" = 1,000', January.



Maps showing the extent of mining, proposed three-year mine plan, instrument location, and shoreline of both the 4 Level flooding and of Cayuga Lake have been submitted in the Annual Report or supplemental data. A short description of current and planned mining operations aided in understanding these maps. Please note that all maps should be to a scale for this review.

**Special Condition 7.d.**—requires the annual report to include a “summary of in situ measurements of rock mechanics required by Special Conditions 12.” Special Condition 12 requires the measurement and collection of in situ rock mechanics data “in accordance with the approved Mined Land Use Plan.” The data is to include “plots of relevant graphs. ...” “Exceptions to anticipated trends in rock behavior shall be noted and explained. ...”

At the August 2004 meeting, it was agreed that “All rock mechanics data” would be incorporated in the Annual Report “including, but not limited to, all instrumentation readings and observations from the initial readings to present. Data for subsidence, closure, and extensometers are to be provided electronically. These electronic files are to include raw and processed data, graphs, and explanations of any inconsistencies and anomalous readings including reasons for abandonment, reinstallation, etc., along with applicable observation in the vicinity of the instrument such as floor heave, water inflow, etc. Future reports are to contain comment on whether, in the opinion of Cargill, the instrument readings support or conflict with prior stability models especially in areas employing new mine, panel, or main configurations.”

Cargill forwarded only data on closure stations. RESPEC reviewed these closure data in its January 2005 letter<sup>6</sup> making the following comment:

- The closure measurements to date “show that the yield-pillar panels continue to perform as expected based both on comparing current panel closure rates to past (measured) rates and to the closures predicted by the numerical modeling in RE/SPEC’s previous stability assessments.”

Rock Mechanics Assist in their January 2005 letter<sup>7</sup> concluded:

- “I reviewed all the rate graphs of the mine-wide closure stations and did not find any of the mining panels to be significantly increasing in rate, except in those cases of the effect of adjacent mining....”

<sup>6</sup> Van Sambeek, Leo, 2005, “Cayuga Minewide Stability,” letter to David Plumeau of Cargill Deicing Technology, RESPEC File 541, January 26.

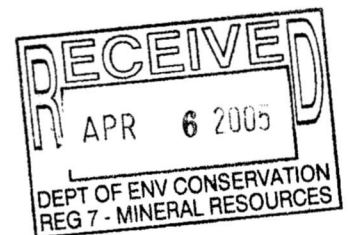
<sup>7</sup> Petersen, Gary, 2005, untitled, letter to David Plumeau of Cargill Deicing Technology, Rock Mechanics Assist, January 26.

Closure measurement data are significant because they offered insight into the collapses, and inundation of the Retsof Mine was obtained by review and analysis of closure stations installed throughout the mine and in the collapse area. Sustained closure rates of 0.04 inches/day were measured in stable areas of the Retsof Mine while in the failure areas; closure rates regularly measured sustained rates over 0.65 inches/day with onset of failure around 1.65 inches/day. Although Retsof and Cayuga Mines have different overburden and material properties, in the general sense a comparison seems warranted for a relative indicator of stability.

BOYD reviewed 851 closure station readings supplied by Cargill. Special attention was given to the 651 stations that were monitored in the last five years. The maximum closure rate that occurred over the last five years for each closure station was examined, and none recorded a closure rate at or over 1.65 inches/day. Of these 651 stations three stations recorded rates at or above 0.65 inches/day. All three rates occurred during the initial period when the stations were located in the vicinity of active mining and thus at the time when the ground is the most active and such closure rates are expected. All three stations show a final sustained rate below 0.04 inches/day.

Of the 651 stations read in the last five years, 322 recorded maximum closure rate over 0.04 inches/year. Of these, 305 maximum readings occurred during the initial readings again when the mining in the vicinity was most active and closure rates should be high. The remaining 17 maximum closure rates occurred after mining in the area ceased. An explanation included with the data was given for two of the 17 readings. Cargill noted that mining was stopped and restarted in the vicinity of these two closure stations. BOYD reviewed the locations of the remaining 15 stations and believes that the increased closure rates may have been due to adjacent panel mining or the completion of a panel or main intersection. However, BOYD was not provided the type of information needed to verify this. Following is a list of the 15 closure stations whose maximum reading and temporal position of the maximum reading will need to be clarified by Cargill:

- U36PIN#16
- U38PIN#1, #2, #3, and #18
- SW2PIN#3
- U41PIN#22, #23, and #24
- U43PIN#7, #8, and #9
- U45PIN#1, #2, and #3

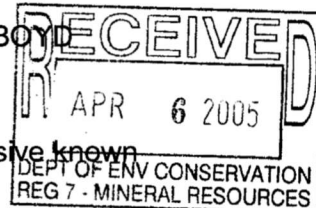


Of the 322 closure stations which had maximum closure rates over 0.04 inches/day, 307 had final closure rates below 0.04 inches/day. Of the remaining 15 stations with final rates above 0.04 inches/day, fewer than 100 days had passed from the maximum reading to the final reading for 13 of these stations. Thus, insufficient time had passed to

allow for lower closure rates. Review of the graph for these 13 closure stations shows a constantly decreasing closure rate, a sign of stable mine conditions.

Closure stations U40BPIN#6 and #12 were still above 0.04 inches/day more than 400 days later. Both of these closure stations show elevated closure rates from March 2002 to June 2002. Graphing these two closures stations indicates that their behavior is similar to U40BPIN#2, #8, and #20 as shown in the Rock Mechanics Assist report. Rock Mechanics Assist did not discuss the reason for this behavior but focused on latter behavior that occurred from November 2003 until October 2004, pointing out that this latter behavior was caused by the adjacent mining of Unit 48. We recommend Cargill provide clarification of the behavior of these five closure points (U40BPIN#2, #6, #8, #12, and #20).

Notwithstanding the closure stations results that require further clarification, BOYD offers the following comments:



- The closure station program at the Cayuga Mine is one of the most extensive known to BOYD.
- Location of stations and frequency of readings are acceptable for giving an indication of global mine and panel stability.
- Monitoring abandoned panels and levels also aids in understanding global mine stability.
- Closure station results provide a strong indication that the Cayuga Mine is globally stable.

Typically, closure stations are paired with extensometers to aid in identifying closure due to bed separation, floor heave, or panel closure. Since the closure rates throughout the mine are slow for a salt mine, BOYD sees no reason to recommend the addition of extensometers to the in situ monitoring program at this time.

Cargill provided two maps (non-authored, undated, not to scale) to aid in understating the relationship of the closure measurements:

- "Cayuga Mine Closure Rate (Inches/Year) Jul-2004"
- "Cayuga Mine Closure (Inches) Jul-2004"

**Special Condition 7.e.**—requires the annual report include a "summary of subsidence monitoring data required by Special Condition 11. Special Condition 11 requires "Subsidence monitoring shall be conducted in accordance with the approved subsidence monitoring plan contained within the approved Mine Land Use Plan." "Exceptions to the trends shall be noted and explained. ..." Points applicable to Special Condition 7.e. were



agreed upon at the August 2004 meeting and are noted above under Special Condition 7.d.

RESPEC commented on the subsidence monitoring data in its January 2005 letter<sup>8</sup> as follows:

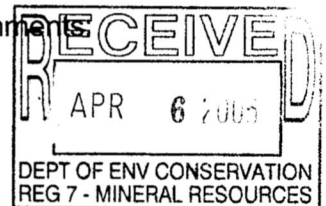
- "Taken as a whole, the surface subsidence program indicates that the measured subsidence is everywhere fully within our expectations for a stable mine situation."
- "The only caveat to this is the recognition that it is impossible to measure the subsidence directly above the active mining areas under the lake."

Rock Mechanics Assist in their January 2005 letter<sup>9</sup> echoed these viewpoints:

- "The subsidence measurements over the east end of the mine also show that this area is stable."
- "... the subsidence rates are not increasing showing that this area of the mine continues to be stable."

BOYD reviewed the supplied subsidence data and offers the following comments:

- For "East Side of Mine at Water or 34 South"
  - Stations 22 and 45 for the October 2004 survey are in error.
  - Station 33 is an exception to the trend and needs clarification by Cargill.
  - Maximum total subsidence from June 1979 through October 2004 is 0.99 ft.
- For "East Side of Mine at Triphammer Road"
  - Stations 99 and 103 for August 1994 and October 2004 surveys are in error.
  - Maximum total subsidence from June 1979 through October 2004 is 0.53 ft.
- For "East Side of Mine at Peruville Road"
  - Stations 45, 46, 47, 48, 72, 86, 87, 88, 90, 91, and L163 for the October 2004 survey are in error.
  - Stations 46, 47, and 48 or the August 1994 survey are in error.
  - Station 49 is an exception to the trend and needs clarification by Cargill.
  - Maximum total subsidence from June 1979 through October 2004 is 0.81 ft.

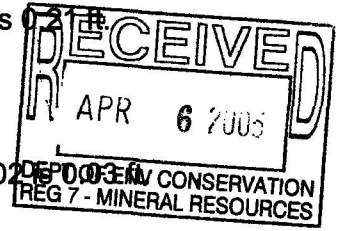


<sup>8</sup> Van Sambeek, Leo, 2005, "Cayuga Minewide Stability," letter to David Plumeau of Cargill Deicing Technology, RESPEC File 541, January 26.

<sup>9</sup> Petersen, Gary, 2005, untitled, letter to David Plumeau of Cargill Deicing Technology, Rock Mechanics Assist, January 26.

- For "East Side of Mine at Triphammer Road"
  - Stations 158 and 162 for the October 2004 survey are in error.
  - Stations 154 and 155 for the June 1985 survey are in error.
  - Maximum total subsidence from July 1982 through October 2004 is 0.11 ft.
- For "East Side of Mine at Drake Road"
  - Stations 7 and 16 for the October 2004 survey are in error.
  - Station 12 for the July 1983 survey is in error.
  - Maximum total subsidence from June 1979 through October 2004 is 0.87 ft.
- For "East Shore Southern Leg"
  - Station 183A has an approximate 2.2 ft error from October 1996 to present.
  - Maximum total subsidence from July 1983 through October 2004 is 0.48 ft.
- For "East Shore Northern Leg"
  - Station 194A has an approximate 1.6 ft error from October 1993 to present.
  - Maximum total subsidence from June 1987 through October 2004 is 0.21 ft.

For "West Shoreline - Northernmost Leg"

- Maximum total subsidence from October 1997 through October 2002 is 0.03 ft.
  - Movement is so small that it is within the accuracy of the survey.
- 
- For "West Shore of Cayuga Lake - Over Units 28, 30, 32, and 34"
    - Maximum total subsidence from November 1992 through October 2002 is 0.16 ft.
  - For "West Shore of Cayuga Lake - Over Unit 12"
    - Maximum total subsidence from January 1989 through March 2002 is 0.19 ft.
  - The frequency of Cargill's subsidence survey is between one and ten years. The longer periods will not allow for adequate monitoring of mine stability. BOYD suggests intervals of one to two years.
  - Subsidence monitoring shows a typical profile and rate leading BOYD to conclude that subsidence results indicate that the mine is globally stable.

**Special Condition 7.f.**—requires the inclusion of "Information regarding the source and volume of any water inflow into the mine, and the disposition of such water." At the August 2004 meeting, it was agreed that a discussion about water disposal in Level 4 would be included in the Annual Report noting: "Updates of Level 4 filling including data



on shore line advance" and include "calculations and assumptions for determination of brine volume storage on Level 4."

Cargill reported that total water inflow averaged 37 gallons per minute from the shafts, ED plant, and storm water. This water is moved to a containment pond on Level 4 and then onward to the lower areas of Level 4.

Cargill included calculations and a map of Level 4. The portions of the calculations that could be reviewed were reasonable, but clarification on the location of Small Basin, East Basin, and Overflow Basin and the methods to arrive at the square footage of the areas is needed. Cargill estimates that 15 years of storage remains on Level 4 and that the shoreline has not advanced significantly since BOYD's last visit.

**Special Condition 7.g.**—requires the inclusion of "A summary of all other monitoring data required under the terms of this permit or Department SPDES permit issued to Cargill.

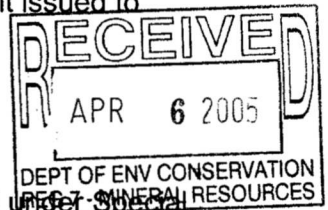
SPDES data and a short discussion are included in the Annual Report.

**Special Condition 8**—addresses non-routine incidents and is discussed under Special Condition 7.b.

**Special Condition 9**—addresses Mine Safety and Health Administration reporting involving non-routine mining incidents and is discussed under Special Condition 7.b. Cargill also notes in the Annual Report that Cayuga Mine has not been cited by MSHA in connection with any non-routine mining incidents.

**Special Condition 10**—addresses reporting requirements "Prior to undertaking any material change in the approved mining methods or techniques. ..." This condition does not require the reporting to occur in the Annual Report. At the August 2004 meeting, it was noted that "Cargill plans to change the panel configuration. It is expected that Cargill's next annual report will present these planned changes by comparing the existing and planned configurations using text, sketches, and maps. NYSDEC and BOYD are of the understanding that an analysis will be completed that will compare stability for the new and old configurations. Cargill reported that RE/SPEC may be retained to complete this assessment and that Rock Mechanics Assist may be retained to aid in instrumentation installation and interpretation."

Cargill notes that "There have been no changes of mining method at the Cayuga Mine" in the Annual Report. There was no note of the planned change of the panel configuration in the Annual Report. No RE/SPEC or Rock Mechanics Assist reports were included in data for this review that address this subject.



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**Special Condition 11**—addresses subsidence monitoring as discussed under Special Condition 7.e. above.

**Special Condition 12**—addresses rock mechanics monitoring as discussed under Special Condition 7.d.

**Special Condition 13**—addresses the reporting and recording of citizen complaints. Cargill notes in the Annual Report that "no written citizen complaints" were received.

**Site Visit**

A site visit to discuss these finding with NYSDEC, Cargill, and BOYD should be arranged. Please contact us if you require additional information or if we may be of further service.

Respectfully submitted,

JOHN T. BOYD COMPANY

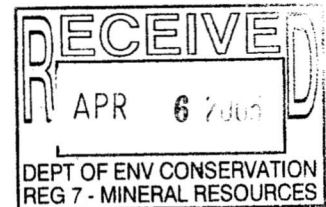
By:



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