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March 5, 2014

File: 2499.004

New York State Department of Environmental Conservation
Bureau of Resource Management & Development
Division of Mineral Resources
625 Broadway, Third Floor
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Attention: Mr. Matthew Podniesinski
Chief, Resource Development Section
Bureau of Resource Management &
Development

Subject: Annual Report Review - 2013
Cayuga Mine, Cargill, Inc.
Seneca and Tompkins Counties, New York

Gentlemen:

John T. Boyd Company (BOYD) received a CD from Cargill Deicing Technology (Cargill) on January 25, 2014 and post marked January 20, 2014. The CD included a cover letter¹, the Annual Report², maps as AutoCAD® files, extensometer and closure readings as Excel® files, and consultant reports. Two reports are from Rock Mechanics Assist (RMA)^{3,4}; although the letterhead of these reports is from "RockTec Solutions," Mr. Petersen's signature shows him as an RMA employee. Cargill's cover letter¹ states "formerly RMA."

¹ Plumeau, David B., 2014, untitled letter from Cargill Deicing Technology to Vincent A. Scovazzo, John T. Boyd Company, January 15.

² Cargill Deicing Technology, 2013, "Annual Report for Mine File #709-3-29-0052; Cayuga Salt Mine, Permit ID#0-9999-00075-00001," from Shawn G. Wilczynskito Matthew Podniesinski of New York State Department of Environmental Conservation, November 27.

³ Petersen, Gary, 2013, an untitled report from Rock Mechanics Assist to Dave Plumeau of Cargill Deicing Technology, January 3.

⁴ Petersen, Gary, 2013, an untitled report from Rock Mechanics Assist to Dave Plumeau of Cargill Deicing Technology, June 21.

Seven^{5,6,7,8,9,10,11} and 13 monthly reports¹² from ESG Solutions were also included.

On February 15, 2006, Mr. Steven M. Potter, then the Director, Bureau of Resource Management & Development, New York State Department of Environmental Conservation (NY SDEC), requested that BOYD review all documents, digital data, and annual reports received by BOYD starting with the 2006 Annual Report.

The recently received documents were reviewed for their adherence to conditions of the revised Permit¹³. §12.8 of this revised permit limits cost for review of annual reports by Consulting Services to \$15,000. For this review, BOYD is the Consulting Services. It is noted that "Funding relating to permit modifications or alterations requiring consultant review shall be not be capped due to the varying nature of potential future applications. Cargill shall fund the cost of the annual meeting/underground inspections, and will share the cost of joint inspections with American Rock Salt Co., LLC."

The Cargill 2013 Annual Report is accepted. However, the annual report does not include a discussion of a roof fall that occurred at the mine on October 22, 2013.

⁵ ESG Solutions, 2011, "Cayuga Advanced Data Processing and Event Mechanisms (Phase 1 & 2)," Reference Number: 2010-002937-0102, submitted to: Mike Davis of Cargill Co., February.

⁶ ESG Solutions, 2013, "Seismic Source Parameters Analysis, Cayuga Mine," two versions, Reference Number: 2014-0601, submitted to: Cargill, August.

⁷ ESG Solutions, 2013, "ESG Field Activity Summary Report," Reference Number: 2014-0485, submitted to: Cargill, June 17.

⁸ ESG Solutions, 2012, "Cayuga Mine South Zone - Advanced Microseismic Location Analysis," Reference Number: 2012-3861, submitted to: Cargill, November.

⁹ ESG Solutions, 2013, "Cayuga Mine South Zone - Full Event Mechanism Analysis," Reference Number: 2012-4094, submitted to: Cargill, March.

¹⁰ ESG Solutions, 2013, "Cayuga Mine South Zone - SMTI Feasibility Study," Reference Number: 2012-3664, submitted to: Cargill, January.

¹¹ ESG Solutions, 2012, "Cayuga Mine - Array Design Summary," Reference Number: 2012-003664, submitted to: Cargill, June.

¹² ESG Solutions, 2013, "Remote Data Processing, Seismicity & System Health Analysis Report," Reference Number: 2012-003664, submitted to: Cargill, January 17, February 19, March 7, April 10, May 17, June 07, July 04, August 07, September 06, October 04, November 01, December 04, and January 07, 2014.

¹³ New York State Department of Environmental Conservation, Region 7, 2007, "Permit" DEC ID 0-9999-00075, expiration December 31, 2012, December 31, Modification # 1 Effective Date: November 8, 2013.

Discussion of Annual Report

The Permit has several conditions that affect the Annual Report and its review including:

Condition 3—Requires all reports required by the permit to be submitted to Region 7.

Condition 9.a.—Requires investigation into the disturbed salt zone and this investigation to be completed and submitted before mining proceeds into the area.

Condition 12.a.—Requires the Annual Report submitted by Cargill and response to 12.a. sub-conditions 1 through 8 and Condition 12.b through g. These conditions and Cargill's responses are summarized below:

Condition 12.a.1.—Requires the inclusion of the Mine Manager's 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 was included on page 2 §13.a.1 and the certification sent to NYDEC was signed by Mr. Shawn G. Wilczynski, Mine Manager, on November 27, 2013. This certification notes "... that all mining activities, to the best of my knowledge, conducted during the reporting period from November 1, 2012 to present were in conformance with the DEC Permit # 0-9999-00075/00001 and the approved plans. No variances occurred and none were reported."

Condition 12.a.2.—Requires "A summary of all non-routine mining incidents as defined in Special Conditions Part b. ..." Condition 13.b. 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 or property of the general public." During a meeting held on August 17, 2004, with Cargill, NYDEC, and BOYD, 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."

Cargill included a statement in the Annual Report page 2, Section 13.a.2 that "[t]he Cayuga Mine is not aware of any non-routine incidents as associated with the mining, processing, or other mine related activities that would have adversely affected ... mine stability, ground and surface water, natural resources, health, safety, welfare or property of the general public."

BOYD is aware¹⁴ that a roof fall occurred at the mine on October 22, 2013 and was estimated to be 40 ft x 40 ft and 7 ft high. This area was reported to be supported by 6 ft long roof bolts and the opening was unoccupied. The article notes that Cargill notified Mine Safety and Health Administration (MSHA) who investigated the incident and issued no citation. It was reported that a Cargill investigation concluded that nearby stress relief blasting did not reach the intended depth. Although this incident does not rise to the level of affecting or indicating global mine stability, it should have been noted to alleviate any misconception.

Condition 12.a.3.—Requires “[a]n 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.

Cargill included a statement in the Annual Report, page 2, Section 13.a.3 that “Active mining is located in panels U-62 and U-68 to the west, and NW-3 to the north. As can be seen on the map, mining is proposed to continue east from U-63 under the land, pending acquisition of mineral rights there..”

Mine maps as AutoCAD files were supplied by Cargill to fulfill this condition. All AutoCAD maps supplied were overlays and a base map. The base map was included as basemap_with_rock_layer_roof_rock_floor_rock_rolls(updated1-14-14).dwg, which was created on July 11, 2006, last modified January 14, 2014, and includes a map entitled “Cayuga Mine, 6 Level Workings,” by Cargill Deicing Technology. Also included on this map are roof and floor rolls. Other maps provided are:

- The AutoCAD file, Complete Mine Overlay w Surface Subsidence.dwg, created December 06, 2000, last modified January 16, 2014, and containing untitled, undated map, which shows subsidence monument locations, shore line, and the 1st, 4th, and 6th Level workings.
- The AutoCAD file, ROYALTY.DWG, last modified January 17, 2014, and containing the Cargill Deicing Technology, 2013, “Cayuga Mine, Mine Royalty Map, 2013/2014 Fiscal Yr.” January. Map shows fiscal year production areas from June 1, 1984 through May 31, 2013.

¹⁴ Hill, David, 2013, “Feds Clear Cargill in Lansing Mine Ceiling Collapse,” ithacajournal.com, November 5.

- The AutoCAD file, U38-36 Dust fill map.dwg, modified January 14, 2014, containing an untitled, undated map shows areas filled and to be filled for U38.
- The AutoCAD file, Basemap planning for MLRP.dwg, modified January 15, 2013, and containing the map Cargill Deicing Technology, 2013, "Cayuga Mine, 3 Yr Mine Plan, 2013/2014 Fiscal Yr.", December. This map shows planned expansion through fiscal year 2014 to 2016.
- The AutoCAD file, 4 Level Pond Map MLRP Version 19Nov13.Dwg, modified January 14, 2014, and containing the map, 2014, "Cayuga Mine, 4 Level Pond Map, Updated: 14 Nov 2012," January. This map shows filled levels to January 1, 2014, and remaining potential pond area.
- AutoCAD file, 4 Level Convergence Map.dwg, modified January 15, 2013 and contains an untitled and undated map showing closure station locations. This map has not been updated since the last annual report.
- The AutoCAD file, 4A Level for JT Boyd.dwg, modified January 16, 2014 containing undated, "4A Level Instrumentation Map." This map shows closure stations locations.
- A hard copy map, undated and untitled, scale 1" = 50' and AutoCAD file, PAMELPASS.DWG, modified January 15, 2013, and contains the map "4 Level, Pamel Pass - 13 Belt." This map shows locations of extensometers along 13 belt.
- An untitled AutoCAD file, Screen Plant Horizontal Roof Ext.dwg, modified January 15, 2013, and showing map and cross-section view of installation locations of near horizontal extensometers in the roof of the screen plant gallery.
- The AutoCAD file, Screen Plant Instrumentation.dwg, created March 6, 2009, modified January 15, 2013, and containing map undated, "Unit # 5 Screenplant," showing instrument locations in and around the screen plant gallery.
- The AutoCAD file, undated, "Current Surge Bin Instrumentation Map as of 9-09" and AutoCAD file, Surge Bin instrument Map to JT Boyd.dwg, modified January 15, 2013, and containing undated, "Current Surge Bin Instrumentation Map as of 9-09," showing instrument locations in and around the screen plant gallery.
- AutoCAD file, Convergence map with basemap 2013.dwg, modified January 14, 2014, and containing the map Cargill Deicing Technology, undated, "Cayuga Mine, 6 Level Workings, Convergence Stations" This map shows the locations of convergence stations.

- Cargill Deicing Technology, 2014, "Cayuga Mine Closure Rate (Inches/Y ear) Dec-2013," showing closure of the 6 Level as file; "Cayuga Mine Contour Dec 2013 for JT Boyd Rate Dec-2013.srf," Created and modified January 14.
- Cargill Deicing Technology, 2014, " Cayuga Mine Closure (Inches) Dec-2013," showing closure of the 6 Level as file; "Cayuga Mine Contour Dec 2013 for JT Boyd Closure Dec-2013.srf," January 14.

Two map files that had been included in the past but w ere not received from Cargill are:

- The AutoCAD file, U31 POWDER MAG 2009.DWG, created June 7, 2001, modified January 15, 2013, and containing an untitled and undated mapshowing instrument locations in and around the powder magazine. Plumeau¹⁵ notes that "We have closed the powder magazine at U-31 and have moved to a new magazine near NW-3. No more readings are being tak en from that location, and the readings we were getting were showing no movement. No map was sent."
- The AutoCAD file, W1_1 TUNNEL 8 DOOR INSP TO JT BOYD.DWG, created March 02, 2001, modified January 15, 2013, and containing undated and untitled map. This map shows extensometer locations. Plumeau¹⁵ notes that "We have not taken readings in W-1, 1 tunnel, near #8 door over the past year or more. No map was sent."

The supplied maps show the extent of mining, proposed mine plan, subsidence monument locations, shorelines of both the 4 Level flooding and of Cayuga Lake, total closure, closure rate, and instrument locations. However, maps illustrating recorded mine closure for the reporting period were not provided.

Condition 12.a.4.—Requires the annual report to include a "summary of in situ measurements of rock mechanics required by Part f. of this Special Condition."

Condition 13.f. requires the measurement and collection of in situ rock mechanics data "in accordance with the approved Mined Land Use Plan." The data are to include "plots of relevant graphs. ..." Furthermore, "[e]xceptions to anticipated trends in rock behavior shall be noted and explained. ..."

At the August 2004 meeting, it was agreed that "[a]ll rock mechanics data" would be incorporated in the Annual Report, "including, but not lim ited to, all instrumentation readings and observations f rom 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 e xplanations of any inconsistencies and anomalous readings including reasons for abandonment, reinstallation, etc., along

¹⁵ Plumeau, Dave, 2014, "RE: documents" email sent to Vincent Scovazzo, February 21.

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 included a statement in the Annual Report on page 2 and 3, Section 13.a.4 that "Evaluations of weekly and quarterly convergence data indicate that no unusual trends have been identified and the mine is behaving as expected, with the exception of the U-40B and U-12 areas. Since backfill placement in the U-40B area has been completed the convergence rates have slowed and are trending back toward historical rates. The U-12 panel also shows higher than normal closure near the breakthrough with SW-2 and near the U-12A sub-panel. These areas are being monitored more frequently as we try to understand why the rates are increased. Both of these areas in U-12 were backfilled during the 1990's and both areas show a decreasing rate trend at this time."

Closure measurements can be evaluated to indicate possible instability in three ways:

1. By studying the graphs of the rate of closure over time. The shape of these graphs indicates areas of instability, areas of concern, and areas of stability. Mr. Petersen of RMA (Cargill geotechnical consultant) evaluated the closure in this manner.
2. By establishing trigger values for total closure. This method is applicable in harder, less viscous rock but is not applicable for the Cayuga Mine, as stable closure in salt will continue until the openings are closed.
3. By establishing trigger values for long-term closure rates. Since this is not being completed by the other investigators, BOYD applied such trigger rates in its evaluation of the closure readings.

Closure rate data are significant because they offered insight into the collapses and the inundation of the Retsof Mine. Sustained closure rates of 15 in. per year or less were measured in stable areas of the Retsof Mine, while in the failure areas, closure was regularly measured with sustained rates over 230 in. per year with onset of failure around 600 in. per year. 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 the 365 closure stations read in 2012 of which 155 (42%) had the highest closure rate of the year on the last calculated rate of the year. A similar trend was noted over several years by BOYD. Reviewing in-mine humidity data, it can be

seen that the highest humidity in the mine occurred between late May and early November which accounts for this trend.

None of these 365 closure stations showed readings that exceeded 230 in. per year. Below is a list of the 10 highest measured closure rates in 2012 for areas of recent mining defined as areas within 1,000 ft of mining that occurred in 2011 or 2012.

Top 10 Closure Rates in Areas of Recent Mining			
Closure Station	Rate of Closure (in./yr)	Last Recorded Rate of Closure (in./yr)	Notes
NW3PIN#16	69.5325	5.3707	1st Reading
U63PIN#16	65.5957	18.9539	1st and 2nd Reading
U62APIN#6	64.1879	9.7057	1st Reading
NW3PIN#10	63.7381	8.8087	
U63PIN#14	61.9979	1.3605	2nd Reading
NW3PIN#18	60.5900	16.3729	1st Reading
U63APIN#3	59.2213	2.7292	1st Reading
U63PIN#11	58.7407	1.5181	1st Reading
U63APIN#2	56.0536	11.3671	2nd Reading
U62APIN#3	55.4279	6.2209	2nd Reading

All of these rates substantially dropped over time showing that the ground is stable or stabilizing. All 10 of these stations are located in the most northern part of the mine where all production is located, with 3 stations located in U-63 likely because the panel is wider than most and these closure stations are located at or near the intersection with U-63A resulting in an even wider mining area. For similar reasons two of these stations are located in U-62A. Three of these closure stations are located in NW3 and two are located in U-62A. Also determined are the top 10 closure rates away from recent mining activity as shown below:

Top 10 Closure Rates Away from Recent Mining			
Closure Station	Rate of Closure (in./yr)	Last Recorded Rate of Closure (in./yr)	Notes
U60PIN#20	1.9602	0.6499	
U60PIN#17	1.4194	0.5609	
U58PIN#29	1.4059	0.5927	
U58PIN#26	1.2843	0.6107	
U12PIN#32	1.2091	1.1032	
U58PIN#23	1.1761	0.6035	
U12PIN#28	1.1748	1.0868	
U12PIN#107	1.1520	1.0294	
U65PIN#2	1.1303	0.6281	
NW2PIN#23	1.1019	-	Previous reading 2003

All of these rates dropped over time, except NW2PIN#23, showing that the ground is stable. These high-rate stations are clustered near active production and U-12 areas

(three stations) near the U-12A sub-panel, which are the same stations that have been included over the last two years. U12 areas have been frequently visited in the past by BOYD and NYDEC to observe conditions and each time the area appears globally stable. NW2PIN#23 has not been monitored for 10 years thus the "Last Recorded Rate of Closure" could not be noted.

Extensometer data were also evaluated. Extensometers were installed in various manners including vertically into the roof, at low angle (near horizontal) into the roof, and into pillars. In addition, extensometers were installed in Levels 4 and 6. Thus, four populations exist. These data are further complicated by the varying rod lengths between extensometers. Still, BOYD attempted to ascertain anomalies within this data. In many instances the rate of extension was not calculated, thus BOYD completed these calculations.

Extensometer Rates (anomalous rates are highlighted)				
Extensometer Location	Station	1 st , in./day	2 nd , in./day	3 rd , in./day
Roof Horizontal – Level 6				
Screen Plant	1A	0.0000267	0.0001533	-0.0000067
	1B	0.0000133	0.0000200	0.0001200
	2A	0.0000100	0.0000900	0.0001700
	2B	0.0000000	0.0000777	0.0001845
	3A	0.0000227	-0.0000032	0.0000550
	3B	0.0000259	0.0000000	0.0000324
	4A	0.0000032	0.0004854	-0.0004498
	4B	0.0000227	0.0000227	-0.0000518
Pillar – Level 6				
Screen Plant	H Pillar, Hole A			
	1 Tun	0.0007110	0.0004870	0.0003831
	3 Tun	0.0000550	0.0000971	0.0004790
	G Pillar, Hole B			
	1 Tun	0.0004822	0.0002395	0.0000874
	I Pillar, Hole B			
	1 Tun	0.0002367	0.0002100	0.0000667
	J Pillar, Hole B			
	1 Tun	0.0002867	0.0002667	0.0000533
Roof – Level 4				
Pamel Pass	No. 1	0.0000610	0.0000798	0.00008920
	No. 2	0.0000141	0.0000094	0.0000070
	No. 3	0.0001315	0.0000822	0.0001080
	No. 4	0.0002535	0.0002653	0.0002864
	No. 5	0.0010656	0.0010492	0.0011803

Extensometer Rates (anomalous rates are highlighted)				
Extensometer Location	Station	1 st , in./day	2 nd , in./day	3 rd , in./day
Pillar – Level 4				
Surge Bin	No. 20	0.0001422	0.0002444	0.0002311
	No. 25	0.0002311	0.000724	0.000747
	No. 50	0.0002444	0.0004000	0.0004489
	GA-No. 8	0.0000000	0.0001192	0.0001178
	GA-No. 10	0.0000000	0.0001911	0.0001956
	GA-No. 27	0.0000000	0.0006578	0.0006756
	GA-No. 29	0.0000000	0.0003534	0.0003630
	GA-No. 49	0.0000000	0.0000137	0.0000178
	GA-No. 60	0.0000000	0.0001911	0.0002044
	GA-No. 80	0.0000000	0.0000000	0.0000178
	GA-No. 90	0.0000000	0.0000311	0.0000444
	GA-No. 100	0.0000000	0.0000222	0.0000133
	HR-1A	0.0001800	0.0000267	0.0001733
	HR-1B	0.0000133	0.0000333	0.0001533
	HR-2A	0.0000100	0.0001000	0.0002700
	HR-2B	0.0000000	0.0000777	0.0002621
	HR-3A	0.0000227	0.0000194	0.0000744
	HR-3B	0.0000259	0.0000259	0.0000583
	HR-4A	0.0000032	0.0004887	0.0000388
	HR-4B	-0.000016	-0.000158	0.0001359

A measurement of 0.00030 in. per day is often accepted as a convenient point in examining vertical extensometer data, as this value is close to, but normally less than the value required for bed separation (opening of bedding planes). Horizontal roof extensometers are installed at 5 degrees to 15 degrees from the horizontal as measured in the AutoCAD drawings. This angle would multiply any bed separation, thus the trigger used for horizontal extensometers is 0.02 in. per day. No extensometer readings were alarming.

In the 2013 Annual Report, a series of reports as ESG Canada Inc., 2013, "Remote Data Processing, Seismicity & System Health Analysis Report," for Cayuga Mine, Cargill Salt Division," Kingston, Ontario, included:

- December 1 – 31, January 17
- January 1 – 31, February 19
- February 1 – 28, March 7
- March 1 – 31, April 10
- April 1 – 30, May 17
- May 1 – 31, June 7

- June 1 – 30, July 4
- July 1 – 31, August 7
- August 1 – 31, September 6
- September 1 – 30, October 4
- October 1 – 31, November 1
- November 1 – 30, December 4
- December 1 – 31, 2013, January 07, 2014

Condition 12.a.5.—Requires the Annual Report include a “summary of subsidence monitoring data required by Part e. of this Special Condition.” Condition 12.e. requires “[s]ubsidence monitoring shall be conducted in accordance with the approved subsidence monitoring plan contained within the approved Mine Land Use Plan.” Furthermore, “[e]xceptions to the trends shall be noted and explained...” Points applicable to this condition were agreed upon at the August 2004 meeting and are noted above under Condition 12.a.4.

Cargill included a statement in the Annual Report page 3, Section 12.a.5 that “A survey of the west shore of Cayuga lake was performed this year and the data is being evaluated now. Plans are being made to conduct subsidence surveys of the east shore line in the 2014 calendar year. Past measurements indicate that the mine is behaving as expected with no anomalous subsidence zones.” A similar statement was included in the 2012 annual report that noted the east line would be completed in 2013.

Consultant Reports Concerning Conditions 12.a.4. and 5.

Mr. Petersen³, in discussing closure rates in the U40B which peaked in 2008 and that have since declined, states that he is no longer concerned with excessive closure rates. He notes that the area has been backfilled tightly to the roof.

He also addresses two areas in Panel 12 at intersecting panels that show high closure rates. He notes that the rates spiked in 2001 and 2009-2010 and then rates have steadily declined. U12/U12A area was backfilled around 1993.

U24 closure rates increased in 2006 and have declined since then. It was thought that the increase was due to wash water from the shop.

An excavation in the roof and floor of Unit 5 was completed for screenplant equipment. Subsequently, tension cracks developed in the roof of tunnels 1 and 3 and these cracks were then instrumented. 12 years of data were gathered showing that the rate is constant. Mr. Petersen noted that the bolts were taking load in “I” crosscut between tunnels 2 and 3, bolts at other crosscuts were in good condition.

The surge bin roof has been monitored since 1990. The surge bin is moving more than other parts and gaps have formed in this area. The roof's rate of movement is steady at 0.25 in. per year since 1990. Mr. Petersen notes that "As long as the roof expansion rates do not begin to increase significantly, the roof is considered in a stable state."

Mr. Petersen commented on the microseismic monitoring, which was installed in the southern area of the mine in response to "popping" and recommended more studies. Mr. Petersen concludes "I did review all the mine wide closure rate graphs and, except for those areas mentioned in this report, they were all indicating very stable conditions."

Mr. Peterson also reports on a June⁴ mine visit and concentrated on advising on pillar configuration for shaft access. He also notes that Unit 70 mined into thin salt areas and production has been stopped, and that the NW3 faces have "rock" in the roof and floor. As a result, Cargill is developing a salt thickness isopach in the northwest mine area.

Mr. Petersen believes that seismic survey has shown possible anomalies where others believe that glaciation cut down and into the carbonates where a 1000 ft barrier has been established around this cut down. He noted the study conducted in the U54 to U60 area where this cut down exists and closure was normal.

He also notes U40B, U12, and U24 and makes the same comments on these areas as in reference 3. Mr. Petersen notes "I did review all the mine wide closure rate graphs and, except for those areas mentioned in this report, they were all indicating very stable conditions."

Eight ESG Solutions reports and presentations were provided by Cargill to BOYD. Several of these documents were previously reviewed by BOYD. The newer documents expand and clarify earlier results and conclusion. These documents should be discussed at the annual review meeting as they are significant relative to the anomalies required by the NYDEC to be studied and the need to understand global stability of the mine.

Condition 12.a.6.—Requires the inclusion of "[i]nformation 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 4 Level would be included in the Annual Report, noting: "Updates of Level 4 filling including data on shore line advance." However in 2012 it was noted that "Access to view the pond is not possible due to ground conditions."

Mr. Plumeau¹ notes that "All of the water is directed to a settling pond located on the 4-level of the mine. The water is then pumped from the settling pond to abandoned areas at the far east end of 4-level as well as to various areas of the active mine for dust control. Recent volume calculations indicated that at our current rate of storage (about 12,000,000 gallons per year) we have approximately 13 years of storage life remaining on 4-level.

Action plans are in place to continue to reduce the inflow into the mine over the next year. A system for collecting the #1 shaft water inflow and for pumping it to surface for processing has been installed and is now operational. Once the processing system is fully operational it is expected to reduce inflow by an additional 6 gpm.."

Cargill included a statement in the Annual Report page 3, Section 13.a.6 that " The following is a list of sources and associated flow rates of water into the Cayuga Mine:

- Production Shaft (#1 shaft) – 16 gallons per minute
- Ventilation Shaft (#2 shaft) – 4 gallons per minute
- ED Plant Concentrate discharge – 7 gallons per minute
- Total Water Inflow = 27 gallons per minute"

Cargill included a 4 Level pond map, as noted above, and an Excel file, UG Pond Volume Calculation 15Nov13.xls, which was last modified November 21, 2013. This spread sheet reports the inflow in 2013 at 15,102,252 gallons with 12.7 years of storage remaining.

Condition 12.a.7.—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." Cargill included a statement in the Annual Report page 3, Section 12.a.7 that " There were no exceedances of the SPDES limits for the outfalls or the Waste Water Treatment Plant to report during the time of this report." An included spreadsheet last modified November 21, 2013, provides information on outfall water quality including cyanide, chloride, zinc, total dissolved solids, and cooling and treatment water.

SPDES data and a discussion of these data are included in the Annual Report. These data are to be reviewed by NYSDEC.

Condition 12.b. and c.—Addresses Mine Safety and Health Administration (MSHA) reporting involving non-routine mining incidents as defined in Condition 12.b. Condition 12.c. requires Cargill to submit "all correspondence with the Mine Safety and Health Administration involving non-routine mining incidents..."

Cargill includes a statement on page 3 section 12.b. of the Annual Report that, "[t]here were no incidents meeting the guidelines for notification as identified in section 12.a.2 and section 12.c. of the Annual Report that..." "[t]he The Cayuga Mine has not received any citations or correspondence from MSHA regarding non-routine mining incidents.." The Annual Report does not note reports or letters from MSHA concerning any non-routine mining incidents.

BOYD is aware¹⁴ that a roof fall occurred at the mine on October 22, 2013 and was estimated to be 40 ft x 40 ft and 7 ft high. This area was reported to be supported by 6 ft long roof bolts and the opening was unoccupied. The report notes that Cargill notified MSHA who investigated the incident and issued no citation. It was reported that a Cargill investigation concluded that nearby stress relief blasting did not reach the intended depth. Although this incident does not rise to the level of affecting or indicating global mine stability, it should have been noted to alleviate any misconception.

Condition 12.d.—Addresses reporting requirements "Prior to undertaking any material change in the approved mining methods or techniques ... Cargill shall submit to the Department a description of such modification ..." This condition does not require the reporting to occur in the Annual Report.

Cargill notes on page 3 in section 12.d. that, "There have been no changes to the Cayuga Mine layout in the past year."

Condition 13.g.—Addresses the reporting and recording of citizen complaints.

Cargill includes a statement on page 4 section 13.g. of the Annual Report that "[n]o written complaints from citizens were received since the last report (November 2012)."

Site Visit

A site visit to discuss these findings with NYSDEC, Cargill, and BOYD should be arranged. A suggested area to visit in the mine is U63.

Discussions at this meeting should include the:

- Nomenclature used and reporting of extensometer data.
- ESG Solutions reports.

New York State Department of Environmental Conservation
Mr. Matthew Podniesinsk

March 5, 2014
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Please contact us if you require additional information or if we may be of further service.

Respectfully submitted,

JOHN T. BOYD COMPANY

By:

A handwritten signature in black ink, appearing to read "V.A. Scovazzo", with a long horizontal flourish extending to the right.

Vincent A. Scovazzo
Director of Geotechnical Services

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