RESPONSE TO COMMENTS

dEIS Review and Comments
DEC 8-3436-00033/00001 MLR 80823
Frontier Stone LLC. Proposed Shelby Quarry
Shelby (T) Orleans County

Prepared By:

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September 11, 2012

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Scott Shelley/Dave L. Bimber
Regional Permit Administrators
6274 East Avon-Lima Road
Avon, New York 14414

RE: dEIS Review and Comments
DEC 8-3436-00033/00001 MLR 80823
Frontier Stone LLC, Proposed Shelby Quarry
Shelby (T) Orleans County

Dear Scott and Dave:

The following information is our response to comments received from the NYSDEC dated December 8, 2011, comments provided by Thomas P. Roster of the Iroquois National Wildlife Refuge (TNWR) dated March 1, 2012 and comments received during our March 19, 2012 meeting with the Department staff. Finally, the following responses address the concerns identified in the USGS report titled "Water Resources of the Iroquois National Refuse, Genesee and Orleans Counties, New York, 2009-2010.

The comments are presented below followed by the Applicant's response.

New York State Department of Environmental Conservation Comments

Comment 1: Future submissions must include five printed copies and a digital version of all documents. You should additionally be preparing to have the documents associated with the dEIS placed on your website for public review when the Department accepts the dEIS and deems the application complete.

Response: These instructions will be followed.

Comment 2: The Permit Application form, Organizational Report form and Environmental Assessment Form, submitted as part of the March 1, 2008 Revised Mined land Use Plan, are not dated and are missing signatures, The Organizational Report form also has not been notarized.

Response: All necessary forms will be signed and notarized as applicable with the final DEIS submission once the Applicant has been notified that the DEIS can be deemed complete.

Comment 3: Review of the most recent EAF and Page 15 of Volume 1 of the DEIS indicate that the maximum truck trips generated per hour is 30. The SRF Transportation Impact Study, dated June 2007, performed an impact evaluation based on an anticipated traffic level of 8 trucks trips per hour. The traffic study must be revised to reflect the 30 trucks per hour maximum.

Response: The average number of trucks using the site is 8 to 10 trucks per hour; this is a realistic assessment of conditions during normal steady state operations in this market area. The Department, however, has requested a "worst case" scenario. Up to 30 truck trips per hour may be generated, if a large project required material from Frontier. Project traffic volumes are dependent on economic conditions and government infrastructure spending in the market area and the results of competitive bidding.

Project timing and duration are affected by factors such as seasonal and daily climatic conditions, labor issues, DOT and municipal bid requirements and geotechnical and engineering factors.

During the March 19th meeting, Department staff also requested that Frontier consider accessing the site using Fletcher Chapel Road. Based upon this recommendation and the consideration of a potential 30 truck trip condition, Frontier has obtained a traffic study, which analyzes the use of Fletcher Chapel Road based upon 30 truck trips per hour. This study resulted in the conclusion that the use of Fletcher Chapel is a viable alternative.

This plan (i.e. using Fletcher Chapel) offers many different scenarios for traffic distribution. Traffic could be split between Sour Springs/Oak Orchard Ridge Road (existing plan) and a Sour Springs/Fletcher Chapel route, or the traffic could directly access Fletcher Chapel from the site. Any percentage could be allocated to these scenarios, or all could just use only Fletcher Chapel (note: an access could be made out the north side of the mine site along the west side of the utility line onto Fletcher Chapel). If the Fletcher Chapel or Sour Springs/Fletcher Chapel access were used, it would mitigate mine related traffic within the refuge.

The following traffic-related statistic was presented in the Iroquois National Wildlife Refuge Comprehensive Conservation Plan:

"The Refuge receives more than 28,000 visits on the trails and overlooks each year. The majority of Refuge visitors come during the spring, early summer and fall months to take advantage of favorable trail conditions and opportunities for viewing annual spring and fall bird migrations and enjoy the brilliance of New York's fall foliage. The Refuge receives nearly half its annual visitation during the months of March and April."

The forgoing statistic indicates that the Refuge is heavily used during the months of March and April. Because of climatic conditions, construction activity typically has an operating season which begins in mid to late April, and peaks in mid to late -summer. Peak mine related traffic activity will not coincide with peak use of the refuge by the public.

Comment 4: An Article 24, Freshwater Wetlands permit application may be needed to evaluate increases in size and other potential changes to the wetland. More information is needed, in addition to water quality data, which would describe how the wetlands would be expected *to* increase based on current wetland size, water discharge rates and capacities or limits of culverts and control structures on the Refuge. See comments below for more detail.

Response: The issues cited above will be addressed individually as they occur in the subsequent comments.

It is difficult to envision any measurable impact from quarry pump out water to the downstream wetland in light of the fact that the U.S. Fish and Wildlife Service alters the water level of the receiving wetland complex by several feet on a recurring basis. Nevertheless, potential changes to the downstream wetland from discharge water were evaluated in the TES Wetland Impact Assessment Report of July 2011, with additional assessments of seasonal changes provided in the response to NYSDEC Comment 6. These assessments used calculated water discharge volumes of the proposed continuous pumping from Phase 1 of the quarry development, as other phases of quarry development would not exceed these discharge levels as a result of using the Phase 1 quarry for water storage.

Calculated potential changes (see response to NYSDEC Comment 6) to the USFWS-controlled 74-acre Schoolhouse Marsh wetland, which is the receiving wetland, would be an estimated potential increase in water level in this wetland of 0.19 inch using the average annual discharge, 0.26 inch using the March seasonal high discharge, and 0.14 inch using the July/September seasonal low discharge.

To address the potential change in wetland size, a calculation was made of the potential increase in wetland area that would result using these estimated water level changes, length of the perimeter of the wetland, and an assumed wetland side slope. The perimeter of the 74-acre wetland, which was shown in the July 2011 TES report, was calculated to be approximately 10,900 feet. Side slopes around the edge of the wetland vary, but an average side slope of 1 foot vertical in a horizontal distance of 50 feet was assumed. Using this wetland perimeter and assumed side slope, the potential area increase in the size of the wetland would be as follows: 0.20 acre using the 0.19 inch estimated change in water level from projected annual average discharge; 0.27 acre using the 0.26 inch estimated change in water level from projected March seasonal high discharge; and 0.14 acre using the 0.14 inch estimated change in water level from projected July/September season low discharge.

The calculations reveal that there will be very minor potential changes in water elevation and wetland area. Although the potential changes are extremely minor, the effect of any change in wetland hydrology should consider the time of year of the change. The greatest change is projected to be in March when wetland systems naturally have high water levels. These spring season high levels are tolerated by wetland vegetation because it is well before the start of the growing season. These high levels are also tolerated by animals because it is before the breeding season. Water level changes of significance in July in the middle of the growing season could potentially affect vegetation and wildlife, but this is when the discharge and any potential water level changes are at their lowest. The calculated 0.14 inch changes in water level in July would not have a noticeable effect on the wetland.

Ditches and culverts below the USFWS-controlled Schoolhouse Marsh dam have been assessed and found to be of more than sufficient capacity to accommodate the quarry water discharge. Little to no change is expected over existing conditions in these downstream systems as the result of the quarry discharge. It should be noted that in the downstream direction the size of the drainage basin and existing surface water runoff becomes progressively larger. For example, the existing calculated March surface water drainage for Basin 1 at the Schoolhouse Marsh dam is 653 gpm, but increases within this basin to a calculated discharge of 962 gpm at State Route 63. This is an increase in existing drainage discharge of 47%. With the progressively larger surface water runoff, the additional quarry water discharge amount becomes progressively smaller when expressed as a percentage of the total runoff. As a result, any potential for a change from the additional quarry water discharge decreases as you progress downstream in the basin.

In light of the normal seasonal variation in wetland systems, the controlled nature of Schoolhouse Marsh wetland, and the very minor projected increase in water levels, this additional water will not have a noticeable effect on the Schoolhouse Marsh wetland or areas farther downstream. If there is any effect, it would be a very slight increase in the wetness of the wetland and perhaps a very slight increase in the wetland size.

Comment 5: Impacts on the Iroquois Nation Wildlife Refuge (ENWR) have not been adequately addressed and additional information/clarification is required. The noise and vibration limit boundaries on Plate #3 of the dEIS, Proposed Quarry Impact, need to be revised. The noise boundary limit does not take into account air blast which could approach 134 dB. Also, the human perception vibration limit should be assessed at 0.05 in/sec. Applicable narrative discussions should be updated to evaluate these changes.

Response: A line has been added to Plate #3 which delineates the effect of blasting noise on the surrounding environment.

In regard to air blasts, the following information is presented.

In typical blasting applications, explosives are inserted into holes drilled into the bedrock. When the explosives are detonated they immediately create rapidly expanding, high pressure gases. These gases create stress waves that are transmitted through the bedrock. The blast gases are confined and the energy produced will break the rock. As the gases continue to expand, the result is a release of

SITE

MINING NOISE
REDUCES TO AMBIENT NOISE
44 dBA

BLAST NOISE
REDUCES TO AMBIENT NOISE
44 dBA

VIBRATION LIMIT
1 inch/sec: Human Perception

REFUGE AREAS IMPACTED BY HUMAN ACTIVITY SUCH AS TRAFFIC, FARMING AND RESIDENTIAL ACTIVITY. PROJECTED dBA LEVEL >50

PROJECTED dBA LEVEL >60

GRAPHIC SCALE
1500 0 750 1500 3000 6000
(IN FEET)
1 inch = 1500 ft.

Date	Revisions	By
7/25/12	Blasting and Traffic Noise Impact	JRH

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PROPOSED QUARRY IMPACTS
Frontier Stone LLC.
Frontier Stone Quarry
Town of Shelby Orleans Co., NY.

Project Manager:JRH Prepared By:JRH Drafted By:CAP Reviewed By:	Date: February 2, 2011 Project No: 629-01-05-2531	Plate No: 3

energy into the atmosphere referred to as airblast or air overpressure. Airblast is also created by the outward movement of the blasted rock. This energy is measured in decibels (dB) or pounds per square inch (psi) and is simply pressure in excess of the ambient air pressure.

Air overpressure consists of air transmitted sound pressure waves that move outward from an exploding charge. A well confined explosive charge creates pressure waves with frequencies that are predominantly less than 20 hertz (Hz), with a relatively small amount of energy having frequencies above 20 Hz. The human ear responds to frequencies above 20 Hz, but filters out frequencies below 20 Hz. Buildings respond predominantly to frequencies in the range 2 to 20 Hz. Because air overpressure from blasting consists of frequencies that are substantially below 20 Hz, air over-pressure levels are measured with a meter that measures frequencies in the range 2 to 250 Hz on a decibel (Linear) (or dBL) scale.

Airblast and air overpressure are interchangeable terms but they should not be confused with acoustic noise by the fact that both are measured in decibels. Acoustic noise is measured using the A-weighted decibel scale (dBA). Most noise standards have been developed for steady-state noise e.g., engine, plane, equipment sounds, etc. The steady-state noise is related with the duration of the noise producing event; airblast is a short duration event, typically less than a second per blasting event.

Airblast is influenced by many factors. The most common variables are the pounds of explosives detonated per delay period, distance from blast site to the area of concern, quarry highwall height and orientation, blast hole stemming, burden and spacing of blast holes and weather conditions. As a general rule, if other factors are equal, airblast levels increase with the increase in the pounds of explosives detonated per delay period, and decrease as the distance from the blast site increases. Air vibration levels can be assessed using the following cube root scaling formula:

where: P = pressure (kPa)
W = explosives charge mass per delay (kg)
D = distance from charge (m)
K = site constant
a = site exponent

Note: To convert kilopascals to pounds per square inch (kPa to PSI), multiply the kPa value by 0.14503773773020923.

For well confined blast hole charges used in quarry blasting, the site constant is 3.15 with a site exponent of -1.2. As the confinement of the blast hole charges decrease, the site constant increases and site exponent decreases.

This formula was applied to the design parameters previously set forth in the Draft Environmental Impact Statement for distances between 100 to 1800 feet from the blast area (see Table 1). The kilopascal value for each distance was converted to pounds per square inch pressure and then the PSI value was converted to decibels (dBL).

Table 1 –Predicted Decibels

Pounds/Delay	Cube Root	Distance (m)	Distance (ft)	Site Constant	Site Exponent	Dist/Cube Root	kPa	PSI	Decibels (linear)
426	7.524365204	30.5	100.1	3.15	-1.2	4.053498092	0.587373821	0.08519137	149.36
426	7.524365204	61	200.1	3.15	-1.2	8.106996185	0.255669305	0.037081698	142.14
426	7.524365204	91.5	300.2	3.15	-1.2	12.16049428	0.157169793	0.022795551	137.91
426	7.524365204	122	400.3	3.15	-1.2	16.21399237	0.111286529	0.016140746	134.91
426	7.524365204	152.5	500.3	3.15	-1.2	20.26749046	0.08514332	0.012348995	132.58
426	7.524365204	183	600.4	3.15	-1.2	24.32098855	0.068412126	0.00992234	130.68
426	7.524365204	213.5	700.5	3.15	-1.2	28.37448665	0.056858702	0.008246657	129.08
426	7.524365204	244	800.5	3.15	-1.2	32.42798474	0.048440275	0.007025668	127.69
426	7.524365204	274.5	900.6	3.15	-1.2	36.48148283	0.042055575	0.006099645	126.46
426	7.524365204	305	1000.7	3.15	-1.2	40.53498092	0.037060783	0.005375212	125.36
426	7.524365204	335.5	1100.7	3.15	-1.2	44.58847902	0.033055472	0.004794291	124.37
426	7.524365204	366	1200.8	3.15	-1.2	48.64197711	0.029778107	0.004318949	123.46
426	7.524365204	396.5	1300.9	3.15	-1.2	52.69547520	0.027050953	0.003923409	122.63
426	7.524365204	427	1400.9	3.15	-1.2	56.74897329	0.024749187	0.003589566	121.85
426	7.524365204	457.5	1501.0	3.15	-1.2	60.80247139	0.022782694	0.00330435	121.13
426	7.524365204	488	1601.0	3.15	-1.2	64.85596948	0.021084854	0.0030581	120.46
426	7.524365204	518.5	1701.1	3.15	-1.2	68.90946757	0.019605408	0.002843524	119.83
426	7.524365204	549	1801.2	3.15	-1.2	72.96296566	0.018305752	0.002655025	119.23

As stated above, a significant portion of the airblast is in a frequency range that is below 20 Hz. To adjust the airblast sound pressure level measured in dBL to dBA, the inaudible portion of the airblast is removed resulting in a lower intensity. The adjustment is frequency based with the lower frequencies of the airblast resulting in larger reductions in noise. The typical frequency range of a confined quarry blast is between 1 to 20 Hz. A frequency of 10 Hz was selected as an average frequency for a typical, confined quarry blast. The anticipated blast noise was calculated at certain distances from the blast areas (Table 2). The quarry site will have a 20 foot high berm along the southern property line. There is also approximately 20 feet of overburden onsite. Accordingly, the blasting on the top bench will have, at a minimum, a 40 foot sound barrier. This sound barrier will reduce the sound intensities off site. This reduction is also shown in Table 2. As the quarry is developed and the lower bench is established, the sound barrier height will increase and result in a further reduction of the off- site blast noise.

The orientation of the quarry highwall will also influence how airblast is transmitted. The highwall in this quarry will be oriented in an east/west direction. The mining activity will start on the north end of the property and progress to the south. When an explosive charge in a vertical hole is fired towards a free vertical face, the resulting airblast levels are greater in front of the face than behind it due to the shielding effect of the face (Moore et al, 1993). There are very complex modeling programs to contour how the airblast contours are "stretched" in front of the highwall and flattened behind the highwall; both of these effects reduce airblast intensity. Those modeling programs have not been employed in this exercise; hence, the noise intensities shown in Table 2 are conservative.

Table 2 - Predicted Blast Noise

Distance	Caculated dBL	Frequency dBL (Hz)	Decibel Reduction	dBA	dBA Reduction from 40 ft Barrier	Final dBA
100.1	149.36	10	70.43	78.93	10	68.93
200.1	142.14	10	70.43	71.71	10	61.71
300.2	137.91	10	70.43	67.48	10	57.48
400.3	134.91	10	70.43	64.48	10	54.48
500.3	132.58	10	70.43	62.15	10	52.15
600.4	130.68	10	70.43	60.25	10	50.25
700.5	129.08	10	70.43	58.65	10	48.65
800.5	127.69	10	70.43	57.26	10	47.26
900.6	126.46	10	70.43	56.03	10	46.03
1000.7	125.36	10	70.43	54.93	10	44.93
1100.7	124.37	10	70.43	53.94	10	43.94
1200.8	123.46	10	70.43	53.03	10	43.03
1300.9	122.63	10	70.43	52.20	10	42.20
1400.9	121.85	10	70.43	51.42	10	41.42
1501.0	121.13	10	70.43	50.70	10	40.70
1601.0	120.46	10	70.43	50.03	10	40.03
1701.1	119.83	10	70.43	49.40	10	39.40
1801.2	119.23	10	70.43	48.80	10	38.80

The impulsive, short duration noise produced by thunder from a thunderstorm can be compared to the impulsive, short duration noise produced by a quarry blast. According to the National Lightning Safety Institute "A clap of thunder typically registers at about 120 dB in close proximity to the ground strike" (the noise produced by thunder is expressed in dBA weighting). Beyond 200 feet from the blast area, a typical clap of thunder will be significantly louder than a typical blast.

The proposed blasting season for this operation will be approximately 30 weeks long. It is anticipated that blasting will occur once or twice a week for the 30 week season; consequently, an airblast will occur for less than a second or two every week or for a cumulative duration of approximately 30 to 60 seconds spread out over the 30 week season.

Measurements show that the ambient sound levels in the Refuge are about 44 dBA. Table 2 also indicates that a typical airblast will attenuate to the ambient dBA level at about 1,000+/- feet. The closest blast will be 500+/- feet from the Refuge boundary. Therefore, air blasts will have the potential to impact the perimeter 500+/- feet of the Refuge, or well within the indicated impact area above ambient (dBA level) from farm equipment presently using the project area's fields.

On the subject of human perception of vibration, most studies of human tolerance to vibrations have been of steady-state sources or those of relatively longer duration than typical quarry blasting, in the absence of data on tolerance to impulsive vibrations (i.e. blasting), these steady-state results have been assumed to be applicable to blasting. Additionally, most useful data are from tests involving human subjects when not in their homes. The duration and frequency of the events are critical.

The USBM Report of Investigation 8507 states, "Human reaction to vibration is dependent on event duration as well as level. Particle velocities of 0.5 in/sec from typical blasting (<l-sec vibration) should be tolerable to about 95 percent of the people perceiving it as distinctly perceptible".

The 0.1 in/sec delineation line shown on our map is very conservative given the findings of the USBM RI 8507 study.

Comment 6: The maximum gpm discharge rate has not been provided. An impact assessment of the maximum gpm rate needs to be discussed. This should include an assessment of the impacts relating to the creation of continual wet conditions within the marshes when they normally experience seasonal dry conditions.

Response: The maximum discharge will occur at the end of Phase I when the quarry occupies 11.6 acres and is at its maximum depth. The discharge rate will be reduced during subsequent phases due to the use of the quarries from the initial phases for storage of water pumped from the successive phases.

The maximum discharge from Phase I is estimated to be approximately 385.6 gallons per minute (gpm) (see attached Water Budget Summary Table for comparison with average annual and monthly specific discharge rates). This estimate is derived for March of the last year of Phase I mining. The estimate is based on the plan to pump continuously throughout the year (including the winter months) and under the assumption that all the precipitation during December, January and February will accumulate as a snow pack that is assumed to melt during the month of March. This spring snow melt would be pumped out of the quarry along with the direct precipitation and ground water inflow for the month of March. It is also assumed that there will be no evaporation in March. The assumption of accumulated snow pack and lack of evaporation results in a conservatively high discharge rate since snow melt and evaporation (sublimination) will occur during the winter months. The calculation of the components (snowmelt, direct precipitation and ground water inflow) that comprise the maximum discharge rate is explained in the following paragraphs.

The average precipitation for the months of December, January and February is 3.14, 2.64 and 2.07 inches, respectively. These monthly totals are the rainfall equivalents of the snow that is assumed will accumulate in the quarry. These average values, which were provided in the April 29, 2011 hydrogeology investigation report for this project by Alpha Geoscience (Alpha report), are the precipitation normals at the Albion 2 NE station. This is a National Oceanic and Atmospheric Administration (NOAA) weather monitoring station. The precipitation values are 30-year averages for the period for 1971 to 2000. The total accumulated precipitation equivalent of 7.85 inches (December through February) in the 11.6 acre Phase I quarry would require an average pumping rate of 55.4 gpm if completely discharged in March.

The direct precipitation for the month of March is assumed to be the normal monthly rainfall of 2.8 inches. This is also from the Albion 2 NE station. A March rainfall of 2.8 inches into the 11.6 acre quarry, without evaporation, equates to a rate of 19.8 gpm (see attached Water Budget Summary Table for comparisons).

Ground water inflow for the year enters the Phase I quarry at an average rate of 251.04 gpm for a total accumulation of 131,946,624 gallons (see Alpha report). It is anticipated that the flow will actually be uneven with a greater percentage in the spring months and much less during the late summer. Alpha anticipates that 10.5% (13,854,395.5 gallons) will enter the quarry in March. This is based on more than a year's worth of monthly spring flow (ground water discharge) measurements that Alpha conducted on springs at another location in New York. A ground water inflow of 13,854,395.5 gallons in March equates to an average March discharge rate of 310.4 gpm.

The total average pumping rate for March is conservatively anticipated to be equivalent to the combined snow melt (55.4 gpm), direct precipitation (19.8 gpm) and ground water inflow (310.4 gpm). The addition of these rates yields an average March discharge rate of 385.6 gpm.

The potential impact of the discharge to downstream receptors only needs to be addressed for Basin 1, since there will be no changes to flow in Basin 2 during Phase I. The existing, average discharge from Basin I is 185.33 gpm (see Table 4 in the Alpha report). The average Basin 1 runoff coefficient is approximately 0.25 when the entire 403.3 acres of various soil types and open water bodies are considered together. The runoff from the meltdown of the accumulated winter snow pack combined with March rainfall yields 2.66 inches for Basin 1 using the 0.25 runoff coefficient. This yields an existing average March runoff rate of 653.13 gpm for the basin.

The reduction of Basin 1 from 403.3 acres to 391.7 acres by creation of the Phase I quarry will reduce the March runoff from the undisturbed Basin 1 to 633.75 gpm. The total future maximum flow from Basin 1 is projected to be 1019.35 gpm (combined 385.6 gpm discharge from the quarry and the 633.75 gpm runoff from the undisturbed portion of Basin 1). The 1019.35 gpm rate is 366.22 gpm greater than the existing discharge rate through Basin 1 for the period of maximum discharge.

September is the month when water levels are at their seasonal low and the associated inflow to the quarry will be at a minimum. The average quarry pumping rate in September, at the end of Phase I, is anticipated to be 197.34 gpm. This discharge rate is based on a ground water inflow rate of 183.26 gpm, direct precipitation of 27.2 gpm and evaporation of 13.12 gpm. The ground water inflow rate is estimated from spring flow measurements made by Alpha at another site in New York that yielded 6% of the annual flow during September. The average September precipitation is 3.73 inches and the average evaporation rate is estimated to be 1.8 inches. This evaporation rate for September is equivalent to 6.8% of the annual quarry floor evaporation rate of 13.4 inches per year used in Table 8 of the Alpha report. The 6.8% figure comes from monthly pan evaporation data provided for Aurora, New York in the "Evaporation Atlas for the Contiguous 48 United States" by Farasworth et al (1982; NOAA Technical Report NWS 33; U.S. Department of Commerce, Washington, D.C., 26p).

This discussion of the water budget can be best summarized in the following table.

WATER BUDGET SUMMARY TABLE
Frontier Stone Quarry

	Average Annual Flow Rate	Average March Flow Rate	Average July Flow Rate	Average September Flow Rate
Surficial Drainage from Existing Basin 1	185.33	653.13	157.0	236.37
Surficial Drainage from the Unmined Area of Basin 1 at End of Phase 1 Mining	180.55	633.75	152.48	229.58
Ground Water Inflow from the Mine at the Full Development of the Phase 1 Quarry	251.04	310.40	186.21	183.26
Direct Precipitation into the mine at the Full Development of the Phase 1 Quarry	21.44	75.20	18.06	27.20
Evaporation from the mine for the Full Development Phase 1 Quarry	8.03	0.0	9.03	13.12
Discharge at Full Development of the Phase 1 Quarry	264.45	385.60	195.24	197.34
Total Future Discharge from Basin 1 at Full Development of the Phase 1 Mine	445.0	1019.35	347.72	426.92
Increase in the flow to Basin 1 after the Full Development of Phase 1	259.67	366.22	190.72	190.55

Notes: All discharges are in gallons per minute.
The existing Basin 1 area is 403.3 acres.
The unmined area will be reduced to 391.7 acres by the addition of the 11.6 acre Phase 1 quarry.
All the March discharges include the melt of accumulated snow for December, January and February.
Snow melt is imbedded in the direct precipitation of 75.20 gpm in the Future Phase 1 direct precipitation that is comprised of 19.8 gpm of March precipiation plus 55.4 gpm of snow melt.

As seen in the table, the increased flow rate to the Refuge during periods "within the marshes when they normally experience seasonal dry conditions" is minimal, i.e. 190 gpm. This is contrasted to a typical July thundershower (two year precipitation event) which discharges 4,331 gpm to the Refuge under an existing no quarry condition.

Notwithstanding these figures, the Applicant has several alternatives at his disposal. During dry summer months, discharge water can completely bypass the Refuge by pumping to Fish Creek, north of Fletcher Chapel Road. Fish Creek flows to Oak Orchard Creek. Secondly, the quarry site landowner, Chet Zelazny welcomes the use of the discharge water for irrigation of his agricultural fields during the dry season, once again, precluding discharge to the Refuge. Fish Creek has a very large channel which can easily accommodate the meager summer flow from the quarry. It also presents opportunities to expand this directional pumping at other times during the year.

The potential effect of quarry discharge calculations during high and low seasonal periods provided above on the down basin wetlands/waters systems was assessed. Reference should also be made to the response to NYSDEC Comment 4 relative to this assessment, portions of which are reiterated in the following response.

It is difficult to envision any measurable impact from quarry pump out water to the downstream wetland in light of the fact that the U.S. Fish and Wildlife Service alters the water level of the receiving wetland complex by several feet on a recurring basis. Nevertheless, potential changes to the downstream wetland from discharge water were evaluated in the TES Wetland Impact Assessment Report of July 2011, with additional assessments of seasonal changes provided in the response to Comment 6. These assessments used calculated water discharge volumes of the proposed continuous pumping from Phase 1 of the quarry development, as other phases of quarry development would not exceed these discharge levels as a result of using the Phase 1 quarry for water storage.

Since the TES impact assessment report of July 2011, Alpha Geoscience prepared the requested average annual discharge and seasonal discharge estimates during seasonal high and seasonal low discharge periods indicated above for Phase 1 of the quarry development. Their calculations for Phase 1 of the quarry indicate an annual average discharge of 259.67 gpm, a projected seasonal high in March of 366.22 gpm, a projected seasonal low in September of 190.55 gpm and with a similar low in July of 190.72 gpm.

The potential changes to the USFWS-controlled 74-acre Schoolhouse Marsh wetland, which is the receiving wetland, were calculated using the methods described in the July 2011 TES report. These calculations resulted in an estimated potential increase in water level in this wetland of 0.19 inch using the average annual discharge of 260 gpm; 0.26 inch using the March seasonal high discharge of 366 gpm; and 0.14 inch using the July/September seasonal low discharge of 191 gpm. The area calculations were cross-checked using HydroCAD in a "sensitivity" model. The model showed that a 336 gpm discharge would raise the water level .01 foot or .12 inches and a discharge of 381 gpm would raise the water level .04 feet or .48 inches. Discharge amounts below .75 cfs (336 gpm) have a non-measurable effect on water levels. Therefore the area calculations presented are considered very conservative.

Although the incremental water level variations in wetland hydrology are extremely minor, the effect of any change in wetland hydrology should also consider the time of year of the change. Although minor, the greatest change in flow is projected to be in March when wetland systems naturally have high water levels, which are tolerated by wetland vegetation because it is well before the start of the growing season. This change is also tolerated by animals because it is before the breeding season. Water level changes of significance, in July in the middle of the growing season, could potentially affect vegetation and wildlife, but this is when the discharge and any potential water level fluctuations are at their lowest. The calculated 0.14 inch rise in water level in July would not have a noticeable effect on the wetland.

Ditches and culverts below the USFWS-controlled Schoolhouse Marsh dam have been assessed and found to be of more than sufficient capacity to accommodate the quarry water discharge. Little to no change is expected in these downstream systems from the quarry discharge water. It should be noted that the size of the drainage basin and existing surface water runoff becomes progressively larger in the downstream direction. For example, the existing calculated March surface water drainage for Basin 1 at the Schoolhouse Marsh dam is 653 gpm, but increases to a calculated discharge of 962 gpm at State Route 63. This is an increase in existing drainage discharge of 47%. With the progressively larger surface water runoff, the additional quarry water discharge amount becomes progressively smaller when expressed as a percentage of the total runoff. As a result, any potential for a change from the additional quarry water discharge decreases as you progress downstream in the basin.

In light of the normal seasonal variation in wetland systems, the controlled nature of Schoolhouse Marsh wetland, and the very minor projected increase in water levels, it is not expected that this additional water would have a noticeable effect on the Schoolhouse Marsh wetland or areas farther downstream. If there is any effect, it would be a very slight increase in the wetness of the wetland and perhaps a very

slight increase in the wetland size. The gradual increase in quarry related discharges will allow ample time for the floral and fauna to adapt to the new equilibrium.

Comment 7: Additional information on groundwater quality needs to be provided. Water quality sampling results from multiple locations around the quarry property have raised concerns over groundwater quality. Nearby sampling locations from within the Lockport have shown significantly high levels of sodium, sulfate, iron and chloride. Only 2 of the 10 monitoring wells at the site were sampled. Groundwater quality in the remaining 8 wells needs to be analyzed. The additional information shall include a description of how the samples were collected and from what depth the samples were taken.

Response: A total of seven wells, that are located on, and adjacent to the quarry site, have been sampled and tested for ground water quality. These seven wells include: well DH5-05 and the Barn well, which were sampled on April 14, 2010; and wells MW-1, PW-1, DH1-05, DH4-05 and the Garage well, which were sampled on May 11, 2012, and again on June 8, 2012. The locations of these wells are shown on Figure 3 of the April 29, 2011 report by Alpha Geoscience (Alpha) entitled "Hydrogeologic Investigation of the Proposed Frontier Stone Quarry, Town of Shelby, New York". The remaining three unsampled, on-site wells include OB-DH, DH2-05 and DH3-05. The locations of these three holes are also shown on Figure 3 of the Alpha report. Well OB-DH was an overburden hole that was not converted to a well, and it was never drilled down into the water bearing zones within the bedrock. Drill holes DH2-05 and DH3-05 were never cased through the overburden when drilled into the underlying rock; consequently, the overburden was allowed to collapse into the annular space after drilling was completed. This rendered those holes inaccessible for water level and quality assessments. The seven wells that were sampled provide a good representation of the quarry footprint.

Six of the seven wells were sampled by pumping at 3+ gallons per minute for approximately 40 to 90 minutes prior to sampling. The seventh well (DH5-05) was flowing when sampled. Samples were grabbed directly from the pump's discharge hose by using containers supplied by Test America Laboratories, Inc. or Adirondack Environment Services, Inc. The sample containers were then placed in an ice filled chest and taken to the laboratories. Details of the wells which are available for sampling have been previously summarized in the Ground Water Assessment report (Appendix 4) of the DEIS. The wells on the mine site are open rock holes; therefore, the water samples taken represent ground water from the entire rock mass to be mined (Lockport Formation). This simulates the conditions that will be present when the quarry hole is dewatered.

The water quality testing results are provided on the attached table along with the New York State standards for Class C surface water bodies and drinking water for the tested parameters. All of the streams surrounding the site are Class C surface water bodies. The results show that the ground water within the horizon to be mined contains total dissolved solids (TDS) that are near the New York State limit for Class C surface water and drinking water, and three of the wells are slightly above the limit. The rest of the data indicate that most of the TDS is the result of the calcium carbonate hardness, which is very high. The very high hardness indicates that the TDS is not the result of chloride, which is very low, and sulfate, which is at moderate levels that are well below the drinking water standards. There is no sulfate standard for Class C surface water. The hardness does not represent a potential environmental impact.

The water quality results show that the pH is within normal ranges and manganese is low. The results also show that iron is high, relative to the drinking water standards, and there was some indication of low concentrations of sulfides. The indicated sulfide is consistent with the slight H_2S odor observed during some of the aquifer testing conducted in the early stages of the project. Neither high iron or the low concentrations of sulfide will create an environmental impact as the result of the quarrying activities. Iron readily precipitates when exposed to oxygen. The sulfide will off gas as H_2S before the water ever leaves the property.

Table X
Ground Water Quality Testing Results
Proposed Frontier Stone Quarry
Town of Shelby, New York

Well	Date Sampled	Barium mg/l	Iron mg/l	Manganese mg/l	Hardness as $CaCO_3$ mg/l	TDS mg/l	TSS mg/l	pH SU	Sulfide mg/l	Sulfate mg/l	Chloride mg/l
Garage Well	May 11, 2012	0.036	2.7	0.080 B	310	370	4	8.17	<0.10►	41	97
Hole DH-4-98 (DH4-05)	May 11, 2012	0.29	0.63	0.025 B	690	420	42	7.70	<0.10►	84	46
MW-1	May 11, 2012	0.040	6.9	0.032 B	420	420	10	7.48	0.37►	120	18
PW-1	May 11, 2012	0.027	1.8	0.019 B	480	630	<4.0	7.42	0.6►	220	26
Hole DH 1-05	May 11, 2012	0.046	0.55	0.020 B	500	600	39	7.60	0.64►	220	7.7
Deep (DH5-05)	April 14, 2010	0.087	0.351	<0.020	395	490	2.5	7.3	0.18	104	28.5
Shallow (Barn)	April 14, 1010	0.058	0.118	0.042	491	652	7	7.1	<0.10	138	78
NYSDEC GWS		2.0	0.3*	0.3*	NS	500	NS	>6.5, <8.5	NS	250	250
NYSDEC Class C Surface Water Standard		NS	NS	NS	NS	500	NS	>6.5, <8.5	NS	NS	NS

Notes:
1) mg/l = milligrams per liter
2) SU = standard pH units
3) NYSDEC GWS = New York State Department of Environmental Conservation Ground Water Standards (NS = No standard).
4) * = NYSDEC GWS for the sum of iron and manganese = 0.5 mg/l.
5) B = Compound was found in the blank and the sample.
6) ►= Sulfide data from sampling on June 8, 2012.

The water quality results from the seven wells, which provide a good representation of the vertical and areal extent of the mine, indicate that there will not be significant levels of sodium or sulfate from the discharge of ground water. High levels of iron and low levels of sulfide will precipitate and/or dissipate, respectively, before leaving the property. The high calcium carbonate hardness (primary source of high TDS) is not a concern and will be diluted by direct rainfall. Concerns about ground water quality due to high levels of sodium, sulfate, and chloride, based on data from wells beyond the site and, in some cases, from geologic units that are not being mined at the site are addressed by site specific groundwater sampling data provided above.

Test sheets from the water quality analyses follow.

Comment 8: The dEIS does not contain sufficient information to allow the Department to adequately assess the magnitude of impacts to residential water supply wells that will result from drawdown caused by quarry dewatering. Measureable drawdown could extend 7000 ft from the proposed quarry and water levels within the Lockport could be drawn down below the top of rock at a distance of up to 4800 ft. from the quarry limit. The dEIS only presents information on four wells within this area of influence and those wells are located within areas that will likely experience significant drawdown. Limited information suggests that these wells are within the upper bedrock where the water bearing fractures are concentrated and impacts are most likely to occur. Of the remaining wells, only generalized assumptions are provided for approximately 40+ wells that are located within the potential area of influence.

Response: The Alpha report appended to the dEIS, provides a set of cross sections on Plate 2 that illustrate the projected maximum water level drawdowns. This maximum drawdown represents a theoretical condition when all phases have been mined and no water is retained in any of the phases. This is an extreme condition that will never occur since the initial phases will be allowed to fill with water before completion of the final phase. The water retained in the quarry phases will raise the water levels in the adjacent aquifer system; consequently, the maximum projected drawdown impacts will never occur.

Regardless of the fact that the maximum drawdown will not occur, an analysis was provided to show maximum impacts if the quarry was dewatered. The drawdown analysis provided on Plate 2 in the Alpha report shows that the drawdown is essentially zero at 7000 ft. from the quarry face. The drawdown is anticipated to be less than 1.0 ft. at Route 63 at a distance of 6,000 ft. This shows that there will be no impact to the wells along Route 63.

The areas of highest potential impact are concentrated near the mine perimeter within the area that is essentially defined by Sour Spring Road, the southern end of Edwards Road, the southern end of Bigford Road, Southward Road and Fletcher Chapel Road. The section of Fletcher Chapel Road of interest extends westward 1000 ft. from the intersection with Sour Spring Road and 1500 ft. east of the intersection with Southward Road. Figure 11 in the Alpha report shows the previously described roads and the location of residential streets and wells that were investigated by Continental Placer Inc. (CPI). The maximum drawdown will occur along Fletcher Chapel Road, adjacent to the mine, where water levels could decline approximately 40 ft. This should not be considered an impact to these residents, or for any residents along Fletcher Chapel, since a municipal water line extends along Fletcher Chapel Road.

The locations of greatest potential concern are for the residents along Sour Spring Road, which are identified as well number 16 and 17 on Figure 11 in the Alpha report. Well No 16 and 17 could experience maximum drawdowns of 33 and 26 ft., respectively. It is unlikely that this maximum potential impact will ever occur since the relatively small Phase I quarry is located closest to those residents. This part of the quarry will be used to store water while the rest of the quarry is expanded. This approach will minimize drawdown during mining of subsequent phases.

Adirondack Environmental Services, Inc

Date: *29-Apr-10*

CLIENT:	Continental Placer	**Client Sample ID:**	Shallow BARN WELL
Work Order:	100415044	**Collection Date:**	4/14/2010 2:00:00 PM
Reference:	Shelby, NY /	**Lab Sample ID:**	100415044-001
PO#:		**Matrix:**	WATER

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
HARDNESS SM 2340B (**Prep: SW3010A - 4/16/2010**)						Analyst: **KH**
Total Hardness (As CaCO3)	491	5		mg/L	1	4/28/2010
ICP METALS E200.7 (**Prep: SW3010A - 4/16/2010**)						Analyst: **KH**
Barium	0.058	0.010		mg/L	1	4/28/2010 1:10:00 PM
Iron	0.118	0.050	B	mg/L	1	4/28/2010 1:10:00 PM
Manganese	0.042	0.020		mg/L	1	4/28/2010 1:10:00 PM
ANIONS BY ION CHROMATOGRAPHY E300						Analyst: **SH**
Chloride	78.0	1.00		mg/L	1	4/22/2010
Sulfate	138	2.00		mg/L	1	4/22/2010
PH SM4500 H B						Analyst: **LS**
pH	7.1	1.0	H	pH Units	1	4/15/2010
SULFIDE SM4500 S2 D						Analyst: **PL**
Sulfide	< 0.10	0.10		mg/L	1	4/21/2010
TOTAL DISSOLVED SOLIDS SM2540C						Analyst: **PL**
TDS (Residue, Filterable)	652	5	H	mg/L	1	4/22/2010
TOTAL SUSPENDED SOLIDS SM2540 D						Analyst: **CJ**
TSS (Residue, Non-Filterable)	7.0	1.0		mg/L	1	4/16/2010

Qualifiers:

ND - Not Detected at the Reporting Limit
J - Analyte detected below quanititation limits
B - Analyte detected in the associated Method Blank
X - Value exceeds Maximum Contaminant Level
S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
T - Tentitively Identified Compound-Estimated Conc.
E - Value above quantitation range

Adirondack Environmental Services, Inc

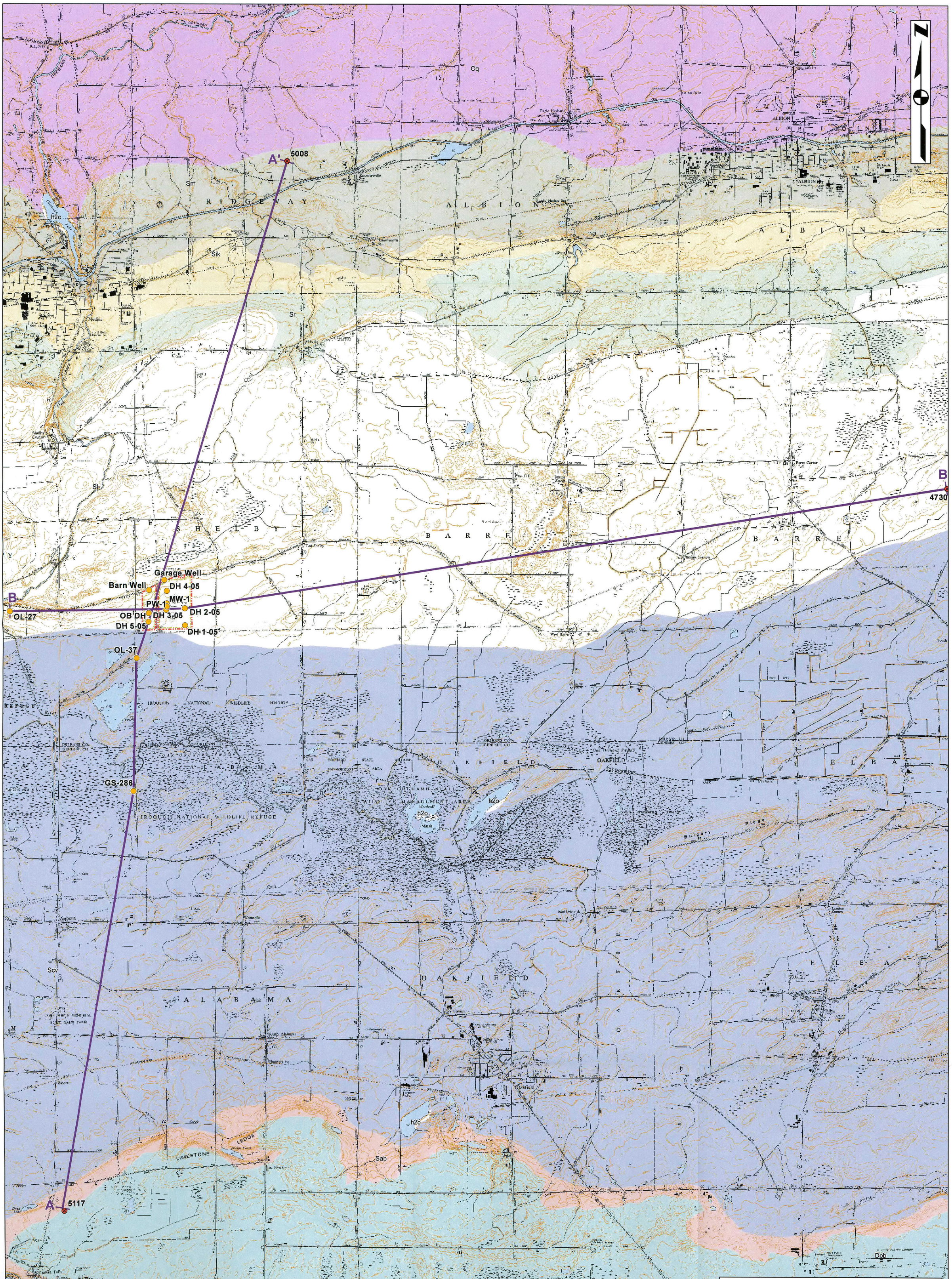
Date: *29-Apr-10*

CLIENT:	Continental Placer	**Client Sample ID:**	Deep DRILL HOLE 5-05
Work Order:	100415044	**Collection Date:**	4/14/2010 2:00:00 PM
Reference:	Shelby, NY /	**Lab Sample ID:**	100415044-002
PO#:		**Matrix:**	WATER

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
HARDNESS SM 2340B (**Prep: SW3010A - 4/16/2010**)						Analyst: **KH**
Total Hardness (As CaCO3)	395	5		mg/L	1	4/28/2010
ICP METALS E200.7 (**Prep: SW3010A - 4/16/2010**)						Analyst: **KH**
Barium	0.087	0.010		mg/L	1	4/28/2010 1:15:00 PM
Iron	0.351	0.050	B	mg/L	1	4/28/2010 1:15:00 PM
Manganese	< 0.020	0.020		mg/L	1	4/28/2010 1:15:00 PM
ANIONS BY ION CHROMATOGRAPHY E300						Analyst: **SH**
Chloride	28.5	1.00		mg/L	1	4/16/2010
Sulfate	104	2.00		mg/L	1	4/23/2010
PH SM4500 H B						Analyst: **LS**
pH	7.3	1.0	H	pH Units	1	4/15/2010
SULFIDE SM4500 S2 D						Analyst: **PL**
Sulfide	0.18	0.10		mg/L	1	4/21/2010
TOTAL DISSOLVED SOLIDS SM2540C						Analyst: **PL**
TDS (Residue, Filterable)	490	5	H	mg/L	1	4/22/2010
TOTAL SUSPENDED SOLIDS SM2540 D						Analyst: **CJ**
TSS (Residue, Non-Filterable)	2.5	1.0		mg/L	1	4/16/2010

Qualifiers:

- ND - Not Detected at the Reporting Limit
- J - Analyte detected below quanititation limits
- B - Analyte detected in the associated Method Blank
- X - Value exceeds Maximum Contaminant Level
- S - Spike Recovery outside accepted recovery limits
- R - RPD outside accepted recovery limits
- T - Tentitively Identified Compound-Estimated Conc.
- E - Value above quantitation range



Legend

- Monitoring Well
- Deep Drill Hole
- Regional_X-Sections
- Property Boundary
- Life of Mine Boundary

Bedrock Geology

Onondaga Formation
- Dob, Onondaga Limestone

Salina Group
- Sab, Akron Dolostone
- Scv, Camillus and Vernon Shales

Clinton Group (Lockport Formation)
- Sl, Guelph Dolostone
- Sr, Decew Dolostone
- Sik, Irondequoit Limestone

Medina Group
- Sm, Thorold Sandstone
- Oq, Queenston Formation

Notes:
-NYS Department of Transportation Raster Quadrangle
-Elevations are shown in feet above mean sea level.
-Bedrock Geology of New York State - Niagara Sheet. New York State Museum GIS Dataset based on Map and Chart Series 15. Publication_Date: 7/19/1999

ALPHA GEOSCIENCE
Alpha Proj. No. 08122

ATTACHMENT A

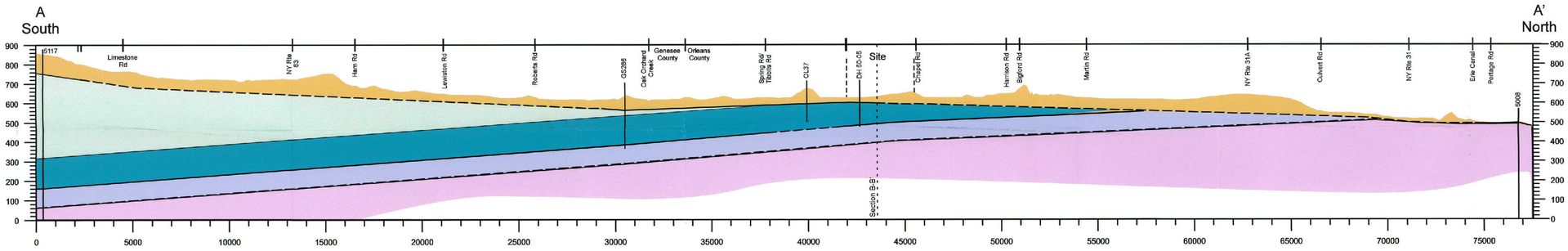
GEOLOGIC CROSS SECTION LOCATIONS

Frontier Stone LLC
Frontier Stone Quarry

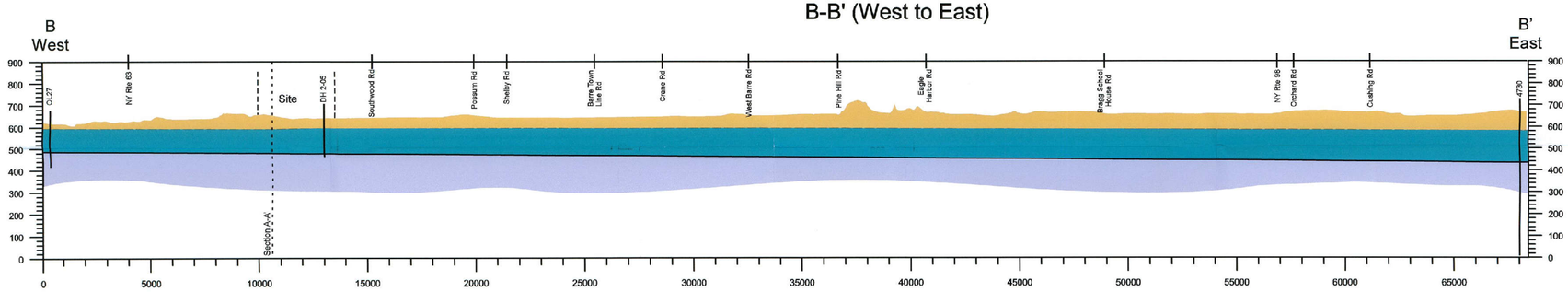
Town of Shelby
Orleans County, New York

Map Document: (Z:\projects\2008\08121 - 08140\08122- Frontier Stone\GIS\Regional Cross Section Map.mxd)
8/22/2008 -- 2:00:55 PM

A-A' (South to North)



B-B' (West to East)



LEGEND

- Glacial Overburden

Bedrock Geology

- Salina Group
- Lockport Formation
- Rochester Fm
- Medina Fm

STRIKE = N 88° E
Apparent Dip = 0.42° SSE
(5117 to GS286, top of Rochester)
~7.4 FT per 1000 FT

300
SCALE
(feet)
0
3000

ALPHA GEOSCIENCE
Project No. 08122

ATTACHMENT B

GEOLOGIC CROSS SECTIONS

FRONTIER STONE LLC
FRONTIER STONE QUARRY

Town of Shelby, Orleans County, New York

08122 - Frontier Stone\Cross-Sections\Cross-Section.cvx

5

Client Sample ID: GARAGE WELL — Lab Sample ID: 480-19955-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Barium	0.036		0.0020	0.00070	mg/L	1		6010B	Total/NA
Iron	2.7		0.050	0.019	mg/L	1		6010B	Total/NA
Manganese	0.080	B	0.0030	0.00040	mg/L	1		6010B	Total/NA
Chloride	97		0.50	0.28	mg/L	1		300.0	Total/NA
Sulfate	41		10	1.7	mg/L	5		300.0	Total/NA
Hardness as calcium carbonate	310		4.0	1.1	mg/L	1		SM 2340C	Total/NA
Total Dissolved Solids	370		10	4.0	mg/L	1		SM 2540C	Total/NA

Analyte	Result	Qualifier	RL	RL	Unit	Dil Fac	D	Method	Prep Type
pH	8.17		0.100	0.100	SU	1		9040B	Total/NA
Total Suspended Solids	4.0		4.0	4.0	mg/L	1		SM 2540D	Total/NA

Client Sample ID: HOLE DH-4-98 — Lab Sample ID: 480-19955-2

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Barium	0.29		0.0020	0.00070	mg/L	1		6010B	Total/NA
Iron	0.63		0.050	0.019	mg/L	1		6010B	Total/NA
Manganese	0.025	B	0.0030	0.00040	mg/L	1		6010B	Total/NA
Chloride	46		0.50	0.28	mg/L	1		300.0	Total/NA
Sulfate	84		10	1.7	mg/L	5		300.0	Total/NA
Hardness as calcium carbonate	690		4.0	1.1	mg/L	1		SM 2340C	Total/NA
Total Dissolved Solids	420		10	4.0	mg/L	1		SM 2540C	Total/NA

Analyte	Result	Qualifier	RL	RL	Unit	Dil Fac	D	Method	Prep Type
pH	7.70		0.100	0.100	SU	1		9040B	Total/NA
Total Suspended Solids	42		4.0	4.0	mg/L	1		SM 2540D	Total/NA

Client Sample ID: MW-1 — Lab Sample ID: 480-19955-3

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Barium	0.040		0.0020	0.00070	mg/L	1		6010B	Total/NA
Iron	6.9		0.050	0.019	mg/L	1		6010B	Total/NA
Manganese	0.032	B	0.0030	0.00040	mg/L	1		6010B	Total/NA
Chloride	18		0.50	0.28	mg/L	1		300.0	Total/NA
Sulfate	120		10	1.7	mg/L	5		300.0	Total/NA
Hardness as calcium carbonate	420		4.0	1.1	mg/L	1		SM 2340C	Total/NA
Total Dissolved Solids	420		10	4.0	mg/L	1		SM 2540C	Total/NA

Analyte	Result	Qualifier	RL	RL	Unit	Dil Fac	D	Method	Prep Type
pH	7.48		0.100	0.100	SU	1		9040B	Total/NA
Total Suspended Solids	10		4.0	4.0	mg/L	1		SM 2540D	Total/NA

Client Sample ID: PW-1 — Lab Sample ID: 480-19955-4

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Barium	0.027		0.0020	0.00070	mg/L	1		6010B	Total/NA
Iron	1.8		0.050	0.019	mg/L	1		6010B	Total/NA
Manganese	0.019	B	0.0030	0.00040	mg/L	1		6010B	Total/NA
Chloride	26		0.50	0.28	mg/L	1		300.0	Total/NA
Sulfate	220		10	1.7	mg/L	5		300.0	Total/NA
Hardness as calcium carbonate	480		4.0	1.1	mg/L	1		SM 2340C	Total/NA
Total Dissolved Solids	630		10	4.0	mg/L	1		SM 2540C	Total/NA

Analyte	Result	Qualifier	RL	RL	Unit	Dil Fac	D	Method	Prep Type
pH	7.42		0.100	0.100	SU	1		9040B	Total/NA

Client Sample ID: HOLE DH-1-05 — Lab Sample ID: 480-19955-5

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Barium	0.046		0.0020	0.00070	mg/L	1		6010B	Total/NA
Iron	0.55		0.050	0.019	mg/L	1		6010B	Total/NA
Manganese	0.020	B	0.0030	0.00040	mg/L	1		6010B	Total/NA
Chloride	7.7		0.50	0.28	mg/L	1		300.0	Total/NA
Sulfate	220		10	1.7	mg/L	5		300.0	Total/NA
Hardness as calcium carbonate	500		4.0	1.1	mg/L	1		SM 2340C	Total/NA
Total Dissolved Solids	600		10	4.0	mg/L	1		SM 2540C	Total/NA

Analyte	Result	Qualifier	RL	RL	Unit	Dil Fac	D	Method	Prep Type
pH	7.60		0.100	0.100	SU	1		9040B	Total/NA
Total Suspended Solids	39		4.0	4.0	mg/L	1		SM 2540D	Total/NA

General Chemistry

Client Sample ID: **DH-1**

Lab Sample ID: 480-21070-4 Date Sampled: 06/08/2012 1227
Client Matrix: Water Date Received: 06/08/2012 1405

Analyte	Result	Qual	Units	MDL	RL	Dil	Method
Sulfide	0.064	J	mg/L	0.052	0.10	1.0	SM 4500 S2 D

Analysis Batch: 480-68186 Analysis Date: 06/12/2012 1246

General Chemistry

Client Sample ID: **DH-4**

Lab Sample ID: 480-21070-1 Date Sampled: 06/08/2012 1104
Client Matrix: Water Date Received: 06/08/2012 1405

Analyte	Result	Qual	Units	MDL	RL	Dil	Method
Sulfide	ND		mg/L	0.052	0.10	1.0	SM 4500 S2 D

Analysis Batch: 480-68186 Analysis Date: 06/12/2012 1246

General Chemistry

Client Sample ID: **MW-1**

Lab Sample ID: 480-21070-2 Date Sampled: 06/08/2012 1130
Client Matrix: Water Date Received: 06/08/2012 1405

Analyte	Result	Qual	Units	MDL	RL	Dil	Method
Sulfide	0.37		mg/L	0.052	0.10	1.0	SM 4500 S2 D

Analysis Batch: 480-68186 Analysis Date: 06/12/2012 1246

General Chemistry

Client Sample ID: **PW-1**

Lab Sample ID: 480-21070-3 Date Sampled: 06/08/2012 1200
Client Matrix: Water Date Received: 06/08/2012 1405

Analyte	Result	Qual	Units	MDL	RL	Dil	Method
Sulfide	0.60		mg/L	0.052	0.10	1.0	SM 4500 S2 D

Analysis Batch: 480-68186 Analysis Date: 06/12/2012 1246

General Chemistry

Client Sample ID: **GARAGE WELL**

Lab Sample ID: 480-21070-5
Client Matrix: Water

Date Sampled: 06/08/2012 1250
Date Received: 06/08/2012 1405

Analyte	Result	Qual	Units	MDL	RL	Dil	Method
Sulfide	ND		mg/L	0.052	0.10	1.0	SM 4500 S2 D

Analysis Batch: 480-68186 Analysis Date: 06/12/2012 1246

The well on Southward Road, which is No. 19 on Alpha Figure 11, could experience a maximum mine related drawdown of 34 ft. This well has the greatest chance to experience impacts due to dewatering of the eastern phases of quarrying. Maximum drawdowns of 25 ft. are anticipated as worst case impacts at the southern end of Edwards and Bigford Roads. These impacts along Southward, Edwards and Bigford Roads, along with the wells on Sour Spring Road, will need to be monitored and mitigated if the water supplies are compromised. A monitoring plan will be prepared to provide early warning of drawdown near these existing wells. The plan will include a well survey to obtain information about wells in potential impact areas; however, these surveys are dependent on cooperation from each well owner.

Comment 9: The proposed groundwater monitoring program is insufficient. A plan shall be submitted which includes:

- **a. A schedule for increased frequency of monitoring during the first two years of quarry operations;**
- **b. Submissions of annual summary reports for the first 5 years of quarry operation;**
- **c. Confirmation that all monitoring data will be retained throughout the life of the project and made available to the Department upon request; and**
- **d. Frontier must commit to the installation of perimeter wells once existing wells are destroyed. Locations must be submitted for Department review and approval prior to installation.**

Response: A ground water monitoring program will be initiated at the start of mining. The program will consist of measuring water levels in existing site monitoring wells PW-1, MW-1, DH1-05, DH4-05, the barn well, the Garage well and four sets of new monitoring wells. Previous wells DH2-05,3-05 and 5-05 either no longer exist or will be destroyed during initial mining in Phase I.

Each of the four new monitoring well sets will consist of a shallow well (50 ft. deep) and a deep well (150 ft. deep). The shallow well will be constructed by setting casing into the top of the rock and leaving an open rock hole to 50 ft. The deep well will be cased to a depth of 50 ft. and left as an open rock hole to 150 ft. The well sets will be placed between the property line and quarry limit at locations between the quarry and residential wells of concern. One of these will be in the southwest corner of Phase I to address the residential wells identified as 16 and 17 on Alpha Figure 11. Another set will be placed in the northeast corner to address wells at the southern end of Bigford Road. The fourth set will be east of previous well DH2-05 to address the residential well on Southward Road that is identified as No. 19 on Alpha Figure 11. Frontier will install the northeastern and eastern well sets prior to mining in the phases east of the power line. The existing wells will provide monitoring information in the northeastern and eastern sectors until that time. The locations of all new monitoring wells will be submitted for review and approval by the NYSDEC prior to installation.

Monitoring will consist of measuring water levels every two months during the first two years of mining. The frequency will be reduced to quarterly thereafter. Annual monitoring reports will be submitted to the NYSDEC at the end of each calendar year for five years. Reporting will cease after five years; however, the applicant will maintain a database of quarterly measurements throughout the life of the mine.

Comment 10: It has been brought to the Department's attention that a potentially unique geologic feature exists within the IWWR that may be negatively impacted by drawdown caused by quarry dewatering. The USGS and Refuge staff have raised concerns over the Oak Orchard Acid Springs. These springs were discovered in the early 1800's and are the source of a unique bedrock groundwater discharge of water with a pH of approximately 2.0. An analysis must be provided to determine if the drawdown could potentially affect the acid springs and how they function. Additional information pertaining to these springs, as well as their location can be acquired from Refuge staff.

Response: A recent publication by the U.S. Geological Survey (USGS) (William M. Kappel and Matthew B. Jennings; 2012; Water Resources of the Iroquois National Wildlife refuge, Genesee and Orleans Counties, New York, 2009-2010; Scientific Investigation Report 2012-5027, 53 p) provides supplemental information that can be utilized with the Alpha report findings to assess potential impacts to the Orchard Oak Acid Springs. Although the exact locations of the Oak Orchard Acid

Springs were not provided, the USGS revealed that they are in the eastern half of the refuge near Oak Orchard Creek and their water quality is relatable to the shales of the Salina Group.

The location of the springs near Oak Orchard Creek, within the eastern half of the refuge, places the springs within the discharge zone of the bedrock aquifer system. The discharge zone interpretation is consistent with the analyses by both Alpha and the USGS. The assessment by the USGS that the water quality indicates a Salina shale source is also consistent with the springs being in the vicinity of the creek. A north-south cross section (see Section A-A' on Attachments A and B) shows that the basal portion of the Salina Group underlies the area occupied by Oak Orchard Creek, If the Acid Springs are on the south side of the creek, such as near USGS hole GS-286, then there would be nearly 30 feet of the Salina Group above the Lockport Group.

The geologic cross sections represented on Attachment A were derived from a combination of oil and gas well data (wells 5008, 5117 and 4730), USGS wells (OL-37, OL-42 and GS-286) and site wells (DH2-05 and DH5-05). The oil and gas well data are available in the publication "Deep Wells in New York State" (W.L. Kreidler, A.M. Van Tyne and K.M. Jorgensen; 1972; Bulletin Number 418A; New York State Museum and Science Services; 334 pp). The USGS well data are provided in the previously referenced 2012 publication by Kappel and Jennings.

The thickness of the Lockport Group provided on the north-south section (A-A') is based on a thickness of 155 feet derived from well 5117. None of the other available well data provided a complete section; however, a thickness of 155 is consistent with observations by CPI in their work in the region and is consistent with the general thickness that can be approximated from the outcrop. An apparent dip of 0.42° (7.4 ft./lOOO ft.) and strike of N 88'E were calculated by correlating the base of the Lockport Group between wells 5117, GS-286 and DH5-05. The result is similar to the east-west (N90° E) strike and dip to the south at 0.351° derived from the elevation of the contact between the Gasport and Decew Formations at wells 2-05 (498.0 ft. amsl), 4-05 (503.34 ft. amsl) and 5-05 (493.76 ft. amsl) provided by CPI. This is a sharper, more well defined contact than the base of the Lockport Group.

The north-south cross section shows that there are approximately 35 ft. of the Salina Group rock above the Lockport Group at the GS-286 well location. This projection from the cross section is consistent with the gamma log for GS-286 in the Kappel and Jennings (2012) publication that shows a similar thickness of apparent shaiey material in the upper part of a unit identified in the USGS report as the Guelph Formation, It is also consistent with the Bedrock Geology of New York State - Niagara Sheet, which indicates Oak Orchard Creek, near well GS-286, is underlain by Salina Group shale. The reassignment of the upper part of the rock to the Salina Group at GS-286 is also consistent with the observation that the USGS has an interpreted thickness of more than 170 ft. at GS-286 for the Lockport. This is thicker than the typical Lockport Group in the area.

The sulfide and other constituents contained in the Acid Springs are also consistent with water coming from the Vernon Formation and overlying Syracuse Formation of the lower part of the Salina Group. The USGS suggests the source is pyrite; however, the ubiquitous anhydrite within the Salina Group is a more likely source. Ground water flow on the south side of the creek is upward through the Salina Group and toward the discharge zones along the creek and; likewise, the flow on the north side of the creek is upward primarily through the Lockport and toward the discharge zones along the creek. The worst case drawdown analysis for the proposed quarry by Alpha shows that the quarry induced drawdown will not extend to the discharge zones along Oak Orchard Creek. The use of the initial phases of the quarry for water storage during the later phases will prevent the drawdown from reaching even the worst case represented in the Alpha report. It is apparent that there will be no drawdown impacts or disruption of flow from the ground water flow system associated with the acid springs.

Comment 11: Page 106 of Volume 1 of the DEIS states that the sump located in Phase 2 will pump water to a series of settling ponds or to Phase 1 of the quarry. Indicate if the phase 1 settling ponds are planned to be used for sump water coming from Phase 2. If this is the case, a flow pathway from the sump to the ponds must be clearly shown on the Mine Plan Map. If a series of settling ponds is planned to be constructed in the Phase 2 area in order to service the Phase 2 sump, construction details and the flow pathway to the ditch must be included on the Mine Plan Map.

Response: Water, which accumulates in Phase 2, will be pumped via pipe to the Phase 1 quarry. Any water which is in the Phase 1 hole will exit through three settling ponds previously shown in the DEIS Mining Plan Map. This pumping route will be clearly shown on the Mining Plan Map in the DEIS.

Comment 12: Page 14 of the MLUP states that process water settling ponds will be on a closed-loop system, eliminating the probability of offsite discharge of wash plant water. A schematic layout of the wash plant and closed loop settling pond system must be provided on the Mining Plan Map.

Response: A detailed diagram of a closed loop wash water system for a site that does not even yet have a processing plant on the ground is not feasible. It should also be understood that if wash water did leave the site it would be a violation of permit conditions. Frontier will not wash aggregate without submitting a MLRL permit modification.

Comment 13: In the absence of oxygen, sulfur-reducing and sulfate reducing bacterial derive energy from oxidizing hydrogen or organic molecules by reducing elemental sulfate to hydrogen sulfide. Sulfate-reducing bacteria will use the sulfates present in the water to oxidize the organic matter, producing hydrogen-suliide as a waste. Even though it is a natural process under anaerobic wetland conditions, excessive levels of hydrogen sulfide can have a negative impact on wetland systems. Reduced sulfur inhibits enzymes involved in photosynthesis and reduces the capacity of roots to respire both aerobically and anaernhieally. Sulfides have a negative effect on the primary productivity of plant communities. Water discharged into the IIWVR from the quarry sump may have elevated levels of these molecules. Information pertaining to this concern must be addressed and provided in the DEIS.

Response: The information above describes the reaction of sulfur **in the absence of oxygen.** However, these processes will not occur in quarry pump out water because of its exposure to oxygen. Water will initially be exposed to oxygen as it collects in the quarry floor, exposed to oxygen when it is pumped into the receiving basins, and further exposed to oxygen as it drains into the wetlands within the refuge. As a result of these aerobic conditions, elevated levels of these molecules will not occur.

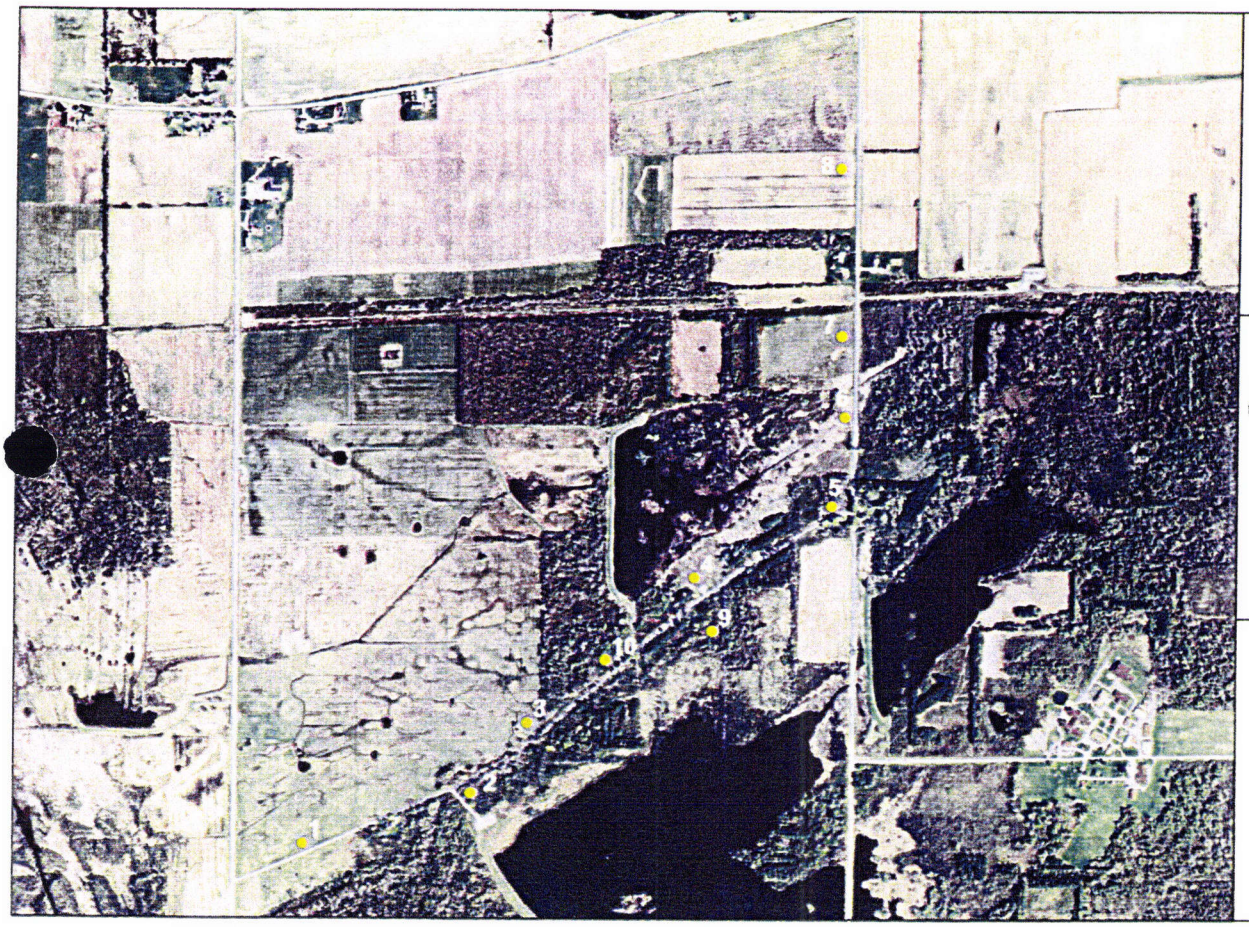
VEGETATION AND WILDLIFE RESOURCES AND IMPACT or ECOLOGICAL RESOURCES

Comment 14: The analysis of projected noise shown on Plate 3 only seems to address the noise generated by mining noises other than blasting. The plate should include the area of influence from blasting noise in addition to the other quarry noise sources. While it may be true that the total impact of blasting will only be 3 minutes per year, an analysis should still be done to determine the area of influence from this activity, and there should be a discussion of the habitat types and species of wildlife that may be affected by the noise generated by the blasting. The impacts to recreation in the area of influence from blasting noise should also be discussed.

Response: The area of influence (AOI) of blasting noise is provided above, along with a discussion of the frequency and duration of blasts. As indicated, a typical blast will attenuate to ambient dBA levels at a distance of about 500 feet into the INWR, with a blast likely occurring once or twice per week for duration of less than one second.

TES determined that the following vegetation cover -types were found in the AOI: scrub-shrub upland, deciduous forest upland, mixed forest upland, wet meadow, scrub-shrub wetland, and deciduous forest wetland (See Figure 1 -TES 2011). TES listed the breeding birds recorded within these cover types (see Figure 1 and Table 3).

Noise from blasting in the small AOI within the INWR is not expected to affect the wildlife species that would occur in the habitats of the area. The noise will be similar to a short duration of thunder rumble once per week, which would not result in a negative reaction from wildlife. Blasting noise will occur for a very short duration (less than 1 second per blast) and would be conducted once or twice per week. The blast,



NORTH

0' 400' 800'

APPROXIMATE SCALE IN FEET

Aerial Photograph obtained from NYS GIS Clearinghouse 2010

Figure Prepared by Terrestrial Environmental Specialists, Inc.

Figure 1

Location of Breeding Bird Plots Conducted 5/31/12

Table 3

Birds Recorded Per 10-Minute Point Count on lands including the Iroquois National Wildlife Refuge on Oak Orchard Ridge Road and Sour Springs Road May 31, 2012

Town of Shelby

Cover Type:	SSU	DFU	OF	AG	EW
Great blue heron					
Ardea herodias	6.00		1.00		
Great egret					
Casmerodius albus	0.50		0.50		
Turkey Vulture					
Cathartes aura					1.00
Canada goose					
Branta canadensis	1.00				
Wood duck					
Aix sponsa	1.00				
Mallard					
Anas platyrhynchos	1.00		1.00		
Osprey					
Pandion haliaetus	0.50				
Killdeer					
Charadrius vociferus				1.00	1.00
Ring-billed gull					
Larus delawarensis		0.25			
Red-bellied woodpecker					
Melanerpes carolinus		0.25			

1

Table 3 (cont.)

Cover Type:	SSU	DFU	OF	AG	EW
Downy woodpecker *Picoides pubescens*		0.25			1.00
Eastern wood-pewee *Contopus virens*		0.50			
Willow flycatcher *Empidonax traillii*	0.50		1.50		1.00
Great crested flycatcher *Myiarchus crinitus*	0.50	0.25			
Eastern kingbird *Tyrannus tyrannus*	0.50	0.25	1.00		
Tree swallow *Tachycineta bicolor*	2.00		1.50		
Blue jay *Cyanocitta cristata*	1.00				
American crow *Corvus brachyrhynchos*	1.00	0.75			1.00
Black-capped chickadee *Parus atricapillus*		0.25			
White-breasted nuthatch *Sitta carolinensis*		0.25			
Marsh wren *Cistothorus palustris*					2.00
American robin *Turdus migratorius*	1.00	0.50	1.00		3.00

Table 3 (cont.)

Cover Type:	SSU	DFU	OF	AG	EW
Gray catbird *Dumetella carolinensis*	0.50	0.25			
European starling *Sturnus vulgaris*				19.00	
Red-eyed vireo *Vireo olivaceus*		0.75			
Yellow warbler *Dendroica petechia*		1.75	1.00		3.00
Chestnut-sided warbler *Dendroica pensylvanica*	1.00				
Cerulean warbler *Dendroica cerulea*		0.25			
American redstart *Setophaga ruticilla*	0.50				
Common yellowthroat *Geothlypis trichas*	4.50	1.25	2.00		1.00
Hooded warbler *Wilsonia citrina*		0.50			
Scarlet tanager *Piranga olivacea*		0.25			
Northern cardinal *Cardinalis cardinalis*		0.50			1.00
Rose-breasted grosbeak *Pheucticus ludovicianus*		0.25	0.50		1.00

Table 3 (cont.)

Cover Type:	SSU	DFU	OF	AG	EW
Indigo bunting *Passerina cyanea*	0.50		0.50		
Chipping sparrow *Spizella passerina*	0.50		1.00	2.00	
Field sparrow *Spizella pusilla*			1.00		
Savannah sparrow *Passerculus sandwichensis*			1.00	1.00	
Song sparrow *Melospiza melodia*	1.50	0.75	1.50		1.00
Swamp sparrow *Melospiza georgiana*	0.50				4.00
Bobolink *Dolichonyx oryzivorus*	1.00		1.50		1.00
Red-winged blackbird *Agelaius phoeniceus*	2.00	0.25	1.00	3.00	7.00
Common grackle *Quiscalus quiscula*	1.50			1.00	
Brown-headed cowbird *Molothrus ater*	1.00	0.75	0.50	6.00	
Baltimore oriole *Icterus galbula*		0.25		1.00	
American goldfinch *Carduelis tristis*			2.50		

Table 3 (cont.)

Cover Type:	SSU	DFU	OF	AG	EW
Total Number of Species:	25	23	19	8	15
Number of 10 Minute Samples:	2	4	2	1	1
Total Number of Birds Per 10 Minute Sample:	31.50	11.25	21.50	34.00	29.00

unlike the explosions documented in our literature review, will be noise similar to thunder from a thunderstorm. According to the analysis provided by Continental Placer, the blast will attenuate at a distance of 500 feet in the INWR with a dBA of 52.15. As this blast is similar to thunder, we do not anticipate negative reactions from wildlife.

Comment 15: Further information is needed as it pertains to the conclusion on Page 24 that "noise from the quarry would not affect resident or migrating wildlife on INWR". This statement appears to be based solely on noise other than blasting. This statement also seems to contradict the following:

a. **Page 24 "The timing of overburden removal could affect wildlife. The removal of overburden prior to blasting the rock could take several months".**

b. **Page 22 "Noise and vibrations that result from blasting can potentially affect wildlife. Loud abrupt noises can startle animals, causing them to flush from a perch, leave a foraging area, or abandon a nest. This can result in increased energy expenditure, reduced foraging time, and lowered reproductive output".**

Response: Construction of the berm occurs during the first phase of quarry development and is a temporary impact likely limited to the first year of quarry work. The construction of the berm is designed to minimize off-site noise impacts and based on the noise and vibration maps it meets the purpose.

The statement on page 22 recognizes that noise and vibrations can potentially affect wildlife, but as stated it depends on the level or loudness of the noise. "Loud abrupt noises" can have an effect. However, as the projected level of noise and vibrations from the proposed quarry including blasting are similar to levels from existing farming activity and natural events (thunder), those noise impacts are not in the category of noises identified on page 22. The conclusions from page 24 are valid.

Comment 16: On page 22, the articles cited in the Literature Review have some relevance to the DEIS, however, they do not necessarily fully support the statement that "blasting and firing activities had little effect on abundance, behavior, and nesting success." Please provide further information as to how this conclusion was determined.

Response: TES provided a literature review of noise and vibration, but the available literature is primarily associated with military activity at bombing ranges. These references were added at the request of the NYSDEC and the USFWS. There are no studies of quarry activities such as this pre- and post-construction. The literature presented is limited to studies with much greater disturbance potential to wildlife than the "rumble of equipment" within a quarry and the occasional blast. It was our conclusion that there was little effect on abundance, behavior, and nesting success at the bombing ranges noted in the articles reviewed, and disturbance to wildlife adjacent to the quarry operation would not occur based on the much lower noise levels projected.

Comment 17: Also, page 24 states that blasting will occur once per week, whereas page 14 in Volume 1 says that it could occur once or perhaps twice per week. If blasting could occur more than once per week this information should be included throughout the document and the possible impacts of this should be included in the analysis of blasting impacts on wildlife and recreation.

Response: Based on the noise and vibration levels projected from blasting and its short duration, TES does not consider the blasting to be a significant impact on wildlife whether it occurs once or twice a week.

Comment 18: Page 11 (also page 134 of Volume 1). In the discussion regarding potential Bald Eagle Habitat, the statements regarding the fact that there is little mature forested habitat in the vicinity of the site do not take into account that many of these trees may become large enough during the life of the mine. Also, the fact that Center Marsh did not have any water in it at the time of the study period is irrelevant considering that these marshes are drawn down periodically to improve habitat conditions. Center Marsh's potential as eagle nesting habitat should be assessed.

Response: Center Marsh does not currently provide optimum nesting habitat for bald eagles. Center Marsh might provide nesting bald eagle habitat in the future when the trees grow larger. Currently there are 19 impoundments on INWR of which two contain bald eagle nests. There are numerous locations for bald eagles to nest on INWR. In addition, the bald eagle has over 225 nesting locations in New York State and has been delisted from the federal Endangered Species Act. Many of these nests are near roadways, residential areas, and other areas of human activity. The nearest open water area of Center marsh is approximately 1500 feet south of the southern quarry property boundary. Even if future nesting habitat developed, operation of the quarry would not affect the establishment of an eagle nest at Center Marsh. We understand that the USFWS significantly alters the hydrology of Center Marsh and other impounded wetland areas in the INWR on a recurring basis.

Comment 19: Page 25. The statement "The threshold for disturbance has been established by the current road traffic and since volumes will not increase significantly, there should be no effect on wildlife" is not necessarily supported. The analysis of the impacts of truck traffic on wildlife should perhaps look at the percent increase in vehicles. Oak Orchard Ridge Road currently has a very low volume of traffic (the traffic study did not even collect data at the Sour Springs Road/Oak Orchard Ridge Road intersection due to "very low volumes"). An increase to 30 vehicles per hour could potentially be significant especially if you are talking about going from a few smaller vehicles to 30 large trucks.

Response: Truck traffic may be as high as 30 one-way trips per hour or 60 trucks per hour passing a given point. Over an eight-hour day, this would be 480 trucks passing a given point. From a traffic volume standpoint, this is a very low number, although it may be a significant increase when expressed as a percentage of existing traffic volume. The increased truck traffic may result in an increase in wildlife-vehicular collisions and, as indicated on the revised Plate 3, there would be an increase in noise from the trucks. However, based on our observations of wildlife usage near highways of much greater traffic volume, it is the opinion of TES that the truck traffic would not affect wildlife usage in the habitats adjacent to the roadways in the INWR.

Comment 20: In addition, concluding that traffic on route 63 has not had a notable impact on wildlife despite the fact that it bisects the refuge solely based on the information that Route 63 goes by a field in which Henslow's sparrows were noted is not valid. The field where Henslow's nested is a large field, and disturbance from the roadway may impact only a portion of that field. In addition there is no comparison between wildlife use at the site before and after route 63 was constructed. Further assessment is needed regarding mine traffic impacts upon wildlife within the refuge.

Response: Route 63 was present before the INWR was established. TES has no clear indication that Henslow's sparrow has been documented nesting in this field in recent years. TES conducted a breeding bird survey next to the Sour Springs Road and Oak Orchard Ridge Road on May 31, 2012 (see results presented in attached Table 3 and Figure 1). Representative nesting bird species found in multiple communities in those habitats include: Eastern kingbird, red-winged blackbird, common yellowthroat, American robin, and song sparrow. These species were recorded next to the road despite considerable ambient' noise from Route 63. It is TES's professional opinion that additional truck traffic would not affect nesting birds on Sour Springs and Oak Orchard Ridge Roads.

Comment 21: Page 10. Contrary to the dEIS which states that there are three known bald eagle nests on the complex composed of Iroquois NWR, and Tonawanda and Oak Orchard WMA, there have been four nests in the complex since 2010.

Response: As referenced on page 10 of the TES report, this information was obtained from the INWR Draft Comprehensive Plan and Environmental Assessment (USFWS 2010, Page 3-22), which apparently was in error.

HYDROGEOLOGIC INVESTIGATION OF THE PROPOSED FRONTIER STONE QUARRY, TOWN OF SHELBY, NEW YORK

Comment 22: Discharge rates are still presented only as annualized averages. Seasonal flow rates should be included as well as a

discussion of the cumulative impacts that will result from continuous pumping of water onto the refuge during phase 1. At maximum buildout of Phase 1 the annualized average ground water addition is 251 gpm which equates to 1.3 acre feet/day being pumped into School House marsh. What will be the maximum combined flow of water from spring runoff/sncwmclt and the additional water from quarry dewatering?

What are the impacts of this constant flow of water into the marsh and if this water is simply allowed to pass through the marsh, what are the impacts of this additional water to the habitat and infrastructure to the west of School House marsh? Will this result in ponding in the fields east of route 63 and impacts to grassland habitat during the nesting season? Will the culvert(s) under Route 63 be able to handle the increase in water during the spring? What will be the impact of increased flow in School House marsh and the areas to the west of the marsh during the spring when they are already stressed by high water levels?

Response: As discussed in the response to Comment 6, the highest quarry discharge rates from maximum buildout of Phase 1 will be in the spring and the lowest will be at the end of the summer. The quarry discharge rate for the combined snow melt, precipitation and ground water inflow in March is anticipated to be 385.6 gpm. The lowest ground water inflow will occur in September. The quarry pumping rate in September is anticipated to be 197.34 gpm. The seasonal discharges for the rest of an average year will range between this seasonal high and low. These seasonal high and low values will be discharged to Basin 1, which will continue to yield an average runoff of 633.35 gpm and 229.58 gpm for March and September, respectively from the 391.7 acres that will remain undisturbed (see Water Budget Summary Table for comparisons). The March runoff is based on the assumption of meltdown of snow accumulated for the three previous months combined with March rainfall and no evaporation. Both of these results show that the quarry discharge is less than the ongoing drainage to the refuge from Basin 1.

Comment 23: Comment 6 from the 2009 DEC letter states that the analysis of impact should be augmented by a more concise estimate of seasonal highs and a management plan developed jointly by Frontier Stone and the refuge manager. Wording on Page 20 of the hydrogeologic investigation regarding communication between quarry operation and the refuge has been removed and the only mention of coordination with the refuge is in the conclusion on page 23 which states that "the rate can be changed seasonally in a controlled manner in coordination with the Wildlife refuge," No details on how this rate can be changed are included and it does not appear that discussions with the refuge staff on this matter have taken place to date.

Response: Impacts of the discharge of pump out water to down basin systems are discussed in the response to NYSDEC Comments 4 and 6. As discussed, potential changes to the USFWS-controlled, 74-acre Schoolhouse Marsh are expected to be fractions of an inch in water level and fractions of an acre in size. These minor changes are not expected to noticeably impact the wetland system. Drainage features west of Schoolhouse Marsh, including the culvert under Route 63, were assessed and are of more than sufficient capacity to accommodate the additional discharge water. Ponding in the fields east of Route 63 would not be expected to differ from existing seasonal fluctuations. There would not be any impact to the grassland habitat east or west of Route 63 during the nesting season. These upland grassland habitats are sufficiently above the elevation of the ditch system in this area so that the minor increase from quarry discharge water would not affect these areas.

Spring seasonal high discharge rates are provided in the responses to NYSDEC Comments 4 and 6. The culverts under Route 63 would accommodate the additional quarry pump out water during spring.

Potential impacts from the increased water discharge to the School Marsh wetland system during spring are discussed in the response to Comments 4 and 6. Seasonal discharge are expected to be highest in March when the rate of discharge would be 366 gpm. As discussed, such a discharge could potentially increase the water level in the USFWS-controlled Schoolhouse Marsh by an estimated 0.26 inch, which could potentially result in an increase in the size of the wetland system by 0.27 acre. These extremely minor changes are not expected to result in a noticeable change in the wetland complex or areas further down basin.

High spring water levels are a natural occurrence in wetland systems in this area. It is not a stress to the system, but can actually provide habitat diversity benefits. The very minor changes from the increased discharge water would not be expected to result in any noticeable impact during these seasonal high water periods.

Comment 24: The Iroquois National Wildlife Refuge and the U.S. Geological Survey may also be commenting on this proposal. I will forward their comments when available.

Response: Comments from the Refuge manager are addressed below.

UNITED STATES DEPARTMENT OF INTERIOR
IROQUOIS NATIONAL WILDLIFE REFUGE
COMMENTS

Comment: Page 14. 1.3.2.2: In this section as well as others throughout the dEIS and related documents the applicant states that the quarry will pump 2S1 gpm of water into the agriculture ditch that flows onto the Refuge. This appears to be an average gpm measured over a year or many years. In order to properly review the proposal it is necessary that the applicant provide additional data on the maximum and minimum estimated gpm of water that will be pumped onto the Refuge and the duration that these pumping rates may be maintained. Additionally, any expected change in the maximum or minimum pumping rate during the life of the quarry should be identified.

Response: The maximum discharge to the agricultural ditch will occur toward the end of Phase 1 due to the need to maintain a dry quarry. The discharge will not exceed 251 gpm thereafter due to the ability to use Phase 1 and the subsequent completed phases for water storage.

The discharge rate of 251 gpm represents an annual average ground water discharge based on a water budget derived from average monthly rainfall from the nearby Albion 2 NE NOAA weather monitoring station. The actual monthly discharges during Phase 1 will vary seasonally with the highest in March and the lowest in September (see Water Budget Summary Table for comparisons). The average discharge from ground water in March toward the end of Phase 1 mining is anticipated to be approximately 310.4 gpm. The average ground water discharge during these months will be less than 310.4 gpm due to the flow reducing effects of using the completed quarry phases for water storage. (See also response to Comment 6).

Comment: Page 16. 1.3.2.7: The applicant acknowledges a potential annoyance to wildlife watchers at Schoolhouse Marsh overlook, but then states that "...truck traffic volumes will be minimal when compared to nearby traffic on Route 63...". While this may be true, the Refuge does not have any overlooks on Route 63, so this information is irrelevant to a discussion of potential traffic effects on Refuge visitors at overlooks.

Response: As noted in the response to Comment 3, 50 percent of the visits to the refuge will occur when there is little to no quarry activity.

While there will be a noise increase for the Schoolhouse Marsh overlook, this is not the case for the Ringneck overlook. Sound readings were taken of tractor trailers and dump trucks in a highway next to an active quarry. The average sound level (Leq) was 74 dBA at 25 feet from the roadway. The Ringneck overlook is approximately 400± feet from Oak Orchard Ridge Road. Using the inverse square law, distance alone will reduce the sound level 24 dBA and vegetation a conservative 2 dBA for a total dBA reduction of *26*± dBA. The measured sound level at the Ringneck overlook was 48 dBA when there was no mining activity, the same as that projected. This limited impact can be further mitigated, as stated in Comment 3, by utilizing a proposed alternative vehicle route on Fletcher Chapel Road.

Comment: Page 16. 1.3.3.2: The applicant references the map outlining an Area of Influence (A 01) around the quarry for noise and vibration. This map appears to include a noise area for regular quarry sounds excluding blasting. We would like to see the noise AOI include blasting. Additionally, this map and associated analysis and discussion should include an AOI along Sour Springs and Oak Orchard Ridge Roads to identify potential disturbance from the increased truck traffic, which the applicant says could be as high as 30 trucks per hour. Also, we it should be clarified if this is 3 trucks driving down the road per hour or if it is 30 trucks driving in and out of the quarry per hour, effectively resulting in 60 truck trips down the road per hour.

Response: (See response to Comment 3 and 5).

Comment: Page 17. 1.3.3.2: In the hiking section, the applicant states that there are no hiking trails within the AOI. While this statement is true, during periods of time when the Refuge is open to off-trail hiking, visitors are allowed to hike in areas without designated trails.

In the bird watching section, the applicant states that bird watching activity focuses on migratory waterfowl at the two refuge overlooks on Oak Orchard Ridge Road and then concludes that even though there will be an increase in truck traffic by these two overlooks, "...the potential for disturbance to bird watchers is minimal." Given the fact that two of the four overlooks on the refuge are located on this truck route and also that the applicant has not evaluated the potential noise and disturbance associated with this increase in truck traffic, it is unclear to us how their conclusion of minimal disturbance can be drawn.

In the hunting section, the applicant states that "deer hunting season does not coincide with the quarry's normal operations season". According to the applicant on page 6, the quarry's normal operations season will be from April to November. It is unclear if this means November 1 or November 30. Regardless the archery deer season on the Refuge begins on or about October 15 and the Deer Management Plan recently adopted by NYSDEC proposes moving opening day of the deer season to October 1, beginning in 2012. There will be overlap between the quarry operation season and the deer hunting season.

Additionally, the applicant only mentions deer and updated game bird hunting in the hunting section. Other types of hunting occur on the Refuge in the area adjacent to the quarry.

The applicant states that "hunting has not been impacted by numerous quarry settings elsewhere in the region", but offers no basis for this statement. Many hunters, particularly bow hunters, prefer to hunt in a settling with minimal noise and disturbance. It seems unlikely that an area near an active quarry would provide the kind of solitude required for this kind of hunting experience.

Response: While hiking may be allowed, there are dense stands of shrubs and wetland areas in the AOL There was no indication that visitors to the INWR use this area.

The increase in truck traffic could have an impact on wildlife watchers at the Schoolhouse Marsh overlook based on the increased volume and the rise of ambient noise levels noted on revised Plate 3. The Ringneck Marsh overlook is shielded from the road by a dense tree and shrub canopy and interference with recreational wildlife watchers would be much less.

There will be some overlap in the hunting seasons. Other types of hunting could occur in the AOI; however, waterfowl hunting would occur in areas with adequate water and adequate cover for hunters.

During the March 19th meeting, Department staff also requested that Frontier consider accessing the site using Fletcher Chapel Road. Based upon this recommendation and the consideration of a potential 30 truck trip condition, Frontier has obtained a traffic study, which analyzes the use of Fletcher Chapel Road based upon 30 truck trips per hour. This study resulted in the conclusion that the use of Fletcher Chapel is a viable alternative.

This plan (i.e. using Fletcher Chapel) offers many different scenarios for traffic distribution. Traffic could be split between Sour Springs/Oak Orchard Ridge Road (existing plan) and a Sour Springs/Fletcher Chapel route, or the traffic could directly access Fletcher Chapel from the site. Any percentage could be allocated to these scenarios, or all could just use only Fletcher Chapel (note: an access could be made out the north side of the mine site along the west side of the utility line onto Fletcher Chapel). If the Fletcher Chapel or Sour Springs/Fletcher Chapel access were used, it would mitigate mine related traffic within the refuge.

The following traffic-related statistic was presented in the Iroquois National Wildlife Refuge Comprehensive Conservation Plan:

"The Refuge receives more than 28,000 visits on the trails and overlooks each year. The majority of Refuge visitors come during the spring, early summer and fall months to take advantage of favorable trail conditions and opportunities for viewing annual spring and fall bird migrations and enjoy the brilliance of New York's fall foliage. The Refuge receives nearly half its annual visitation during the months of March and April."

The forgoing statistic indicates that the Refuge is heavily used during the months of March and April. Because of climatic conditions, construction activity typically has an operating season which begins in mid to late April, and peaks in mid to late summer. Peak mine related traffic activity will not coincide with peak use of the refuge by the public.

Comment: Page 36. 3.1: Nearly all of this text appears to be copied from the Refuge's Draft Comprehensive Conservation Plan (CCP). We request this section be changed in the following ways. First, the applicant should put quotation marks around *te^t* that has been copied verbatim from another document and provide a citation for these quotes and also for information paraphrased from another document. Secondly, the Refuge CCP states that there are 19 managed freshwater impoundments, not 10.

Response: Corrected - 19 impoundments rather than 10. Quotation marks and citations will be provided for any material used verbatim.

Comment: Page 50. 3.1.2.2: Table 4 should include the overall depth of the wells.

Response: The purpose of Table 4 is to establish groundwater depths and elevations, not to document well construction. The reader is referred to Table 4.6 of the Groundwater Assessment report (Appendix 4 of the DEIS) for well depths.

Comment: Page 53. 3.1.2.2: The water quality assessment seems to be based on two water samples taken from unknown depths. A more thorough water sampling study should be conducted.

Response: (See Comment 7).

Comment: Page 63. 3.1.4.1: The applicant states "no state-regulated wetlands are mapped on or near the site". While it may be accurate that there are no state-regulated wetlands on site, there are state-regulated wetlands on the Refuge within a few hundred feet of the site and potential secondary impacts to these wetlands should be evaluated.

Response: As indicated, no state-regulated wetlands are mapped on or near the site. The closest mapped state-regulated wetland (Wetland OK-1) is on the Refuge property, approximately 300 feet south of the southern property line of the quarry, which is part of the USFWS-controlled and manipulated Center Marsh system. This system is not proposed to receive pump out water from the quarry.

The other NYSDEC mapped wetland southwest of the quarry site is Wetland MD-3, which is mapped as occurring approximately 1,500 feet southwest of the southern property line of the quarry. This mapped wetland is part of the USFWS-controlled and manipulated Schoolhouse Marsh system. Assessments of any potential impacts to this wetland system are discussed in response to NYSDEC Comments 4 and 6.

Page 65. 3.1.4.2: The applicant suggests that Center Marsh being periodically dewatered somehow makes it less attractive to bald eagles. All four eagle nests that are currently located within the wetland complex are located on impoundments that are periodically dewatered and they continue to nest successfully nearly every year. Dewatering an impoundment helps to regenerate the marsh and it in fact concentrates fish making it easier for eagles to catch prey. In impoundments where there is no active nest, many eagles (10+) have been seen foraging at one time. Additionally, Center Marsh contains a large and deep borrow ditch adjacent to the dike that nearly always contains open water, even when the rest of the pool is dewatered.

Response: No bald eagles have established a nest in Center Marsh. Based on USFWS statements, bald eagles nest in impoundments that have a regular supply of water. As there are 19 impoundments on the INWR there does not appear to be a lack of available nesting habitat for bald eagles. Regardless of dewatering, the areas of potential future nest locations at Center Marsh are more than 1,500 feet from the southern quarry boundary.

Page 66. 3.1.4.2: We were unable to find a Holt and Leasure (200S) reference in the Birds of North America (SNA). However, the Short-eared Owl section of the Birds of North America (No. 62) (2006) is available online and it appears that this is the reference that the applicant used. The applicant suggests that based on BNA No. 62 "short-eared owls are also known to frequent mines and quarries." In fact, BNA 62 states that short-eared owls "may use" gravel pits and rock quarries. This information is cited from an earlier paper written by R. J. Clark (1975) in which he lists "abandoned limestone quarry partially filled with stumps" and "abandoned gravel pit" as places where he found short-eared owl winter assemblages. Both of these areas are far different than the active stone quarry being proposed and to suggest that this area will somehow be attractive to short-eared owls

once quarrying operations commence is misleading.

Response: Corrected. Holt and Leasure should be cited as 2006 as this reference was recently updated since our first use of this reference. Short-eared owls do not use the proposed quarry site. The applicant has not made any inferences regarding short-eared owls.

Comment: Page 96. 3.2.6: The applicant states that "sound levels at the overlooks will be mainly generated by traffic on Oak Orchard Ridge Road and background sounds from Route 63...sound levels are anticipated to be similar to...S-1...located on Sour Springs Road." Both overlooks are located much farther away from farm machinery than is site S-l and we believe they may have significantly lower ambient noise levels. We suggest additional ambient noise readings be collected at both School house and Ringneck Overlooks.

Response: As previously shown on Plate #2 of the DEIS, ambient noise levels have been recorded for the overlooks. The sound level at location S-l on Sour Springs Road was 53.9 dBA Leq and a second midday reading of 53.7 dBA; the sound level at the Schoolhouse overlook is 54.8 dBA and Ringneck is 48.0 dBA (see also response to Comment # Page 16. 1.3.2.7).

Comment: Page 126. 4.1.2.2.4: The analysis in item 2 assumes that the water level in Schoolhouse Marsh is 6 inches below the top of the "weir", allowing 6 inches of storage capacity in the marsh during a storm event. This is inaccurate since the water level in the marsh is often at or above the "weir: level. Ultimately, there is no way to know what the water level will be prior to a storm event. This analysis should be recalculated with the assumption that there is no water storage capacity available in the marsh at the start of a storm event.

Response: The analysis did not assume that the water level was 6 inches below the top of the weir; it was measured by a GPS instrument. This, however, is a moot point. To analyze the effects of a storm event, a datum has to be assumed to measure the effects of a storm in a measureable way. Thus, the existing observed condition was used. This proved ideal; that is, it enabled an actual measurable effect on the wetland, albeit slight. If the assumption is made that the marsh level is at the top of the weir (i.e. no storage), the storm events will merely discharge over the weir and out of the pond creating **no additional impact** to the marsh beyond the natural storm event. There is no assertion implied that there is storage capacity available or wanted in the pond, this is up to the discretion of Refuge personnel.

The point of the Storm Event Drainage Summary, Drainage Basin 1 table in the DEIS is that even in a 5, 10 and 25 year storm event, the quarry contributes 2.0 to 0.3 percent of the natural drainage to the Refuge. This increase will be an insignificant effect on the marsh. These increases have been calculated in a measurable way by computer modeling.

Comment: Page 128. 4.1.2.2.4: The applicant states that "calculations indicate that the existing system has sufficient design capacity to transmit drainage, including storm events, without adverse structural issues." This statement seems to be based solely on analysis from Schoolhouse Marsh. However, the flow of water from the quarry site travels through Schoolhouse Marsh, immediately to another, smaller wetland, then through a series of ditches within a managed grassland, then under State Route 77, then either into another managed wetland or through a 24" culvert, then into a large managed impoundment where it mixes with water from Oak Orchard Creek and eventually passes through a large water control structure and off the north boundary of the Refuge. We suggest the applicant provide detailed analysis of the potential hydrological impact to this entire wetland system, as it will all be affected by any change in water quantity or quality.

Response: The drainage system from Schoolhouse Marsh to Route 63 was studied. The drainageway consists of a series of ponds, a weir and culverts. All culverts are 24 inches in diameter. As cited in the previous response, the project contributes only 0.3 percent of the flow in a 25-year storm event. The HydroCAD modeling shows that in a 25-year storm event, 2.66 cfs of drainage exits Schoolhouse Marsh via the weir that connects to a 24 inch culvert through the dike. The 24 inch culvert has the capacity to handle 17.96 cfs, or roughly 6.7 times the amount of the 25-year storm event based upon the specific dynamics of this drainage basin. The entire system past Schoolhouse Marsh, composed likewise of 24 inch culverts, has capacity to handle the storm events based upon the modeling data.

The quantity of water from the quarry is insignificant in relationship to the area of the basin and the quantity of water generated from a storm event. No impacts are anticipated given the minimal contribution of quarry water during storm events.

In regard to water quality, see response to Comment 7. From a practical standpoint, a 25-year storm event will generate 65,130 gpm; this will easily dilute 251 gpm from the quarry pump-out. Additionally, from a historical perspective, there are no reports of storm events adversely affecting the existing drainage system. The addition of 251 gpm during a 65,130 gpm storm event will not alter the wetlands.

The ground water quality data obtained from the wells on and adjacent to the site yielded water chemistry that will not result in impacts to surface water. The process of oxidation, and dilution that will occur within the quarry and by the surface water flow associated with Basin 1, prior to flow to the wetlands will prevent impacts.

Comment: Page 129. 4.1.2.2.4: We find the applicants statement that "...the quarry's impact beyond natural seasonal variations and storm events is insignificant" to be misleading. We feel that the continuous pumping of 251 gpm (or other volumes) of water into Refuge wetlands could be very significant. Natural seasonal variations in water levels will certainly be altered as will the ability of the wetlands to absorb storm events. Additionally, we are unable to fully understand the maximum amount of water that may be pumped onto the Refuge from the quarry as the applicant has not thus far provided those data.

Response: The 251 gpm discharge rate from the quarry at the end of Phase I mining is an average annual rate of ground water inflow into the quarry. The actual ground water inflow rate is anticipated to vary seasonally with a maximum estimated rate of 310.40 gpm in March and a minimum of 183.26 gpm in September. These anticipated ground water inflow rates and the total anticipated seasonal discharge rates at the end of Phase I mining are provided on the attached Water Budget Summary Table.

The maximum estimated discharge from the quarry at the end of Phase I mining is 385.60 gpm. This maximum will occur in March and is derived from the combination of ground water, winter accumulated snow melt, direct March precipitation and an assumption of zero evaporation. This maximum quarry discharge will combine with the natural, existing runoff of 633.75 gpm from Basin 1, which is one of the existing source areas of surface water runoff to the refuge. The combination of quarry discharge with natural runoff will result in a total maximum average March flow of 1019.35 gpm to the refuge. This is a "surface flow" to the refuge rather than "pumped onto the refuge" as suggested by the Department of Interior comment.

The forgoing discussion shows that there will be seasonal variations in average monthly flows to the refuge. The data provided on the attached Water Budget Summary Table provide the relative increases in the average flows from Basin 1 as the result of the Phase I quarry discharges. These are averages that do not reflect natural storm runoff events from the remaining unaffected portion of Basin 1. These storm events, which happen now and will continue to occur in the future, result in much higher flows during any month or season of the year. The end of Phase I is provided as the maximum quarry discharge due to the fact that the Phase I quarry, and subsequent completed quarry phases, will be used to store water and moderate the discharge rates during the later stages of quarry development.

WATER BUDGET SUMMARY TABLE
Frontier Stone Quarry

	Average Annual Flow Rate	Average March Flow Rate	Average July Flow Rate	Average September Flow Rate
Surficial Drainage from Existing Basin 1	185.33	653.13	157.0	236.37
Surficial Drainage from the Unmined Area of Basin 1 at End of Phase 1 Mining	180.55	633.75	152.48	229.58
Ground Water Inflow from the Mine at the Full Development of the Phase 1 Quarry	251.04	310.40	186.21	183.26
Direct Precipitation into the mine at the Full Development of the Phase 1 Quarry	21.44	75.20	18.06	27.20
Evaporation from the mine for the Full Development Phase 1 Quarry	8.03	0.0	9.03	13.12
Discharge at Full Development of the Phase 1 Quarry	264.45	385.60	195.24	197.34
Total Future Discharge from Basin 1 at Full Development of the Phase 1 Mine	445.0	1019.35	347.72	426.92
Increase in the flow to Basin 1 after the Full Development of Phase 1	259.67	366.22	190.72	190.55

Notes: All discharges are in gallons per minute.
The existing Basin 1 area is 403.3 acres.
The unmined area will be reduced to 391.7 acres by the addition of the 11.6 acre Phase 1 quarry.
All the March discharges include the melt of accumulated snow for December, January and February.
Snow melt is imbedded in the direct precipitation of 75.20 gpm in the Future Phase 1 direct precipitation that is comprised of 19.8 gpm of March precipiation plus 55.4 gpm of snow melt.

Comment: Pages 185-186. 4.2.7.1: The applicant states that "impacts to hunting on the nearby Refuge are projected to be non-significant", that "the AOI extends into only a small fraction of the adjoining environment" and that "neither the woods, marshes or fields *(on the Refuge in the AOI)* are conducive to hikers." We do not concur. First, the applicant has not included blasting or truck traffic as part of their AOI noise zone determination and disturbance analysis. Second, the applicant has provided no date to quantify the level of recreational activity occurring in the area near the quarry site. Lastly, the statement that an area is not conducive to hikers is a values judgment. Different people have different perceptions regarding what is a quality recreation area.

Response: The noise zone determination has included truck traffic and its calculation of blasting is discussed in detail in response to Comment 14. The sound of blasting is similar to a very short duration rumble of thunder. We would recommend the reviewers from the USFWS visit a nearby quarry to witness a blasting event.

The recently completed INWR Comprehensive Conservation Plan and Environmental Assessment does not describe recreational use in the vicinity ofthe proposed quarry. Based on our visits to the site, there is no indication of recreational use in the area of influence. In addition, INWR policies restrict hiking to the period from October 1 to the end of February. Potential overlap with quarry operations could occur from October until November but not during the remainder of the quarry operating season. The statement that the area is not conducive to hikers is based on the conditions present in the AOI. TES walked through this area on numerous occasions and much of the area is covered by a dense tangle of vegetation. Other portions contain wetlands with no indication of human paths or trails.

Comment: Page 189. 4.2.7.1: The applicant states that "the Refuge receives nearly half its annual visitation during the months of March and April, which *(is)* outside the normal operating season of the project area." However on page 6 the applicant states that "mining and processing will normally occur from April to November...", showing that in fact the month of April is within the normal operating season.

Response: The reference to mining and processing was a generic use of the terms. During the month of April, mine sites are in a start-up mode. Equipment is started to see its need for service or repair, ramps are graded after snow-melt, etc. There is not "full-blown" production with its associated traffic.

Comment: Page 210. 5.2.7.1: We feel that the impacts to recreation on the Refuge have not been adequately addressed. The applicant has not included blasting and increased truck traffic noise in its analysis of disturbance to recreational users of the Refuge.

Response: (see response to Comment #3, Comment #5 and Comment # Page 96, 3.2.6).

Comment: Page 212. 6.0: The applicant states that impacts of increased traffic on Sour Springs Road and Oak Orchard Ridge Road "will be satisfactorily mitigated." We are unclear how this is possible since the applicant has not provided a thorough analysis of the actual impacts.

Response: The traffic noise on Oak Orchard Ridge Road is mitigated to potential receptors in the Ringneck overlook by distance from the roadway (see Comment # Page 96, 3.2.6). Further, the Applicant recognized that road improvements may be necessary by virtue of the increased traffic.

MINED LAND USE PLAN

Comment: Page 13. 2.4.2: In this section and other areas throughout their documentation, the applicant states that the existing agricultural ditch on the site "is not a flowing feature" and that most of the time the ditch does not drain to the Refuge. They also often state that water will be pumped into this ditch from the active quarry "to resume the pre-existing condition drainage pattern." We can find no data to support the first statement or any data that identifies the "preexisting condition drainage pattern." We feel the applicant should provide daily water flow data for at least one full year for this ditch to allow a thorough analysis of the proposed quarry's impact to the hydrology of the Refuge. Additionally, we are unclear how the continuous pumping of 251 gpm of water through the ditch and onto the Refuge can be considered resuming the "pre-existing condition drainage pattern" of a ditch that is currently "not a flowing feature."

Response: The term drainage pattern is a geomorphic term which refers to the location, route or imprint of this fluvial structure on the topographic surface; not how its physical characteristics appear throughout the year. Alpha Geoscience, Continental Placer, Terrestrial Environmental Specialists and others have been on the site frequently since 2005 and infrequently in the two prior years. Our professional expertise allows us to characterize whether the stream generally flows or not. Pumping of quarry water to the existing drainage ditch will not change the channel configuration or location; it will retain its pre-existing drainage pattern.

VEGETATION AND WILDLIFE STUDY AND ECOLOGICAL RESOURCES IMPACTS ANALYSIS

Comment: Page 4. 1.2.3: The applicant conducted two breeding bird surveys on the Refuge. While the timing of the June survey was appropriate, the July survey was too late to adequately assess use by breeding birds.

Response: TES conducted the breeding bird survey in the appropriate time period. As indicated on page 4 of the 2011 TES report the 'off-site breeding bird survey was performed on June 17, 2010." On July 13, 2010, a follow-up survey was conducted by two TES biologists. The follow-up survey was performed during the period when nesting bird species would be actively feeding young and utilizing the habitat if present. For example, the cerulean warbler (mentioned by the USFWS) is known to sing throughout the day and throughout the season.

Comment: Page 9. 1.3.4.3: While the applicant conducted bird surveys adjacent to the quarry site, they did not conduct surveys adjacent to Sour Springs and Oak Orchard Ridge Roads. These areas will be affected by the quarry generated truck traffic and need to be surveyed to properly assess the potential impacts of this traffic.

Some of the species identified during the applicant's bird surveys (e.g., wood thrush, blue-winged warbler, hooded warbler) are on the Partners in Flight (PIF) Species of Continental Importance list. This list includes species that the PIF identified as having "the greatest range-wide concern and which are in most need of conservation attention."

Additionally, the area of the Refuge adjacent to the quarry contains habitat types in which other species of concern (e.g. cerulean warbler, golden-winged warbler) breed, on other parts of the Refuge. These habitats may support these species adjacent to the quarry, even if they were not detected on the applicant's surveys.

Response: As requested by the USFWS, TES conducted a breeding bird survey adjacent to Sour Springs Road and Oak Orchard Ridge Road. It should be noted that as previously provided, there is much ambient noise from nearby Route 63.

See attached Table 7 and Figure 15 showing the results of the breeding bird survey and the survey point locations. Ten locations were sampled along Sour Springs Road and Oak Orchard Ridge Road. It should be noted that at one sample point, at breeding bird location 10, TES recorded cerulean warbler, hooded warbler, and scarlet tanager in a small forested woodlot north of Oak Orchard Ridge Road. Ambient noise was previously monitored by Continental Placer. Increased road noise would occur due to the potential for 480 additional trucks per eight-hour day.

The proposed quarry is not expected to affect these three species. None of these species is listed on the NYSDEC Endangered, Threatened, or Species of Special Concern lists. TES reviewed the status of these Partner in Flight (PIF) species from their website. Wood thrush with a continent-wide population of 14,000,000 birds is listed because of concern primarily with its winter range. Hooded warbler is on the list of "additional stewardship species" whose population trends are stable or unknown and are not currently threatened. Blue-winged warbler is listed due to low population size.

TES conducted a thorough survey in the areas adjacent to the proposed quarry. Cerulean warbler and golden-winged warbler were not present in these areas. Cerulean warbler declines are linked to declines in wintering habitats. Appropriate nesting habitat for Golden-winged warbler habitat is not provided on this portion of ENWR.

Comment: Page 11. 1.3.5.2: The applicant states that "there is little mature forest habitat in the immediate vicinity of the site" as support for their suggestion that bald eagles are likely to not use the area of the refuge adjacent to the quarry. However, their own bird surveys detected both scarlet tanager and ovenbird, two forest interior species known to prefer mature forests. Additionally, while eagles prefer to nest in large super canopy trees they are known to also nest in smaller trees, some as small as 18 inches in diameter. This area of the Refuge contains open water foraging areas and forested habitat, making it suitable for bald eagle nesting and foraging. While it may not be optimum habitat, it is certainly adequate. Abo, over the life of the quarry (75+years), the forest in this area will continue to mature, making it even more attractive eagle nesting habitat.

We were unable to find a Holt and Leasure (2008) reference in the Birds of North America (BNA). However, the Short-eared Owl section of the Birds of North America (No. 62) (20060 is available online and it appears that this is the reference that the applicant used. The applicant suggests that based on BNA No. 62 "short-eared owls are also known to frequent mines and quarries." In fact, BNA 62 states that short-eared owls "may use" gravel pits and rock quarries. This information is in fact attributed to an earlier paper written by R.J. Clark (1975) in which he lists "abandoned limestone quarry partially filled with stumps" and "abandoned gravel pit" as places where he found short-eared owl winter assemblages. Both of these areas are far different than the active stone quarry being proposed and to suggest that this area will somehow be attractive to short-eared owls after quarrying operations commence is very misleading. If this is not the correct reference the applicant needs to provide us with additional reference information.

Response: TES found little mature forest habitat in the vicinity of the site. Scarlet tanager and ovenbird occur in forested areas that may or may not be mature. The area of the refuge that contains open water habitat for foraging bald eagles and that may in the future provide adequate nesting trees is at least 1500 feet south of the southern quarry property boundary. Existing or ftiture disturbance to the bald eagle will not occur. The bald eagle has been delisted by the USFWS under the Endangered Species Act. There are no shortages of potential nest sites on the INWR for bald eagle.

The Holt and Leasure reference should be 2006. No short-eared owls occur on the site. No implication was made that this site would become an alternative for short-eared owls.

Comment: Page 12. 1.3.5.2: The applicant states that "the closest nesting area for *(Henslow's sparrow)* is % mile west from the site", suggesting that these birds are nesting too far away from the site to be affected by quarry operations. However, this nesting area is bisected by a small ditch that will transfer any water pumped from the quarry onto the Refuge, making it vulnerable to any water quantity or quality impacts that may occur.

Response: TES referred to a previous nesting record of Henslow's sparrow from 2001. No recent records of Henslow's sparrows have been provided by the USFWS. Henslow's sparrows do not nest in ditches. As indicated in the response to prior comments, the ditch is of sufficient capacity to accommodate any additional project water.

Comment: Page 19. 2.3.4: The statement that "no adverse modification of bald eagle habitat will occur from the quarry development" is misleading in that the applicant has not adequately addressed the potential disturbance to adjacent Refuge areas.

Response: TES found no potential for adverse modification of bald eagle habitat. The proposed quarry is currently in active agricultural uses and does not provide foraging or nesting habitat for bald eagles. Areas of potential use for bald eagles on the Refuge are distant (over 1,500 feet) from the quarry site.

Comment: Pages 22-23. 2.7.2: There are several literature citations that we draw a different interpretation from the authors information. We provide the following analysis for your consideration.

Schueck *et al* (2001) provides inconclusive information at best. The authors clearly state "during one period of intensive military training in one breeding season, raptor counts were lower during training than on non-training days." Also, "we observed fewer prey capture attempts on ranges on days with training than on days without training." While some response may vary based on species, training activity type and prey abundance, it is clear that, based on the results of this study, there is a level of bird disturbance associated with military training activities.

The statement that "northern harriers are thought to benefit from military training" based on Jackson et al. (1977) is not appropriate. This "study" was simply the observations of two people visiting a bombing range for one hour on one day and observing one bird.

Similar to Schueck *et al.* (2001), he results from Holthuijzen *et al.* (1990) are at best inconclusive. The applicant states that "behavior of incubating and brood rearing prairie falcons was not significantly altered." However, the paper's authors state the overall response rate (i.e., the number of instances in which a change of behavior was observed)..." to blasting "was 54%." It is believed that incubating and brood rearing birds are much less likely to abandon a nesting area than a bird that has not yet laid eggs. The area of the Refuge adjacent to the quarry provides habitat for breeding as well as foraging migratory birds and resident wildlife. A disturbance during any time of year could have a significant negative effect on Refuge wildlife.

Response: TES conducted a literature review at the request of the NYSDEC and the USFWS to include studies of potential adverse effects on wildlife from military operations. TES located no literature analyzing pre-construction and post-construction effects of mining.

A thorough reading of the article provides the reader with a different interpretation. This article was referenced because it was a multi-year study with numerous raptor species.

TES disagrees that these studies are inconclusive. Significant unconfined ordinance explosives detonations, with a magnitude much greater than the planned once or twice weekly confined blasting for the quarry, occurred at the military ranges and successful reproduction occurred. It is our professional opinion based on visiting numerous active quarry sites and surveying wildlife activity that quarry noise does not cause a significant negative effect on wildlife. No military training activities will occur in the proposed quarry.

The study of red-cockaded woodpeckers by Doresky *et al.* (2001) is inappropriate for this evaluation because the authors admit that there was no difference in noise levels between their treatment and control areas. Therefore, they were measuring effects of noise disturbance in an area where there was no increased noise disturbance.

Doresky states in their paper that regardless of the possible explanations for the lack of differences in noise levels between treatment and control clusters, the fact that reproductive variables were similar is of greater importance.

The applicant states that "Stalmaster and Kaiser (1997) showed that wintering bald eagles became habituated to helicopters..." However, the last sentence of these author's abstract states "out data suggest that ordinance explosions, low-level helicopter overflights and boating should be restricted near eagle foraging areas." The scientific literature contains many references supporting the notion that loud noises and human disturbance have a negative effect on wildlife. A balanced review of the literature in this area is necessary for a proper review of this proposal.

As indicated by TES, bald eagles became habituated to helicopters. No foraging areas for bald eagles are found in fields proposed for the quarry. Ordinance explosions, low-level helicopter overflights, and boating will not occur on the quarry site.

TES consulted the literature for articles and studies of mining activities effects on wildlife. There is not a literature base. While loud noises and human disturbance could have a negative effect on wildlife, there is no evidence to support the fact that the proposed mining activities would negatively affect wildlife on the INWR.

Comment: Page 24. 2.7.3: The applicant cites Allaire (1978) regarding minimum mining buffer distances. This citation is not listed in the References section and therefore cannot be evaluated.

The statement that "mining operations will not occur closer than 60 feet from the INWR" is misleading. According to the Mining Flan Map, the constructed overburden berm on the south of the quarry will be less than 400' from the Refuge boundary. Since this berm will be constructed as part of the mining activities, we consider it to be part of the "mining operations."

The applicant provides no basis for the statement that blasting vibrations will be "an insignificant impact" to the Refuge.

Response: Agreed. Reference is Allaire, P.N. 1978. *Reclaimed surface mines: new potential for North American Birds.* 32:3-5.

We disagree with this assessment. The berm would be constructed at the onset of the mining operations and is being constructed to reduce noise from the quarry. Berm construction is a temporary impact likely during the first year of quarry development. The day-to-day mining operations will be further than 600 feet from INWR. As the quarry develops, the distance from the INWR boundary will increase.

As indicated in Section 2.7.1 Noise and Blasting Background Information *"...blasts are planned so that much of the energy as possible is usedtofacture the rock, however, some energy is dissipated beyond the detonation site."* Unlike the numerous studies at military training sites, the blasts will be very brief and occur once or twice a week. The vibration will extend slightly into INWR and be of a very short duration. Based on these facts, there will be an insignificant impact from blasting. Information provided in the response to Comment 14 supports the statement that blasting vibrations will an insignificant impact.

Comment: Page 25. 2.7.3: The truck traffic volumes that TES is basing its analysis on (65 trips per day) does not match the 30 trucks per hour figure elsewhere in the documentation.

The Reijnen *etat.* (1995) study that the applicant uses to base their assertion that "there should be no effect on wildlife" is not supported by the reference. This study was conducted in deciduous and coniferous forests only. More than half of the area immediately adjacent to Sour Springs and Oak Orchard Ridge Roads is shrubland and grassland, with the remainder in forest cover, so the habitat types are not necessarily comparable. The cited study only looked at roads with between 10,000 and 60,000 vehicles per day. The applicant states that "based on this study, the proposed increase in traffic volumes would not cause significant noise disturbance to breeding birds." However, the authors of the cited study make no inferences about the effects of traffic on breeding birds along roads with lower traffic volumes. The applicant simply makes this assumption. In fact, based on the information in the applicant's documentation, they are unclear as to how much traffic might increase on this road (see Page 25. 2.7.3 comment above). It seems to us that the overall traffic volume is less relevant than what the increase in volume and noise level will be. The applicant has stated that these roads currently receive very low traffic volume. An increase in volume, especially by large trucks, may very well have a significant effect on area wildlife.

The applicant provides a comparison in the traffic volume on Sour Springs and Oak Orchard Ridge Roads to the volume on Route 63, to suggest that effects of traffic on wildlife will be minimal. However, the level of traffic on Route 63 is irrelevant to this analysis except to note that the Refuge is already negatively impacted by traffic and any increase in traffic, no matter how small, will likely compound the problem.

The applicants statement that "it appears that traffic has had no notable impact despite the fact that Route 63 bisects the Refuge" has no basis in fact. To our knowledge, there have been no studies to determine this impact.

Response: The maximum volume of trucks is identified to be 30 one way trips per hour or a total of 480 trips during an eight-hour day. The ordinary operation of the quarry will result in 65 trips per day.

Ideally a citation to a paper with mixed cover types would be ideal; however, the Reijnen *et al* (1995) study is a benchmark study for the impacts of road noise on wildlife. Studies of road noise impacts on wildlife are in areas with significant traffic volumes. We do not understand how the commenter concludes that the "the overall traffic volume is less relevant than what the increase in volume and noise level would be." While the maximum traffic increase is expected to be a maximum of 480 trucks per day, ordinary operations will involve approximately 65 trucks per day. This, in our opinion, will not result in a significant impact from increased road noise.

The INWR Comprehensive Plan and Environmental Assessment makes no mention of Route 63 negatively affecting wildlife on the Refuge. While Refuge staff may feel that the Refuge is negatively impacted by traffic, there is a wide variety of wildlife species (mammals, reptiles, amphibians and birds) nesting, foraging, and thriving next to Route 63.

TES noted during visits that a wide variety of open field/wet meadow species were breeding next to Route 63. If Route 63 caused a reproductive sink for breeding birds, it would have been mentioned in the INWR Comprehensive Conservation Plan and Environmental Assessment.

WETLAND IMPACT ASSESSMENT

Comment: The flow analysis conducted by the applicant seems to assume no obstruction to the flow of water through the wetland areas. In fact most of the flow areas are vegetated and this vegetation *h* dependent on historical flow regimes. Any changes to these regimes may have negative impacts to the vegetative community. Additionally, flow analysis that doesn't take into consideration the existing vegetative obstructions will likely overestimate the ability of the system to pass increased water flows.

We can find no discussion regarding the water temperature of water pumped from the quarry onto the Refuge and how that temperature may affect Refuge vegetation, fish, wildlife, invertebrates, etc.

Response: This statement is incorrect. HydroCAD's, TR-20 model does take into consideration the type of surface the flow is passing over through the application of the Manning Number. This comment assumes that the addition of 200 to 300 gallons of water created by the project will potentially have a negative impact on vegetation. This is in contrast to existing conditions where natural storms discharge 4,331 gpm, 11,525 gpm, 40,754 gpm and 65,130 gpm to the Refuge.

In regard to temperature, water discharged from the quarry becomes surface water not groundwater which enters the Refuge. Groundwater which flows into the quarry will collect and sit in a sump. From there it will go through a series of three ponds where it will be retained. From there it will collect in the shallow drainage ditch and flow approximately 1800± feet before entering the northern edge of the Refuge.

In any wetland system there are existing obstructions to the flow of water. These obstructions can change the path of water or act to alter the water level, depending upon the nature of the obstruction and the nature of the surrounding wetland system. The duration of any changes caused by obstructions can vary greatly. These obstructions, especially vegetative obstructions, also change from year to year through decay of dead material, live material being added, or changes in flow pathways by channel erosion/deposition among other things.

Changes in flow patterns are part of the dynamics of a wetland system, where habitat types on a macro or micro scale fluctuate in time. These fluctuations occur on a regular basis to existing wetland systems. They occur now and would occur after the addition of any pump out water from the quarry. Such changes should not be viewed as detrimental or negative.

Of note for this discussion is the fact that the water level in the Schoolhouse Marsh wetland complex is controlled by the Schoolhouse Marsh dam, which likely results in less internal water level fluctuations than an uncontrolled system. The water level is also manipulated by the USFWS for management purposes on a recurring basis. Such water level manipulation may be several feet, which would result in significant habitat changes. Again, these changes are not necessarily negative depending upon the habitat you want to promote. However, they would dwarf any potential changes in fractions of inches estimated from the addition of quarry pump out water.

GROUNDWATER ASSESSMENT

Comment: The applicant's analysis shows that in Phase I the water flow onto the Refuge will increase from 185 to 445 gpm or 241%. For phase 4 the increase is from 185 to 10S4 gpm or 482%. This is a significant increase in flow, but the applicant insists throughout the document that there will be no effect on Refuge habitats and original drainage patterns will be maintained. The presented data do not seem to support these statements.

The applicant only provides average flow rates and no maximum or minimum flow rates.

Many references are made to the idea that previously mined areas (e.g. Phase I) "can" be used to store water before discharging onto the Refuge, but there is no plan outlined for this strategy. Additionally, the water stored in these areas will eventually have to be discharged, which will eventually result in an increased average flow (>251 gpm) during later phases of the mining operation. Also, the notion of pumping 251 gpm continuously is also just a statement that is not part of an outlined plan.

Response: The downstream drainage system is more than adequate to accommodate the increase in average flow rates. The channels already accommodate flows that are more variable than the flows that will occur in the future. The fact that these downstream reaches are adequate to transmit the increased flows will preclude adverse changes in the downstream drainage system. The reduced variability is due to the retention effect of the quarry reservoir.

The current (pre-mine) average flow rate to the refuge from Basin 1, which is the basin that will receive Phase I discharge and drain to the Refuge, is 185.33 gpm. This will increase to an average of 445.0 gpm at the end of Phase I mining as described in the Alpha report. The maximum flow is anticipated to occur in March when the combined contribution of snow melt, March precipitation and increased ground water discharge could yield a maximum Basin 1 discharge of 1019.35 gpm to the Refuge. Although September will experience the lowest ground water discharge of the year, July is actually the driest month due to a very low average rainfall of 2.56 inches and a very high evaporation rate that is assumed to be 50%. The minimum Basin 1 flow, based on July conditions, is anticipated to be 347.72 gpm. This value includes 186.21 gpm of ground water inflow, 9.03 gpm of net precipitation to the quarry and 152.48 gpm of runoff from the remaining undisturbed portion of Basin 1 (see attached Water Budget Summary Table for comparisons).

The idea of using the initial phases to store water and reduce pumping rates is an effective plan because it allowed the opportunity to pump at controlled rates, it reduces the ground water inflow rates by reducing the effective size of the dewatered portion of the quarry, it diminishes the ground water drawdown effects on the surrounding aquifers and it reduces the total dissolved solids (TDS) content of the discharge water. The plan would be to maintain pumping at 250 gpm after completion of Phase I. The Phase I quarry will slowly accumulate water. The rate of ground water inflow will decline slowly and evaporation will increase gradually in the Phase I quarry while the contribution from Phase II will increase slowly from near zero as it is quarried. Pumping from the Phase I and Phase II quarry at a rate of 250 gpm will provide excess capacity when large precipitation events require the transfer of large volumes from the Phase II area to the Phase I quarry. The maintenance of a continuous pumping rate of 250 gpm throughout the life of the mine should be sufficient to maintain the excess capacity necessary to store storm events and slow the rate of quarry filling.

MISCELLANEOUS COMMENTS BY APPLICANT

Comments received from the Department and particularly from Tom Roster of The Iroquois National Wildlife Refuge appear to be based upon the USGS report titled ***"Water Resources of the Iroquois National Refuge, Genesee and Orleans Counties, New York, 2009-2010".*** Data and inferences in the report appear grossly inaccurate, particularly the conclusions on geology and discharge characteristics. First, the stratigraphic nomenclature in the report is incorrect. The site is underlain by the Oak Orchard member, not the Eramosa member. If the quarry site was underlain by the Eramosa member there would be no proposed quarry. The Eramosa fails all NYSDOT specifications and it cannot be used for DOT approved coarse aggregate. Secondly, the acid springs are not underlain at the surface by the Lockport Formation but rather the Vernon Formation, the USGS appears to have mis-interpreted their geophysical logs.

The USGS summary states:

> **"The additional flow to the refuge from the dewatering of the quarry will affect the hydrology of any wetlands downstream from the quarry and possibly Oak Orchard Creek. During low-flow periods, the quantity of discharge from the quarry, when compared with the flow of Oak Orchard Creek, could be less than 2 percent of the Oak Orchard Creek flow, but as much as 20 percent of the creek flow. During low streamflow periods, the anticipated poor quality of the quarry water discharging into tributary channels with no flow could affect the ecology of the wetlands and the wildlife that use these wetlands."**

This statement is not supported. During low flow of Oak Orchard Creek, i.e. July -September, flow to the Refuge would be 190 gpm from the quarry, whereas a summer thunderstorm could result in a natural discharge of 4,331 gpm (2-year event) and up to 40,754 gpm for a 10-year event.

September is the month when water levels are at their seasonal low and the associated inflow to the quarry will be at a minimum. The average quarry pumping rate in September, at the end of Phase I, is anticipated to be 197.34 gpm. This discharge rate is based on a ground water inflow rate of 183.26 gpm, direct precipitation of 27.2 gpm and evaporation of 13.12 gpm. The ground water inflow rate is estimated from spring flow measurements made by Alpha at another site in New York that yielded 6% of the annual flow during September. The average September precipitation is 3.73 inches and the average evaporation rate is estimated to be 1.8 inches. This evaporation rate for September is equivalent to 6.8% of the annual quarry floor evaporation rate of 13.4 inches per year used in Table 8 of the Alpha report. The 6.8% figure comes from monthly pan evaporation data provided for Aurora, New York in the "Evaporation Atlas for the Contiguous 48 United States" by Farasworth et al (1982; NOAA Technical Report NWS 33; U.S. Department of Commerce, Washington, D.C., 26p).

This discussion of the water budget can be best summarized in the following table.

WATER BUDGET SUMMARY TABLE
Frontier Stone Quarry

	Average Annual Flow Rate	Average March Flow Rate	Average July Flow Rate	Average September Flow Rate
Surficial Drainage from Existing Basin 1	185.33	653.13	157.0	236.37
Surficial Drainage from the Unmined Area of Basin 1 at End of Phase 1 Mining	180.55	633.75	152.48	229.58
Ground Water Inflow from the Mine at the Full Development of the Phase 1 Quarry	251.04	310.40	186.21	183.26
Direct Precipitation into the mine at the Full Development of the Phase 1 Quarry	21.44	75.20	18.06	27.20
Evaporation from the mine for the Full Development Phase 1 Quarry	8.03	0.0	9.03	13.12
Discharge at Full Development of the Phase 1 Quarry	264.45	385.60	195.24	197.34
Total Future Discharge from Basin 1 at Full Development of the Phase 1 Mine	445.0	1019.35	347.72	426.92
Increase in the flow to Basin 1 after the Full Development of Phase 1	259.67	366.22	190.72	190.55

Notes: All discharges are in gallons per minute.
The existing Basin 1 area is 403.3 acres.
The unmined area will be reduced to 391.7 acres by the addition of the 11.6 acre Phase 1 quarry.
All the March discharges include the melt of accumulated snow for December, January and February.
Snow melt is imbedded in the direct precipitation of 75.20 gpm in the Future Phase 1 direct precipitation that is comprised of 19.8 gpm of March precipiation plus 55.4 gpm of snow melt.

As seen in the table, the increased flow rate to the Refuge during periods "within the marshes when they normally experience seasonal dry conditions" is minimal, i.e. 190 gpm. This is contrasted to a typical July thundershower (two year precipitation event) which discharges 4,331 gpm to the Refuge under an existing no quarry condition.

Notwithstanding these figures, the Applicant has several alternatives at his disposal. During dry summer months, discharge water can completely bypass the Refuge by pumping to Fish Creek, north of Fletcher Chapel Road. Fish Creek flows to Oak Orchard Creek. Secondly, the quarry site landowner, Chet Zelazny may use the discharge water for irrigation of his agricultural fields during the dry season, precluding discharge to the Refuge.

References to poor quality discharge water from the site are unsupported by analysis or data. The water quality testing results were previously provided on Table X along with the New York State standards for Class C surface water bodies and drinking water for the tested parameters. All of the streams surrounding the site are Class C surface water bodies. The results show that the ground water within the horizon to be mined contains total dissolved solids (TDS) that are near the New York State limit for Class C surface water and drinking water, and three of the wells are slightly above the limit. The rest of the data indicate that most of the TDS is the result of the calcium carbonate hardness, which is very high. The very high hardness indicates that the TDS is not the result of chloride, which is very low, and sulfate, which is at moderate levels that are well below the drinking water

standards. There is no sulfate standard for Class C surface water. The hardness does not represent a potential environmental impact.

The water quality results show that the pH is within normal ranges and manganese is low. The results also show that iron is high, relative to the drinking water standards, and there was some indication of low concentrations of sulfides. The indicated sulfide is consistent with the slight H_2S odor observed during some of the aquifer testing conducted in the early stages of the project. Neither high iron or the low concentrations of sulfide will create an environmental impact as the result of the quarrying activities. Iron readily precipitates when exposed to oxygen. The sulfide will off gas as H_2S before the water ever leaves the property. The authors also fail to recognize that there are roughly 12 Lockport formation quarries which have been discharging for up to 80 years with no environmental issues.

The U.S.G.S. report is insufficient in scientific analysis to address objectives such as describing *"(1) the glacial and bedrock geology; (2) the groundwater -flow system, including water levels and groundwater and surface- water interaction"*. A fundamental professional recognized requirement to address these objectives is the establishment of a geologic framework for the flow system. This requires correlation of the rock and unconsolidated units. The approach is to create geologic cross sections based on interpretation of geologic logs, geophysical logs and other accessible geologic data. No cross sections were provided in the U.S.G.S. analysis. This geologic analysis is necessary to make sure that the water level and water quality data that were collected by the U.S.G.S., is properly assigned to the correct aquifer. The lack of a complete hydrogeologic model is the fundamental reason that conclusions regarding potential impacts from the proposed quarry on the Refuge cannot be drawn from the U.S.G.S. report. The analysis conducted by the applicant's team of experts does meet the threshold required to assess the potential for hydrogeologic impacts from the proposed quarry.

Best regards,

John R. Hellert
Senior Geologist

JRH/acf