THEMAC RESOURCES

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MINING & MINERALS DIVISION

July 17, 2013

Mr. Chris Eustice
Senior Environmental Engineer
Mining and Minerals Division
Wendell Chino Building, Third Floor
1220 South St. Francis Drive
Santa Fe, New Mexico 87505

RE: Baseline Data Report Amendment, Copper Flat Mine, Sierra County, New Mexico

Dear Mr. Eustice,

New Mexico Copper Corporation (NMCC), a wholly owned subsidiary of THEMAC Resources Group, Ltd. is pleased to submit six copies of the Baseline Data Report Amendment for the Copper Flat Mine in Sierra County, New Mexico. This document contains responses to agency comments dated February 18, 2013, on the Baseline Data Report dated June 29, 2012. Per our discussion, one hard copy and a CD with an electronic copy is enclosed and the same are being mailed to the CC list below.

This document presents additional data on vegetation, wildlife, soils, geology, surface water and groundwater, cultural resources, and present and historic land use at Copper Flat in Sierra County, New Mexico. A table presenting comments on the June 2012, Baseline Data Report from the Mining and Minerals Division (MMD), New Mexico Game and Fish, and the New Mexico Office of the State Engineer is attached. This table refers the reader to where each comment is addressed within the Baseline Data Report Amendment, which you will find is divided into six sections by topic and contributor. This report was prepared by NMCC with significant contributions from Geosystems Analysis, Inc., Golder Associates Inc., John Shomaker & Associates, Inc., and M3. The responses to some comments are in reports that have been or will be submitted to the MMD under separate cover. Specifically, the *Geochemical Characterization Report for the Copper Flat Project*, prepared by SRK Consulting was submitted in June 2013. We anticipate submitting *Predictive Geochemical Modeling of the Pit Lake Water Quality at the Copper Flat Project, New Mexico* in August or September 2013. Similarly we expect the *Model of Groundwater Flow in the Animas Uplift and Palomas Basin, Copper Flat Project, Sierra County, New Mexico*, prepared by John Shomaker & Associates, Inc., to be ready for submission in August 2013.

In addition to data requested in specific comments, as previously agreed, we are including reports on the foundation evaluations conducted by M3 at Copper Flat in October 2011 and January 2013.

A revised version of the Mine Operation and Reclamation Plan will be prepared for submission at a later date. As such, none of the agency comments on the previously submitted Mine Operation and Reclamation Plan are addressed in this submission.

A number of MMD comments addressed the Order 1 Soil Survey presented in the June 2012 Baseline Data Report. Rather than update the Order 1 Soil Survey, which did not fully address the requirements of the mine plan, NMCC elected to have Golder complete a Supplemental Soils Investigation to characterize the potential soils resources at Copper Flat. This report supersedes the report prepared by Stetson Engineers, Inc. regarding soil suitability criteria and information regarding potential salvage. The response to comments prepared by Golder does not make specific changes to Stetson's report; however, the responses address MMD's comments regarding the soils at Copper Flat with supplemental data provided.

Any questions or comments regarding this Baseline Data Report Amendment may be directed to me at jdeichmann@themacresourcesgroup.com; or by phone at 505.681.2536.

Best regards,

Jens Deichmann
Project Manager

CC: Douglas Haywood, Bureau of Land Management, Las Cruces District Office
David Henney, Mangi Environmental Group (electronic transmission only)
Rachel Jankowitz, New Mexico Game and Fish
Brad Reid and Kurt Vollbrecht, New Mexico Environment Department
Kevin Myers, New Mexico Office of the State Engineer

Baseline Data Report Comments/Responses

Agency no.	NMCC #	Comment	Resolution
MMD Comments			
602.D.13 Baseline Data Report		These comments address the identified Sections of the BDR. The corresponding section of the Part 6 reg is also identified.	
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1	3	Correct or remove sentence (pg 18 MORP) that refers to a coachwhip as a lizard.	See GSA Addendum Section 5, Wildlife
Section 6 - Topsoil Survey and Sampling Results, 602.D(13) (e)			
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5	8	Pg. 3 of the intro. The scale for 1:6,000 is equivalent to 1 inch = 500' rather than 0.5 inches=1,000'. Please update.	
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1	20	pg 8-3, Section 8.1.2.1.2 states that the NMED SWQB has collected flow data along Las Animas Creek. These data should be available. Although the historical and baseline flow data (quantity data) presented appear to adequately document Las Animas flow, MMD recommends incorporation of any added quantity data form NMED SWQB related to Las Animas creek as further documentation of historic flow variability.	See JSAI Memorandum
2	21	Section 8.2.4.1. The crystalline bedrock aquifer appears adequately characterized for the BDR. MMD recommends submittal of GW quality data for GWQ-5R, GWQ11-24 A&B and GWQ11-25A&B as further documentation of GW quality within the crystalline bedrock aquifer.	
3	22	Pg 8-21, Section 8.2.4.1 states 9 wells were used for water elevations, however only 8, or 12 depending on how you count, were measured. Please correct.	
4	23	Pg 8-22 Section 8.2.4.1.1 refers to GWQ-5 as a crystalline bedrock aquifer well, Fig 8-20 refers to it as a crystalline bedrock well. However reviewer is sceptical, thinks its representative of Grayback alluvial based on completion data and location. Please correct. (Or clarify)	
5	24	Section 8.2.4.3 (Quaternary Alluvium), GW quality within the alluviai aquifer of Las Animas Creeek appears adequately characterized in the BDR w MW-11. However, the water quality of the alluvium aquifers within Percha Creek, Grayback, Hunkidori Gulch & Greenhorn Arroyo appear under characterized for the BDR.	
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	26	b. Grayback alluvium: Historic water quality data for GWQ-1, GWQ-3 and GWQ-8 is provided, this may be adequate. Please provide any historic or recent GW quality data for the alluvium within the Grayback. MMD recommends providing the completion data for these 3 wells/sample locations.	See JSAi Memorandum
	27	c. Hunkidori Gulch allubium & Greenhorn alluvium: Currently no wells in these? MMD recommends installation of at least one shallow alluvial well downgradient of the proposed TSF w/in each of these alluvial systems to characterize the potential alluvial aquifer for the BDR. Or provide any historic or recent GW quality data for the alluvium w/in these systems.	
6	28	Table 8-9 identifies well "UNKNOWN" as being in the Qal aquifer system, however this well is shown in Fig 8-20 to be in the SFG aquifer. Table 8-9 or Fig 8-20 should be corrected. This well appears to be identified as "15.6.31.431" in Table 8-11. Correct name for this well between tables/figures and if 15.6.31.431 is the same as UNKNOWN please clarify.	
7	29	MMD knows results of the aquifer test and associated studies (geochemical, hydrologic modesl) are on-going. MMD withholds comments on these that will help to define the probable hydrological consequences of the proposed operation until they are complete and integrated into the PAP.	
Section 9 - Prior Mining Operations, 602.D(13)(h)			
1	30	The last sentence of Section 9.1 "Mining History" indicates that "More detail about copper explaration can be found in Section 11.3" However Section 11.3 is a soil survey w no such info. Please correct.	See THEMAC Memorandum
Section 10 - Cultural Resources Summary, 602.D(13)(i):			
1	31	Throughout Section 10 authors describe the permit area as being within the "Hillsboro Mining District" and/or/also the "Las Animas Historic District". Confusing. Seems intent is to describe the permit area as in the "Hillsboro Mining District" which is situated inside a larger "Las Animas Historic District" that is yet to be delineated or defined. Please clarify.	See THEMAC Memorandum
2	32	MMD previously provided comments... Please provide an updated Figure 10-1 (from the SAP) w the locations of the four referenced cultural resource surveys depicted.	
3	33	Describe any cultural surveys that have been conducted in the areas of the water supply pipeline and associated well field and update Figure 10-1 of the SAP to include those survey locations and submit.	
4	34	Section 10.2 "Eligibility and Management Summary" indicates that "detailed management recommendations will be presented in a future CR report" and "avoidance will most likely not be feasible for all of these resources, it is recommended that they be included in a testing and data recovery plan..." This testing and data recovery plan should be provided.	
Section 11 Present & Historic Land Use, 602.D(13)(j)			
1	35	Section 11.3 Section 11.3 "Soils Survey" seems irrelevant and out of place under "Present and Historic Land Use". This information would be better presented w/in Sect 6 "Soils Survey". Please provide clarification.	See THEMAC Memorandum
2	36	Please update this section to include a description (present & historic land use) of the water supply pipeline, associated well field, and the electrical power supply lines.	
3	37	Provide a description of land capability & productivity based on Soil Conservation Service, land use capability classes or similar classification.	
Game and Fish Comments			
BDR Chapter 4			
	117	Review Table 4-9 to verify that values were copied over correctly from Table 4-10	See GSA Addendum to Section 4, Vegetation
	118	Jurisdictional status of the Gooddings willow-dominated wetland in Grayback Arroyo is unclear; G&F states "We know that NMED considers this wetland jurisdictional under state standards. Please note state status in the final BDR, and clarify whether it is USACE jurisdictional."	

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BDR Chapter 5			
	119	Section 5.2.3 states isolated springs and seeps were "nearly all on private land and inaccessible," and thus were not examined. However, all these springs were sampled for flow as reported in BDR Chapter 8. Clarify that all springs are on private land and access was, and is, denied, or conduct biological resource surveys using photographs.	See GSA Addendum Section 5, Wildlife
	120	Tables 5-2 and 5-3: Show relative abundance (for example, using terms like "abundant," "common," "uncommon," "rare")	
	121	Incorporate winter observations from Appendix 5-B, Winter Bird Survey Report, into summary Tables 5-2 and 5-3	
	122	Migratory seasons should be covered by monitoring of migrating waterfowl and other birds at the pit lake, in addition to winter and summer surveys	
	123	Table 5-6 Bat Species Detected by Habitat: Include relative activity level (as indicated by calls per unit time), possibly as separate table	
BDR Chapter 5 continued			
	124	Any abandoned historic mine features comprising of more than a shallow blind shaft should be evaluated to determine use by roosting or hibernating bats, especially if the features are expected to be disturbed or destroyed by future mining	See GSA Addendum Section 5, Wildlife
	125	Section 5.4.1.3: Report in text or tabular form the relative abundance of large- or medium-size mammal sightings/sign by location or habitat type. Include a comparison to the reference plots.	
	126	Conduct a survey for raptor nests in all suitable habitat within one mile of any potential mine-related disturbance.	
	127	Conduct focused monitoring of wildlife use of the pit lake. This might include camera traps, diurnal and nocturnal passive observation sessions, track counts, or spot-lighted surveys.	
OSE Comments			
MORP Appendix B (BDR)			
	148	Table 7.1, Figures 7.1 and 7.2: Reference BLM (1999), but it would be useful to reference original authors for maps.	See THEMAC Memorandum
	149	Figure 7.5: Add description of fault systems in legend beneath label for fault (e.g., Hunter fault system N20E, Patten Fault system N50W)	
	150	Table 8-1: Reported temperature of 81.5 deg C appears to be incorrect	See JSAI Memorandum
	151	Figure 8-17: Cross-section lacks control points east of GWQ-21B	
	152	Section 8.2.4.1.5, Figures 8-22 and 8-24, Table 8-11: GWQ96-22A and -23A 2010-2011 sulfate values drop unexpectedly compared to 1996-1997 TDS and specific conductance values; lab error, typographical error or water quality has not stabilized from mixing? Further review of data needed since sulfate, TDS and specific conductance typically show strong correlation.	
	153	Section 8.2.5.2.5, Appendix 8-G Figures G through J: Text asserts no discernible trends in hydrographs for MW-2, -5, -6 and -8, but more effort would be needed to understand hydrographs in order to adequately simulate Upper Santa Fe Group. MW-5 is active stock well that shows 50 ft or more drawdown when pumped for a short duration, then water levels fully recover as showing in 2012 transducer data; Figure H has mix of USGS and other data and 1980s data may represent pumping levels or recent pumping. Additional effort should be undertaken to evaluate data quality, well construction details, lithology and other potential factors for disparate responses shown in hydrographs.	
	154	Table 8-9, Table J1 and Figure I (Appendix 8-G): Discrepancies between elevations and total depths cited (e.g., MW-6 TD); Table J1 draws upon multiple data sources; sources for tables or figures are not clearly identified; possibly bottom of screen interval has been used in place of TD	

Baseline Data Report Comments/Responses

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OSE Comments MORP Appendix B Continued			
	155	Section 8.2.4.3.5 and Figure N (Appendix 8-G): In addition to hydrograph showing responses to wetter years, the alluvial aquifer may be affected by irrigation water usage from surface water diversions from Las Animas Ck and groundwater diversions from alluvial aquifer and Santa Fe Group aquifer. Also, changes in leakage or flow from artesian wells may affect alluvial aquifer.	See JSAI Memorandum
	156	Section 8.2.4.4, Figures 8-13, 8-32 and 8-33: There may be simpler explanation for hydrologic change in artesian aquifer: artesian zones may represent solely a change in sedimentary deposition within Santa Fe Group, with lesser importance given to structural influence from faulting. It's unclear what influence Hawley and Kennedy (2004) reference has on Figures 8-13 and 8-33 given that its geologic map is located in T16S with dashed lines. Hawley section RA-RA' follows changes in lithology rather than create a confined area from dipping USF beds of laterally-extensive clay layers.	
	157	Figure 8-32: USGS 2006 reference not included at end of Chapter 8. Bottom 2/3 of faults should be dashed to represent uncertainty in locations as in Seager (1982). Fault between LA-96 and LA-115 on Figure 8-33 does not appear in plan view in Figure 8-32. NMCC should provide more supporting evidence (e.g., field observations, drilling logs, deeper wells that would provide control points) that would help justify changes to earlier geologic map. Text and figures should indicate modifications in greater detail.	
	158	Section 8.2.5.1: Pit lake levels increased from 1997 to 2011 and likely so did nearby groundwater levels. GWQ96-22 and -23 were drilled in 1990s, yet earlier water level data were not included in BDR. Historical trend of nearby groundwater levels and pit level may be worth considering rather than only 2011 measurements.	
	159	Section 8.2.5.4: Given the local gradients and geology, "stationary" groundwater may not adequately describe vertical and horizontal flow.	
	160	Section 8.2.6 and Figure 8-39: In groundwater model report, modeling objectives should be stated. Are grid and dimensions based on objectives? Will regional model adequately evaluate local impacts of pumping at production well field and open pit?	
	161	Figure 8-33 and Figure 3 (Appendix 8-H): Indicate whether clay-rich layers in Las Animas Ck wells were correlated based on depths indicated from well drilling records or whether dipping clay beds are more conceptual than from specific depths.	
	162	Table 2 (Appendix 8-H), Section 8.2.4.4.2: Artesian flow rates show decline at several wells; clarify the basis for the conclusion that dewatering by artesian well upward leakage and open flow appears to be mainly responsible for long-term decline of artesian flow rates (Appendix 8-H). In particular, what does Table 2's total artesial flow rate represent in support, if any, of conclusion about upward leakage and open flow? If wells are poorly constructed or well seal deteriorates, leakage may partially occur in subsurface, which would appear as decreased flow at surface. Would a better approach for addressing changes at artesian wells include monitoring shut-in pressure of a properly-sealed artesian well?	
	163	Figure 8-36: Shows FW-3 with initial flow rate of 125 gpm; however, declaration indicates initial flow rate of 80 gpm. Murray (1959) indicates the 125 gpm was pressure-pumped for 4 hrs to induce 115 ft of drawdown. So, FW-3 artesian flow should be 80 gpm.	

COPPER FLAT MINE BASELINE DATA REPORT ADDENDUM

July 17, 2013

Prepared by:
THEMAC Resources Group, Ltd.

Contributions from:
GeoSystems Analysis, Inc.
Golder Associates Inc.
John Shomaker & Associates, Inc.
M3

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	26	b. Grayback alluvium: Historic water quality data for GWQ-1, GWQ-3 and GWQ-8 is provided, this may be adequate. Please provide any historic or recent GW quality data for the alluvium within the Grayback. MMD recommends providing the completion data for these 3 wells/sample locations.	See JSAI Memorandum
	27	c. Hunkidori Gulch allubium & Greenhorn alluvium: Currently no wells in these? MMD recommends installation of at least one shallow alluvial well downgradient of the proposed TSF w/in each of these alluvial systems to characterize the potential alluvial aquifer for the BDR. Or provide any historic or recent GW quality data for the alluvium w/in these systems.	
6	28	Table 8-9 identifies well "UNKNOWN" as being in the Qal aquifer system, however this well is shown in Fig 8-20 to be in the SFG aquifer. Table 8-9 or Fig 8-20 should be corrected. This well appears to be identified as "15.6.31.431" in Table 8-11. Correct name for this well between tables/figures and if 15.6.31.431 is the same as UNKNOWN please clarify.	
7	29	MMD knows results of the aquifer test and associated studies (geochemical, hydrologic modesl) are on-going. MMD withholds comments on these that will help to define the probable hydrological consequences of the proposed operation until they are complete and integrated into the PAP.	
Section 9 - Prior Mining Operations, 602.D(13)(h)			
1	30	The last sentence of Section 9.1 "Mining History" indicates that "More detail about copper explaration can be found in Section 11.3" However Section 11.3 is a soil survey w no such info. Please correct.	See THEMAC Memorandum
Section 10 - Cultural Resources Summary, 602.D(13)(i):			
1	31	Throughout Section 10 authors describe the permit area as being within the "Hillsboro Mining District" and/or/also the "Las Animas Historic District". Confusing. Seems intent is to describe the permit area as in the "Hillsboro Mining District" which is situated inside a larger "Las Animas Historic District" that is yet to be delineated or defined. Please clarify.	See THEMAC Memorandum
2	32	MMD previously provided comments… Please provide an updated Figure 10-1 (from the SAP) w the locations of the four referenced cultural resource surveys depicted.	
3	33	Describe any cultural surveys that have been conducted in the areas of the water supply pipeline and associated well field and update Figure 10-1 of the SAP to include those survey locations and submit.	
4	34	Section 10.2 "Eligibility and Management Summary" indicates that "detailed management recommendations will be presented in a future CR report" and "avoidance will most likely not be feasible for all of these resources, it is recommended that they be included in a testing and data recovery plan..." This testing and data recovery plan should be provided.	
Section 11 Present & Historic Land Use, 602.D(13)(j)			
1	35	Section 11.3 Section 11.3 "Soils Survey" seems irrelevant and out of place under "Present and Historic Land Use". This information would be better presented w/in Sect 6 "Soils Survey". Please provide clarification.	See THEMAC Memorandum
2	36	Please update this section to include a description (present & historic land use) of the water supply pipeline, associated well field, and the electrical power supply lines.	
3	37	Provide a description of land capability & productivity based on Soil Conservation Service, land use capability classes or similar classification.	
Game and Fish Comments			
BDR Chapter 4			
	117	Review Table 4-9 to verify that values were copied over correctly from Table 4-10	See GSA Addendum to Section 4, Vegetation
	118	Jurisdictional status of the Gooddings willow-dominated wetland in Grayback Arroyo is unclear; G&F states "We know that NMED considers this wetland jurisdictional under state standards. Please note state status in the final BDR, and clarify whether it is USACE jurisdictional."	

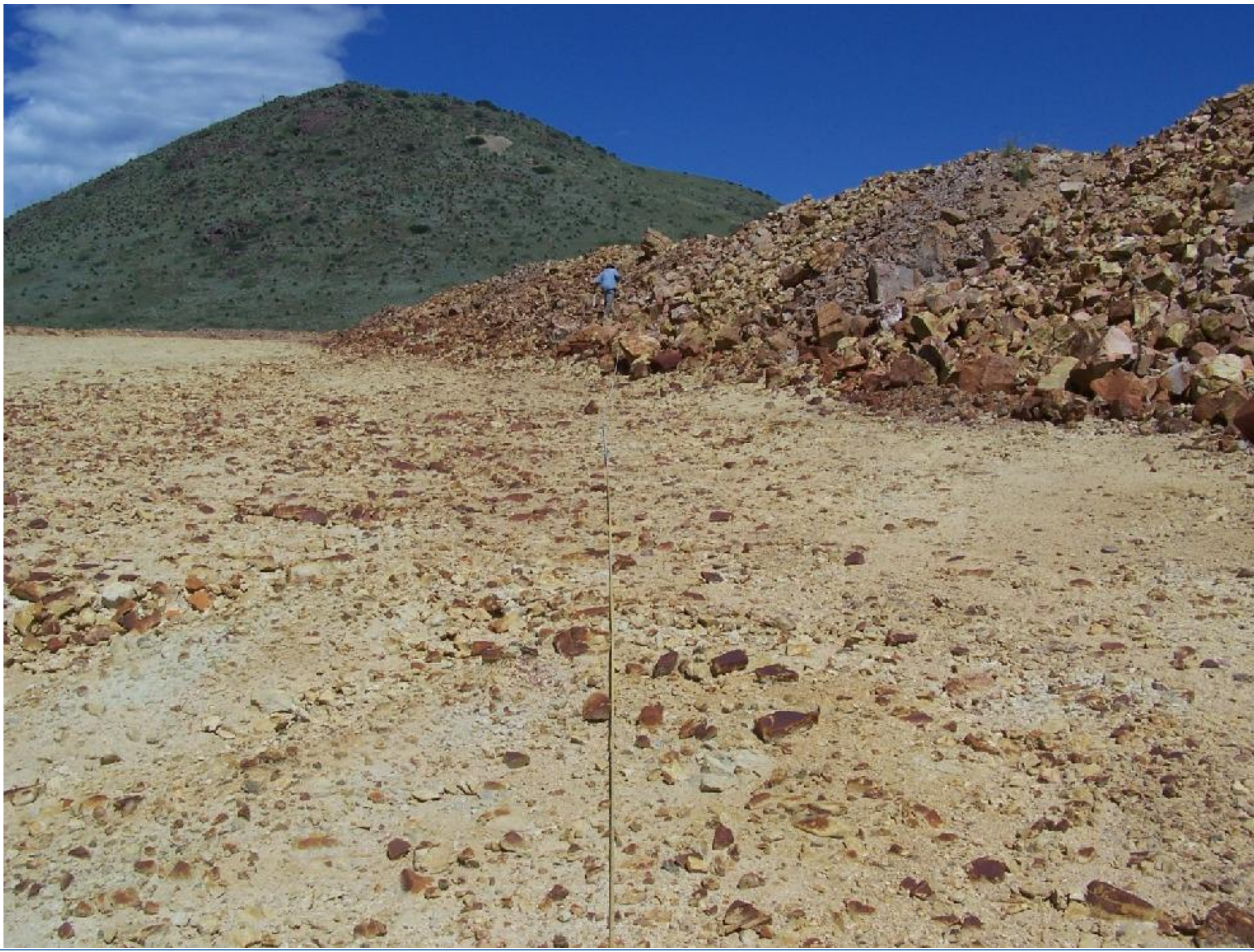
Baseline Data Report Comments/Responses

Agency no.	NMCC #	Comment	Resolution
BDR Chapter 5			
	119	Section 5.2.3 states isolated springs and seeps were "nearly all on private land and inaccessible," and thus were not examined. However, all these springs were sampled for flow as reported in BDR Chapter 8. Clarify that all springs are on private land and access was, and is, denied, or conduct biological resource surveys using photographs.	See GSA Addendum Section 5, Wildlife
	120	Tables 5-2 and 5-3: Show relative abundance (for example, using terms like "abundant," "common," "uncommon," "rare")	
	121	Incorporate winter observations from Appendix 5-B, Winter Bird Survey Report, into summary Tables 5-2 and 5-3	
	122	Migratory seasons should be covered by monitoring of migrating waterfowl and other birds at the pit lake, in addition to winter and summer surveys	
	123	Table 5-6 Bat Species Detected by Habitat: Include relative activity level (as indicated by calls per unit time), possibly as separate table	
BDR Chapter 5 continued			
	124	Any abandoned historic mine features comprising of more than a shallow blind shaft should be evaluated to determine use by roosting or hibernating bats, especially if the features are expected to be disturbed or destroyed by future mining	See GSA Addendum Section 5, Wildlife
	125	Section 5.4.1.3: Report in text or tabular form the relative abundance of large- or medium-size mammal sightings/sign by location or habitat type. Include a comparison to the reference plots.	
	126	Conduct a survey for raptor nests in all suitable habitat within one mile of any potential mine-related disturbance.	
	127	Conduct focused monitoring of wildlife use of the pit lake. This might include camera traps, diurnal and nocturnal passive observation sessions, track counts, or spot-lighted surveys.	
OSE Comments			
MORP Appendix B (BDR)			
	148	Table 7.1, Figures 7.1 and 7.2: Reference BLM (1999), but it would be useful to reference original authors for maps.	See THEMAC Memorandum
	149	Figure 7.5: Add description of fault systems in legend beneath label for fault (e.g., Hunter fault system N20E, Patten Fault system N50W)	
	150	Table 8-1: Reported temperature of 81.5 deg C appears to be incorrect	See JSAI Memorandum
	151	Figure 8-17: Cross-section lacks control points east of GWQ-21B	
	152	Section 8.2.4.1.5, Figures 8-22 and 8-24, Table 8-11: GWQ96-22A and -23A 2010-2011 sulfate values drop unexpectedly compared to 1996-1997 TDS and specific conductance values; lab error, typographical error or water quality has not stabilized from mixing? Further review of data needed since sulfate, TDS and specific conductance typically show strong correlation.	
	153	Section 8.2.5.2.5, Appendix 8-G Figures G through J: Text asserts no discernible trends in hydrographs for MW-2, -5, -6 and -8, but more effort would be needed to understand hydrographs in order to adequately simulate Upper Santa Fe Group. MW-5 is active stock well that shows 50 ft or more drawdown when pumped for a short duration, then water levels fully recover as showing in 2012 transducer data; Figure H has mix of USGS and other data and 1980s data may represent pumping levels or recent pumping. Additional effort should be undertaken to evaluate data quality, well construction details, lithology and other potential factors for disparate responses shown in hydrographs.	
	154	Table 8-9, Table J1 and Figure I (Appendix 8-G): Discrepancies between elevations and total depths cited (e.g., MW-6 TD); Table J1 draws upon multiple data sources; sources for tables or figures are not clearly identified; possibly bottom of screen interval has been used in place of TD	

Baseline Data Report Comments/Responses

Agency no.	NMCC #	Comment	Resolution
OSE Comments MORP Appendix B Continued			
	155	Section 8.2.4.3.5 and Figure N (Appendix 8-G): In addition to hydrograph showing responses to wetter years, the alluvial aquifer may be affected by irrigation water usage from surface water diversions from Las Animas Ck and groundwater diversions from alluvial aquifer and Santa Fe Group aquifer. Also, changes in leakage or flow from artesian wells may affect alluvial aquifer.	See JSAI Memorandum
	156	Section 8.2.4.4, Figures 8-13, 8-32 and 8-33: There may be simpler explanation for hydrologic change in artesian aquifer: artesian zones may represent solely a change in sedimentary deposition within Santa Fe Group, with lesser importance given to structural influence from faulting. It's unclear what influence Hawley and Kennedy (2004) reference has on Figures 8-13 and 8-33 given that its geologic map is located in T16S with dashed lines. Hawley section RA-RA' follows changes in lithology rather than create a confined area from dipping USF beds of laterally-extensive clay layers.	
	157	Figure 8-32: USGS 2006 reference not included at end of Chapter 8. Bottom 2/3 of faults should be dashed to represent uncertainty in locations as in Seager (1982). Fault between LA-96 and LA-115 on Figure 8-33 does not appear in plan view in Figure 8-32. NMCC should provide more supporting evidence (e.g., field observations, drilling logs, deeper wells that would provide control points) that would help justify changes to earlier geologic map. Text and figures should indicate modifications in greater detail.	
	158	Section 8.2.5.1: Pit lake levels increased from 1997 to 2011 and likely so did nearby groundwater levels. GWQ96-22 and -23 were drilled in 1990s, yet earlier water level data were not included in BDR. Historical trend of nearby groundwater levels and pit level may be worth considering rather than only 2011 measurements.	
	159	Section 8.2.5.4: Given the local gradients and geology, "stationary" groundwater may not adequately describe vertical and horizontal flow.	
	160	Section 8.2.6 and Figure 8-39: In groundwater model report, modeling objectives should be stated. Are grid and dimensions based on objectives? Will regional model adequately evaluate local impacts of pumping at production well field and open pit?	
	161	Figure 8-33 and Figure 3 (Appendix 8-H): Indicate whether clay-rich layers in Las Animas Ck wells were correlated based on depths indicated from well drilling records or whether dipping clay beds are more conceptual than from specific depths.	
	162	Table 2 (Appendix 8-H), Section 8.2.4.4.2: Artesian flow rates show decline at several wells; clarify the basis for the conclusion that dewatering by artesian well upward leakage and open flow appears to be mainly responsible for long-term decline of artesian flow rates (Appendix 8-H). In particular, what does Table 2's total artesial flow rate represent in support, if any, of conclusion about upward leakage and open flow? If wells are poorly constructed or well seal deteriorates, leakage may partially occur in subsurface, which would appear as decreased flow at surface. Would a better approach for addressing changes at artesian wells include monitoring shut-in pressure of a properly-sealed artesian well?	
	163	Figure 8-36: Shows FW-3 with initial flow rate of 125 gpm; however, declaration indicates initial flow rate of 80 gpm. Murray (1959) indicates the 125 gpm was pressure-pumped for 4 hrs to induce 115 ft of drawdown. So, FW-3 artesian flow should be 80 gpm.	

A - GSA Addendum to Section 4, Vegetation



Copper Flat Mine: Addendum to Section 4 (Vegetation) of the Baseline Data Characterization Report

6/25/2013

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Table of Contents

Background

A detailed vegetation assessment was completed for the Copper Flat mine as part of the mine's permit application. Vegetation fieldwork was completed during the 2010 and 2011 field seasons, however, the bulk of the transects were conducted during the summer of 2010. Methods and results of the vegetation study were published in the Copper Flat Project Baseline Data Characterization Report (BDR) and the vegetation portion of the document specifically fell under Section 4. Since publication of the BDR, state agencies reviewed the BDR content as part of New Mexico Copper Corporation's (NMCC) Permit Application Package with the Mining and Mineral Division and provided comments. In response to the agency comments, NMCC contracted GeoSystems Analysis, Inc. to develop this addendum for Section 4 of the BDR. This report is organized as a list of agency comments which are followed by the response to each comment. An error on the extent and distribution of noxious weeds reported in the BDR is also corrected at the end of this addendum. A revised noxious weed location map plus more accurate descriptive text is included after the agency comments are addressed.

New Mexico Department of Game & Fish (NMG&F) Comments

Comment 1. Excellent job on this chapter.

Thanks!

Comment 2 . NMCC Comment #117. Please revise Table 4-10, values were copied over from Table 4-9.

Apologize for that oversight, an incorrect data table was pasted into the document as Table 4-10. The correct table is pasted in below.

Table 4-10A. Species Richness Based on Species Intercepts at Cover Transects for Copper Flat Mine Permit Area Strata

Stratum	Perennial Grasses	Perennial Forbs	Shrubs/Trees	Annuals	Total
Chihuahuan Desert Grassland	23	24	23	14	84
Chihuahuan Desert Shrubland	15	17	16	21	69
Tailings Pile	19	16	13	17	65
Tailings Dam	7	6	7	3	23
Pit	4	3	3	0	10
Arroyo	3	0	5	0	8

Comment 3.NMCC Comment 118. Two locations are described on p 4-22 as meeting CWA definition for wetlands. "Based on preliminary discussions with USACE", the cattails in the pit are not jurisdictional. No statement is made as to jurisdictional status of the Gooddings willow dominated wetland in Grayback Arroyo. The Biological Resources Survey Report on the pipeline and well sites, attached as Appendix 5-A to Chapter 5 of the BDR, discusses this wetland. On page 13 it states that it is not jurisdictional, however on page 14 it states that no determination was made due to lack of anticipated impact on this area. We know that NMED considers this wetland jurisdictional under state standards. Please note state status in the final BDR, and clarify whether it is ACOE jurisdictional.

The Goodding's willow community in Grayback Arroyo could be considered a jurisdictional wetland according to State of New Mexico standards. The site does have hydrophilic vegetation, hydric soils, and what appears to be perennial or at least regular standing water, and while formal wetland delineation has not been conducted, the field conditions suggest that the site would qualify as a delineated wetland. The source of the water, whether spring fed or a pool resulting from a previous event in Grayback, hasn't been formally determined and could influence whether the wetland is considered jurisdictional.

A formal delineation report for this wetland has not been submitted to the U.S. Army Corps of Engineers but in response to this NMG&F comment, the probability of jurisdictional classification was discussed with regulatory personnel at the Corps of Engineers (J. Riggs personal communication 2013). Since no formal delineation report was filed or official determination made, the possibility of jurisdiction exists but based on conversations with the Corps, jurisdictional assertion is unlikely because:

- The standing water is probably the result of a thick, impermeable clay layer deposited in an old scour hole at the bottom of Grayback Arroyo due to close proximity to a large culvert just above the site. A clear hydrological connection to a Waters of the U.S. would be difficult to defend since a connection to the Rio Grande would need to be proven, the wetland is very small, and the arroyo is extremely ephemeral and intermittent.
- Even if the wetland was spring fed, it would be difficult to defend the significant nexus assertion or assign a direct hydrological connection to a Waters of the U.S.
- The wetland is relatively unique in the Corps of Engineers system since it doesn't appear to be spring fed and there haven't been other similar wetlands reported nearby, so it would be difficult to defensibly assign a jurisdictional status. It falls in a grey area in defining jurisdictional status.

As discussed in the July 2012 Mine Operation and Reclamation Plan, NMCC plans to leave Grayback Arroyo, the diversion around the mine, and the stand of Gooding's willow trees unaltered during operations. NMCC does not anticipate any significant changes to the existing surface water flow conditions as a result of operations and would endeavor to maintain the existing hydrologic conditions that appear to support the riparian areas. All riparian areas will be managed appropriately according to state and federal requirements.

New Mexico Mining and Minerals Division Comments

Comment 1.NMCC Comment #1. Section 4.3.1.5: Please replace "beside the arroyo" with a word of clarity (parallel to, physically next to, in addition to, etc.).

The sentence from the BDR read as; "Our sampling objective was to meet statistical sampling adequacy (+/- 10 percent of the mean) for perennial plant species cover in each stratum besides the arroyo." The intention of the sentence would have been clearer if it said, "with the exception of the arroyo stratum" instead of "beside the arroyo". Only three transects were sampled in the arroyo stratum. We never expected to meet statistical sampling adequacy with such a small sample size. In comments to the Copper Flat Sampling and Analysis Plan, agencies requested that biologists install at least two transects were in the arroyo stratum. The three arroyo transects were implemented as a response to that particular suggestion.

Comment 2. NMCC Comment #2. Section 4.4.1.5: Please revise to clearly describe which areas were adequately sampled through stratified sampling and which areas were not. Give reasoning. Provide a discussion of the # of transects statistically required for sample size adequacy and the # of transects actually conducted.

The BDR write-up from Section 4.4.1.5 is pasted below along with BDR Table 4-11, which was referenced in the text:

A total of 96 vegetation monitoring transects were sampled in the Permit Area. Sampling intensity within each stratum was based on a small pilot study at the site (Parametrix, 2010b). While obtaining statistical sampling adequacy for each variable measured under this study would have been unrealistic, sometimes requiring several thousand transects per stratum, the goal was to meet statistical sampling adequacy for perennial plant species cover in each stratum with the exception of the arroyo. This goal was achieved at two of the five remaining strata (Table 4-11). Cover summary tables in Appendix 4-A also contain detailed sampling adequacy results at the lifeform level. Anomalous vegetated microsites are frequently found throughout the site because of the history of disturbance at the site, variable soil depths, unnaturally variable soil substrate from previous mining, variable water collection patterns in crevices or at the base of waste rock, and patchy earlier reclamation efforts. Vegetation communities with this distribution create variability both within a transect and across transects in a stratum. This distribution creates extreme challenges to obtaining sample adequacy. The botanists also hesitated to move transects into other strata to achieve lower standard deviation values because this could have led to underestimating the amount of heterogeneity within a stratum.

Vegetation on the tailing dam was more evenly distributed than in the disturbed area/waste rock pile stratum. Based on the cover data, 9.7 transects were adequate for meeting statistical sampling adequacy in the tailing dam stratum; therefore, the ten transects selected for study were sufficient. These ten transects were also adequate for capturing total vegetation cover and total cover. Vegetation species distribution was relatively even in the disturbed area/waste rock pile stratum as illustrated by the relatively high S-W Index. Perennial cover, however, was extremely variable between transects. Statistical *sample adequacy for perennial cover in the disturbed area/waste rock pile stratum required 104 transects. A total of 25 transects were read in this stratum.*

Any vegetation encountered in the pit stratum resulted in extremely high standard deviation values. Standard deviation values exceeded the mean cover for each lifeform in this stratum. Based on sample adequacy calculations, 3,032 transects were required in this very small stratum.

Sample adequacy was achieved in the CDG stratum for perennial plant cover, total vegetation cover, and total cover. This stratum included the majority of the projected mine footprint. In fact, according to sample adequacy calculations, this stratum was oversampled. A total of 8.9 transects were adequate whereas 29 were measured in the CDG. Total cover sample adequacy was obtained in the CDS stratum but 49 transects would have been required to adequately capture total vegetation cover. A total of 39 transects would have met statistical sample adequacy in the CDS stratum; however, only 19 were measured. Based on another review of the section, it appears that coachwhip was not referred to as a lizard in the Draft BDR; it was referred to as a reptile, which is technically correct.

Table 4-11
Number of Transects Required to Meet Sample Adequacy (as ± 10% of the mean) for Copper Flat Mine Permit Area Strata

Stratum	Sample Adequacy Perennial Plant Species Cover	Sample Adequacy All Plant Species Cover	Sample Adequacy Total Cover	Total Number of Transects Actually Recorded
Chihuahuan Desert Grassland	8.9	12.6	2.5	29
Chihuahuan Desert Shrubland	38.8	49.1	13.1	19
Waste Rock/Disturbed Areas	104.3	86.8	17.5	25
Tailings Dam	9.7	10.0	0.2	10
Pit	3,032.1	3,032.1	231.5	10
Arroyo	257.8	257.8	31.3	3
				96

The goal of the project was to obtain statistical sample adequacy for perennial plant cover in the five strata with at least ten transects. This goal was achieved in two of the strata. Table 4-11 includes the number of transects required to achieve statistical sampling adequacy for various vegetation attributes and the number of transects actually measured.

As mentioned in the BDR, transect intensity within each stratum was based on a preliminary pilot study in which transects were measured in the CDG, CDS, and disturbed strata during the 2009 field season. The pilot study used results of these data collected along the preliminary transects to run sample adequacy calculations following vegetation monitoring standards typically employed in mines throughout New Mexico (Clark 2001). According to the results, a total of six transects per stratum was predicted to yield sufficient sample adequacy (+/- 10 percent of the mean). To be conservative, a minimum of ten transects were actually measured within each stratum and transect intensity was also weighted by area – so larger strata received more transects. Theoretically, given the results of the pilot study, this sampling intensity would have greatly exceeded sample adequacy but as shown in Table 4-11, and as originally discussed in the BDR, the statistical prediction from the pilot study didn't actually yield the predicted results after the site was intensively inventoried the following field season.

Several variables could contribute to the fact that sample adequacy was not ultimately obtained, some of which include:

- The sample adequacy calculation is only intended to predict the required sampling intensity for that particular point in time, which is OK because you'd expect that perennial plant cover and intra-site variability in perennial plant cover varies from year to year, season to season, etc. As such, the calculation is only really representative for that particular sampling period. The pilot study for this project was completed in a different field season (2009) than the actual intensive study (which was implemented in 2010). This was intended to be accounted for by significantly increasing the actual number of transects measured versus what was predicted to be necessary in the pilot study.
- Some strata could have been sub-divided further to improve sample adequacy statistics, which would have also required delineating new maps of the vegetation strata. Oftentimes, the sample adequacy was not statistically obtained due to a small subset of outlier transects. Our biologists decided to leave those transects in as part of the sample for the stratum and also leaned against remapping strata because it would have been difficult to reliably discern microsites into different strata. It was preferable to leave the samples as they were and acknowledge the heterogeneity within the strata rather than attempt to redefine.
- Sample adequacy is ultimately just a statistical prediction that a certain number of transects will be required to reach the desired accuracy threshold. However, it's possible that even if this predicted sampling intensity is implemented, the statistical prediction may not hold true – which is actually what happened in this study. It's a floating target to some degree that can be greatly affected by an outlier transect and a suite of other compounding variables.
- Some strata, particularly the areas disturbed during prior mining like the Pit and Waste Rock/Disturbed Areas, have a high degree of variability within the stratum. We also question how important it is to statistically validate, from a sample adequacy standpoint at least, the results of the cover measurements in the Pit stratum. The data showed that perennial plant cover is extremely low through most of this stratum but there are widely distributed, isolated patches of perennial plants that have encroached into the area. As Table 4-11 illustrates, 3,032

transects would have been required at that time to achieve statistical sample adequacy for perennial plant cover, which was beyond the scope of this study. An outlier transect could have also been removed from the stratum to improve the results of the sample adequacy calculation but it was considered more important to capture and present the heterogeneity that is present in the stratum rather than remove descriptive samples to improve sample adequacy statistics.

- It's possible that certain strata could have been better represented statistically by a non-transect based measurement method in which an independent sample described a sample block rather than quads placed along a transect. The quad shape and size could have also been adjusted perhaps in certain strata as well. The project sample adequacy data showed that statistical adequacy was not achieved shrubland sites (CDS stratum) or heavily, irregularly disturbed areas (Waste Rock/Disturbed Areas stratum and the Pit). It's a regular practice, in range science for example, to nest a larger sampling block along the transect in shrublands or forests when trees or large shrubs can be poorly represented if measured using a similar method to grass dominated habitats. Varying the method according to habitat, however, comes with its own set of potential costs, namely measurement inconsistency between strata or between field observers, and it's also difficult to predict when a different sample method is clearly needed.

Addendum to Noxious Weed Information Published in the BDR

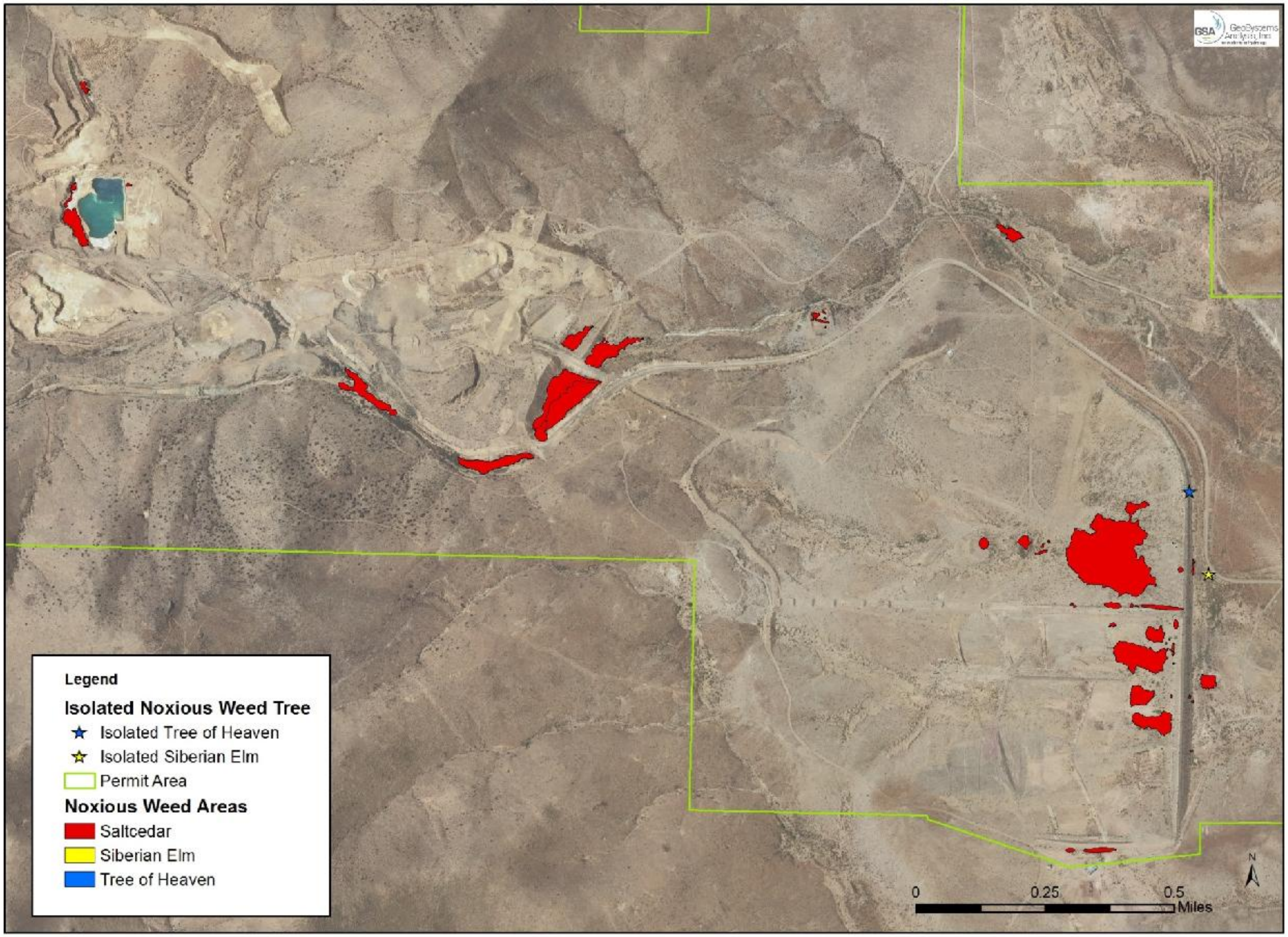
The distribution of saltcedar (*Tamarix* sp.) was under-reported in the BDR and two additional noxious weed species were also observed in the permit area since publication of the BDR. Tree of heaven (*Ailanthus altissimus*) and Siberian elm (*Ulmus pumila*) were both observed as single individuals growing at the base of the tailing dam (Figure 4A-1). Both of these unreported infestations were isolated and minimal - only one pole-sized Siberian elm tree was observed and a small patch of Tree of heaven, likely comprised of one individual connected with rhizomes belowground. The total area of saltcedar patches mapped in the permit area is approximately 30-acres. The additional saltcedar acreage is not due to population expansion, rather an outdated GIS data file was used for reporting noxious weed distribution in the BDR. The unreported patches all lie near the tailing dam.

References

Clark, D.L. 2001. Stabilization of the mean as a demonstration of sample adequacy: Albuquerque, N. Mex., American Society for Surface Mining and Reclamation Annual Meeting, June 3-7, 2001.

Parametrix, Inc. 2012. Copper Flat Baseline Data Characterization Report – Section 4 (Vegetation). Report developed under contract with New Mexico Copper Corporation.

Figure 4A-1. Copper Flat Mine Noxious Weed Map



B - GSA Addendum to Section 5, Wildlife

Copper Flat Mine: Addendum to Section 5 (Wildlife) of the Baseline Data Characterization Report

6/25/2013

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Table of Contents

Background

A suite of wildlife surveys was completed at the Copper Flat Mine site during 2011, when Parametrix, Inc. was contracted by New Mexico Copper Corporation (NMCC) to conduct a wildlife assessment at the mine permit area and off-site reference areas as part of the mine project's permit application. This study was implemented to inform development of the Copper Flat Project Baseline Data Compilation Report (BDR). A draft of the wildlife BDR chapter (Parametrix 2012) was provided to managing agencies for review and comment. The New Mexico Department of Game & Fish (NMG&F) provided a list of ten major comments to the draft report, while the New Mexico Environment Department provided one comment. GeoSystems Analysis, Inc. was later contracted by NMCC to complete additional fieldwork during the Summer 2012-Spring 2013 field season, re-analyze some of the previous data collected at the mine site, and draft this addendum to Section 5 of the BDR. The focus of the additional work was to directly and thoroughly address agency comments to the draft report. This addendum is designed as a list of individual agency comments, which are then followed by the specific approach implemented to address the comment and the results of the additional analysis.

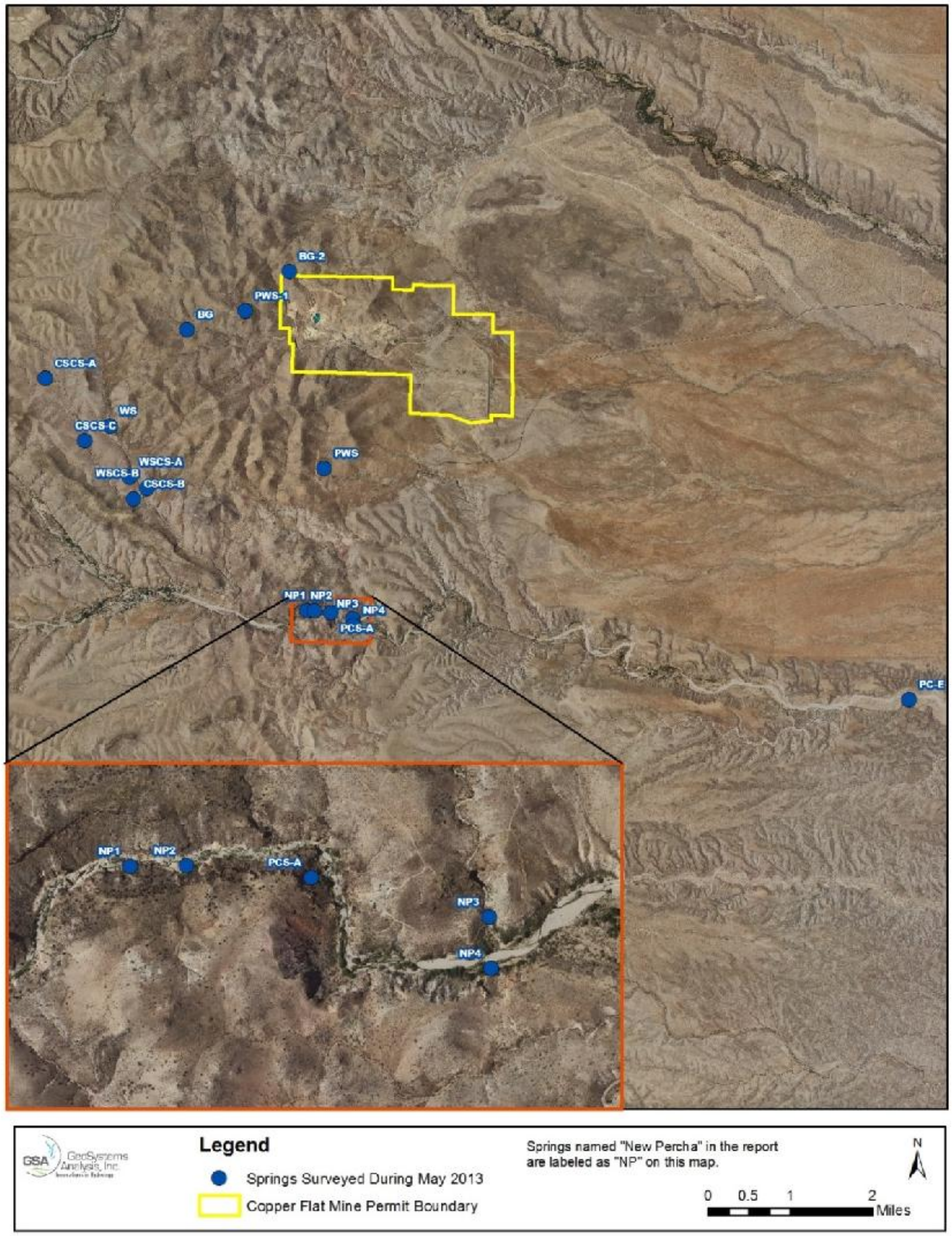
New Mexico Department of Game & Fish Comments

Comment 1. Section 5.2.3, on p 5-3, isolated springs and seeps were "nearly all on private land and inaccessible", and thus were not examined. However all of these springs were sampled for flow as reported in the BDR Chapter 8, Surface Water and Groundwater, raising the question whether any attempt was made to access these locations for vegetation or wildlife surveys. Please clarify that access was denied, or conduct at least qualitative biological resource surveys with photographs.

An attempt was made during summer 2011 to complete a qualitative wildlife habitat assessment at each of the springs that had been previously visited by hydrologists. At that time, private landowners did not grant the biologists permission to access the springs near Animas Creek or the cluster of springs near Warm Springs and Cold Springs Canyons. Access permission to the springs near Warm Springs and Cold Springs Canyon was later granted (permission was obtained during May 2013), so a field biologist completed a qualitative resource survey at these sites and also visited springs that were identified by hydrologists on public land just west of the mine permit and along Percha Creek. Access permission to the springs near Animas Creek was not obtained. Four additional seeps through Percha Box that were not identified in the hydrology section of the BDR were observed by the biologist, mapped, and assessed. These seeps not previously identified in the hydrology section were assigned a name beginning with "New Percha" and numbered according to the order they were initially observed. Each of the springs where an assessment was completed are shown in Figure 5A-1. An assessment was attempted at a total of 16 spring/seep locations but in some cases a spring or seep could not be located in or around the specific GPS location. A surrounding area of typically about 1,000 feet was searched if the spring could not be initially located. The hydrology section mentioned that several springs were also dry during 2011 fieldwork and some of the spring locations were derived historic information. It's possible that some of the dry springs haven't flowed in a long time.

A passive wildlife habitat assessment was conducted at each spring/seep site. Basic characteristics on vegetation structure, dominant vegetation species, presence of moist soil or standing water, water depth (if applicable), observations of fish or amphibians, a representative photograph, and other general notes were recorded.

Figure 5A-1. Spring and Seep Survey Locations



Surface water was observed at eight of the sites (Table 5A-1). Water depth was typically not more than a few inches, but deeper water was observed at the two developed springs. Water depth was estimated to be four feet on average in the concrete lined portion of spring WS while PC-E contained about three feet of water in the stock tank. Not surprisingly, the springs with surface water present were also typically vegetated with riparian or wetland plant species. Goodding's willow, cottonwood, and Baccharis were commonly observed at the wet springs. Cattails grew in the open water at one spring (New Percha 2). Spikerush, saltgrass, Bermuda grass, watercress, cloak fern, and bulrush were also sometimes observed growing within the aquatic habitat or in the surrounding moist soil.

Table 5-A1

Field Observations from Springs and Seeps Visited during May 2013

Name	Water Present (Y/N)	Water Depth	Dominant Vegetation	Notes
WS	Y	4 feet	One large cottonwood tree, saltgrass, spikerush, and bulrush	Source spring is concrete lined, heavy grazing outside of fence, water continues down canyon
BG	N	0	Wolfberry, scrub oak	No spring observed at GPS point. Solar pump with water tank observed nearby.
BG-2	N	0	Mesquite, tabosa grass	Spring now dry, no wetland or riparian plants observed.
PWS	N	0		Initial GPS mapped in upland, searched surrounding areas but no spring/seep evident
CSCS-A	N	0	Emory oak, mesquite	No spring/seep observed
WSCS-A	N	0	One large Goodding's willow, strip of seep willow	Initial GPS point mapped in mesquite upland, assumed that target was actually location where Goodding's willow was observed.
WSCS-B	N	0	Upland shrubs, wait a minute bush, little leaf sumac	Rill observed at original GPS point, no wetland/riparian plants nearby, searched drainage bottom and rock walls nearby but no spring/seep evident.
PWS-1	N	0	Baccharis, scrub oak	Dry area, no clear spring observed. Baccharis patch assumed to be intended location.

Name	Water Present (Y/N)	Water Depth	Dominant Vegetation	Notes
PC-E	Y	3 feet	Relatively barren, mesquite tree.	No spring observed at GPS point. Windmill nearby, assumed this was intended location.
CSCS-B	Y	2 inches	A cluster of large Goodding's willows, no wetland herbs observed	Heavily grazed and impacted by cattle
CSCS-C	N	0	Mesquite	Spring now dry.
PCS-A	Y	1 inch	Baccharis, watercress, Bermuda grass, Goodding's willow	Original GPS point slightly off. Water observed seeping from rocks up canyon about 150 feet away from navigation point. Goodding's willow, Baccharis dominated. Water continues down and connects with creek about 25 feet downhill.
New Percha 1	Y	1 inch	Velvet ash, spikerush	Seep not identified in hydrology section but observed during site visit. Water seeping from rock wall.
New Percha 2	Y	1 inch	Cottonwood, cattail, watercress, also cattails in standing water	Seep not identified in hydrology section but observed during site visit. Water seeping from rock wall. Cattails dominant in standing water portion.
New Percha 3	Y	1 inch	Goodding's willow, cottonwood, Baccharis, watercress, cloak fern	Seep not identified in hydrology section, observed in field. Water flows for about 50 feet but goes underground before reaching creek.
New Percha 4	Y	4 inches	Netleaf hackberry, Baccharis, Goodding's willow, speedwell	Spring snails observed.

Spring snails were observed in one spring (New Percha 4) but not identified to species. Biologists did not observe amphibians or fish within or near any of the springs though an unidentified fish species was common in portions of Percha Creek. The wetted extent of Percha Creek was also comparable to what was mapped in Section 4 (Vegetation) of the BDR. Spring WS appeared to have the highest potential habitat value but livestock grazing has impacted portions outside the perimeter fence. In some cases the surface water from seeps identified in Percha Box went subsurface before reaching the creek. At five sites, no spring or seep could be located at or near (within 1,000+ feet) the GPS location and no signs of isolated, increased soil moisture (riparian vegetation) were observed. In other cases, no standing water was present but standalone riparian trees were observed at or near the spring location and presumed to be the mapped location. Figure 5A-2 includes representative photos of the springs with surface water present. GPS locations were based on information provided by the project hydrologists, which sometimes represented historic information and/or non-GPS based location data. The lack of GPS-based location data, current drought, and the outdated nature of the data probably in combination explains the difficulty in locating some of the springs. Overall spring wetness observed by the biologists corresponded with observations reported by the hydrologists in Section 8 of the BDR.

Figure 5A-2. Representative Photos of the Springs/Seeps with Standing Water

Spring WS, notice difference between grazed and ungrazed sides of fence.

Spring PCE

CBCS-B

PCS-A

New Percha 1

New Percha 2

New Percha 3

New Percha 4

Comment 2. Table 5-6, Bat Species Detected by Habitat. It is quite difficult even for experts to distinguish many species by call, especially for the Myotis group of species. The list is acceptable as submitted, but precise species identifications should be considered with a grain of salt.

Understood.

Comment 3. Table 5-6, Bat Species Detected by Habitat, or on a separate table. Please show relative activity level (as indicated by calls per unit time).

As described in the BDR, the wildlife survey project area was divided into sampling strata and certain strata were measured in 2011 as both an onsite (denoted as "On" in the table below) and offsite ("Off") analog. The primary strata measured include Chihuahuan Desert Grassland (CDG), Chihuahuan Desert Shrubland (CDS), and Arroyo; plus certain areas were stratified to generally isolate common types of features or major features left behind from prior mining at the site. Disturbed strata include the Pit, Pit Lake, Tailing Dam (TD) and Waste Rock/Disturbed Area (WR/DA). Each stratum was not necessarily represented with data collected from each individual survey protocol but habitats were still consistently described across protocols. Offsite analogs were not surveyed or compared for the disturbed strata developed to characterize previous mining.

A total of 12 species of bats were assigned by Sonobat software at the Copper Flat Mine permit area (as depicted in Table 5-5 of the BDR): pallid bat (*Antroorzous pallidus*), Townsend's big-eared bat (*Corynorhinus townsendii*), big brown bat (*Eptesicus fuscus*), silver-haired bat (*Lasionycteris noctivagans*), southern hoary bat (*Lasiurus cinereus*), western small-footed myotis (*Myotis ciliolabrum*), California myotis (*Myotis californicus*), Arizona myotis (*Myotis occultus*), fringed myotis (*Myotis thysanodes*), Yuma myotis (*Myotis yumanensis*), canyon bat (*Parastrellus hesperus*), and Mexican free-tailed bat (*Tadarida brasiliensis*). Extracted Sonobat data were used to determine the relative abundance of bat activity within the sampling strata. Since the software is not always a reliable predictor of species level information, Table 5A-2 below only shows relative activity level by stratum for all species combined. Note that instances where Sonobat could not assign a species at all were also included to calculate the mean sequences recorded in Table 5A-2 since automated data cleaning ("scrubbing") capabilities in Sonobat were employed to remove sequences that likely resulted from noise or other non-bat acoustic signals.

The pit lake had by far the highest relative activity level measured, with over 2,000 mean echolocation sequences captured per day. The Arroyo stratum had 335 mean echolocation sequences measured per day while fewer sequences were captured per day in the CDG stratum (78). Higher activity was measured at each of the 3 on-site strata than their off-site analogs.

Table 5A-2

Mean Number of Echolocation Sequences Recorded per Day Based on Analysis of Sonobat Data

Stratum	Sequences Captured per Day
Arroyo On	335.1
Arroyo Off	49.1
CDG On	78.4
CDG Off	32.6
Pit Lake On	2,039.3
Stock Tank Off	518.6

Comment 4. Table 5-2 and 5-3, S-W diversity indices are helpful, but please also show relative abundance (for example, using terms like ”abundant, “common”, “uncommon” and “rare”).

Revised versions of Table 5-2 and 5-3 are provided below. Relative commonality is represented according to the term (“abundant”, “common”, etc.) that best describes the number of times a species was encountered along transects either within the stratum or during the season. Winter observations are listed in parenthesis in the revised version of Table 5-2.

Table 5-2 - Revised

Bird Species Recorded by Habitat along Bird Transects during the 2011 Field Season

Species	Copper Flat Mine Permit Area					Reference Sites		
	A=Abundant, C=Common, U=Uncommon, R=Rare, Winter survey results in parenthesis.							
	Arroyo	CDS	CDG	Pit	DA/WR	Arroyo	CDS	CDG
American Kestrel	R	(R)	R					
American Robin	U/(R)	(U)	U					
Ash-throated Flycatcher	C	C	C		U	C		C
Barn Swallow			R	R				
Bewick's Wren	(U)	(U)	R			(R)		
Black-chinned Hummingbird	U		U			(U)		(C)
Black-throated Sparrow	A/(A)	A/(A)	A/(A)	A	A/(A)	C	A	A
Blue Gray Gnatcatcher	C		C		U			C
Blue Grosbeak			C		C			C
Brewer’s Sparrow	(A)	(R)	(U)					

Species	Copper Flat Mine Permit Area					Reference Sites		
	A=Abundant, C=Common, U=Uncommon, R=Rare, Winter survey results in parenthesis.							
	Arroyo	CDS	CDG	Pit	DA/WR	Arroyo	CDS	CDG
Broad-tailed Hummingbird	R				R			
Brown-headed Cowbird	U		R		R	C		
Bullock's Oriole			R					
Bushtit	(C)					(C)		
Cactus Wren	U	U	C	U	C	(U)	C	(U)
Canyon Towhee	C/(A)	(A)	C/(A)		(C)	C/(C)		A/(C)
Canyon Wren	C/(R)	(R)	C	R		C		
Chihuahua Raven		(R)	(R)		(R)	(U)	(U)	(U)
Chipping Sparrow	(A)	(A)	(U)					(A)
Common Nighthawk		U					C	
Common Raven	U	U/(C)	C/(C)		U	U	U	C/(C)
Crissal Thrasher	(U)	U/(U)		U				
Curve-billed Thrasher	U		U				U	
Dark-eyed Junco	(C)	(A)			(A)	(U)		(C)
Flycatcher sp.	U		U		U			U
Gambel's Quail	A/(A)	C/(U)	A	C	A	C	C	(U)
Golden Eagle		(R)						
Grasshopper Sparrow			(R)					
Great Horned Owl	R							
Greater Roadrunner	(R)	R	R	R				
Green-tailed Towhee	(R)							(U)
Horned Lark	(R)	(C)	R/(U)	R	(C)	(A)	(A)	U
House Finch	C/(A)	C/(A)	C/(A)	A	R/(A)			
Ladder-backed Woodpecker	(R)							
Lesser Goldfinch	U/(C)		R			U		
Loggerhead Shrike		(R)		R	R/(U)			
Meadowlark		(A)	(U)					
Montezuma Quail			R					
Mountain Bluebird	(R)	(A)	(R)					
Mourning Dove	C	C/(U)	C	C	R/(A)		C	C
Northern Flicker	(C)	(U)	R/(U)	U	(R)			R
Northern Harrier			(R)					
Northern Mockingbird	C	R	C		C	U		C

Species	Copper Flat Mine Permit Area					Reference Sites		
	A=Abundant, C=Common, U=Uncommon, R=Rare, Winter survey results in parenthesis.							
	Arroyo	CDS	CDG	Pit	DA/WR	Arroyo	CDS	CDG
Oriole sp.	U		R					
Red-naped Sapsucker		(R)						
Red-tailed Hawk	R	U	U/(R)		(R)			
Rock Wren	C/(C)	(C)	C/(C)		C/(C)	U(R)		C/(C)
Ruby-crowned Kinglet	(C)		(U)		(R)	(C)		
Rufous-crowned Sparrow	A/(A)	(C)	C/(C)		(R)			C/(U)
Sage Sparrow	(A)	(A)	(A)			(C)	(U)	
Sage Thrasher	(R)	(R)					(R)	
Say's Phoebe	C	R/(R)	C		U/(U)	C		C
Scaled Quail	C		C		(R)			
Song Sparrow		(R)			(R)			
Sparrow sp.	U		(U)					
Spotted Towhee	R/(R)	(R)	(R)					
Swainson's Hawk	R			R				
Swallow sp.					C			
Thrasher sp.	U		U			U		
Townsend’s Solitaire		(U)						(R)
Townsend's Warbler	U							
Turkey Vulture	U		U		U			U
Unknown	U	U	C		U	U		U
Verdin		(U)	(R)			(R)		
Violet-green Swallow	C	R	U		U			
Vireo sp.						(R)		
Warbler sp.	U		U					
Western Kingbird	C		C		R			C
Western Meadowlark	(R)		U		(R)			
Western Wood-Pewee	C	U	U					U
White-crowned Sparrow	(A)	(A)	(C)		(U)	(U)		
White-winged Dove	U							U
Wilson's Warbler	C							
Wren sp.			U					C
Total Species Encountered Summer	39	16	41	4	21	13	7	20

Species	Copper Flat Mine Permit Area A=Abundant, C=Common, U=Uncommon, R=Rare, Winter survey results in parenthesis.					Reference Sites		
	Arroyo	CDS	CDG	Pit	DA/WR	Arroyo	CDS	CDG
Surveys:								
Shannon-Weaver Diversity Score Summer Surveys:	15.1	5.3	16.9	2.3	9.9	11.3	2.6	10.8
Total Species Encountered Winter Surveys:	29	32	23	0	19	14	5	13
Shannon-Weaver Diversity Score Winter Surveys:	10.7	13.9	11.1	0.0	7.8	9.1	1.6	6.7

Table 5-3 - Revised

Bird Species Recorded During 2011 Transects or Likely Present at Copper Flat Mine Permit Area, Las Animas Creek, and Percha Creek

Species	Copper Flat Mine Permit Area				Las Animas/Percha Creeks			
	Spr	Sum	Fal	Win	Spr	Sum	Fal	Win
A=Abundant, C=Common, U=Uncommon, R=Rare; ○ = Not recorded but likely occurs in proper habitat; • = observed, observation method along Las Animas/Percha Creeks did not yield relative commonality.								
Canada Goose	○		○	○				•
Gadwall	○		○	○				•
Mallard	○		○	○	○	○	○	•
Northern Shoveler	U		○	○				•
Northern Pintail	○		○	○				•
Cinnamon Teal	R		○	○				
Blue-winged Teal	R		○	○				
Canvasback	U		○	○				
American Widgeon	R		○	○				
Green-winged Teal	○		○	○				•
Redhead	○		○	○	•			•
Ring-necked Duck	○		○	○				•
Common Merganser	○		○	○		•		•
Scaled Quail	○	○	○	R	○	○	○	•
Gambel's Quail		A			•	•	•	•
Montezuma Quail	○	○	○	○	•	○	○	•
Ring-necked Pheasant								•
Wild Turkey					•	•	○	○
Pied-billed Grebe								•
Bl.-crowned Night Heron		R				○		
Cattle Egret						○		
Snowy Egret					•		•	
Great Blue Heron	U	○	○	○	•	○	○	•
Green Heron					•			
White-faced Ibis						•		
Turkey Vulture		U				•	•	
Bald Eagle						•		•
Golden Eagle				R				
Northern Harrier		○		R	•			•

Species	Copper Flat Mine Permit Area				Las Animas/Percha Creeks			
	Spr	Sum	Fal	Win	Spr	Sum	Fal	Win
A=Abundant, C=Common, U=Uncommon, R=Rare; ○ = Not recorded but likely occurs in proper habitat; • = observed, observation method along Las Animas/Percha Creeks did not yield relative commonality.								
Sharp-shinned Hawk	○	○	○	○	•	○	○	•
Cooper's Hawk	○	○	○	○	•	○	○	•
Swainson's Hawk		R					•	
Red-tailed Hawk	○	U	○	U	•	•	○	•
Ferruginous Hawk	○		○	○	○	•	○	•
Gray Hawk						•		
Zone-tailed Hawk					•	•		
Common Black Hawk					•	•		
Golden Eagle	○	○	○	R	•			
American Kestrel	○	R	○	R	•	○	•	•
Merlin	○		○	○	○		○	•
Peregrine Falcon					•	•		
Prairie Falcon	○	○	○	○				•
Sora					•			
American Coot						○		
Sandhill Crane							○	•
Killdeer	U	○	○	○	•	•	•	
Black-necked Stilt						○		
American Avocet						○		
Spotted Sandpiper	○	○	○	○		○		
Common Snipe						○		○
Ring-billed Gull								•
Rock Dove	○	○	○	○	○	○	○	•
Eur. Collared-Dove	○	○	○	○	•	○	•	•
White-winged Dove	U	U	○	○	•	•	•	•
Mourning Dove	C	C	C	C	•	•	•	•
Common Ground Dove						○		
Yellow-billed Cuckoo						•		
Greater Roadrunner	○	R	○	○	•	○	○	•
Western Screech-Owl	○	○	○	○	•	○	○	•
Great Horned Owl	○	R	○	○	•	•	○	•
Barn Owl	○	○	○	○	○	○	○	•

Species	Copper Flat Mine Permit Area				Las Animas/Percha Creeks			
	Spr	Sum	Fal	Win	Spr	Sum	Fal	Win
A=Abundant, C=Common, U=Uncommon, R=Rare; ○ = Not recorded but likely occurs in proper habitat; • = observed, observation method along Las Animas/Percha Creeks did not yield relative commonality.								
Burrowing Owl	○					•		
Northern Pygmy Owl	○	○	○	○	○	○	○	•
Mexican Spotted Owl					•			
Elf Owl					•	•		
Lesser Nighthawk		○				•		
Common Poorwill		○			•	•		
White-throated Swift		R			•	•		
Bl.-chinned Hummingbird		R			•	•	•	
Br.-tailed Hummingbird		R					•	
Belted Kingfisher					•	•	•	•
Lewis's Woodpecker								•
Red-headed Woodpecker					•			•
Red-naped Sapsucker								•
Acorn Woodpecker					•	•	•	•
Red-naped Sapsucker					•		•	•
Yel.-bellied Sapsucker								•
Lad.-backed Woodpecker				R	•	•		•
Downy Woodpecker	○	○	○	○	•	○	○	•
Hairy Woodpecker	○	○	○	○	•	○	○	○
Northern Flicker	○	R	○	○	•	○	•	•
Western Wood-Pewee		C				•	•	
Hammond's Flycatcher					•			•
Willow Flycatcher					•			
Brown-crested Flycatcher						•		•
Eastern Phoebe								•
Black Phoebe		R			•	•		•
Say's Phoebe	○	C	○	U	•	•	•	•
Vermilion Flycatcher		○			•	•		•
Ash-throated Flycatcher		C				•		
Brown-crested Flycatcher						•	•	
Dusky Flycatcher					•			
Dusky-capped Flycatcher						•		

Species	Copper Flat Mine Permit Area				Las Animas/Percha Creeks			
	Spr	Sum	Fal	Win	Spr	Sum	Fal	Win
A=Abundant, C=Common, U=Uncommon, R=Rare; ○ = Not recorded but likely occurs in proper habitat; • = observed, observation method along Las Animas/Percha Creeks did not yield relative commonality.								
Cassin's Kingbird						•	•	
Western Kingbird		C				•	•	
Loggerhead Shrike	○	R	○	○	•	•	○	•
Bell's Vireo						•		
Plumbeous Vireo						•		
Warbling Vireo							•	
Hutton's Vireo		○		○			•	•
Steller's Jay								•
Western Scrub-Jay	○	○	○	○	○	○	•	•
American Crow	○	○	○	○	○	○		•
Chihuahua Raven				U	•	○	•	•
Common Raven	○	C	○	C	•	○	•	•
Horned Lark	○	R	○	○	•	○	○	•
N. Rough-winged Swallow		○			•	•		
Violet-green Swallow	○	C	○		•	•	○	
Barn Swallow	○	R	○		•	•	•	
Cliff Swallow		○				•		
Mountain Chickadee				○				•
Bridled Titmouse	○	○	○	○	•	•	○	•
Juniper Titmouse	○	R	○	○				•
Verdin	R			R	•		•	•
Bushtit	○	○	○	U	○	○	○	○
Red-breasted Nuthatch								•
White-breasted Nuthatch					•	•	•	•
Brown Creeper	○	○	○	○	○	○	○	•
Cactus Wren	○	U	○	○	•	○	•	•
Rock Wren	C	C	C	C	•			•
Canyon Wren	U	C	○	○		•		
Bewick's Wren	○	○	○	U	•	•	•	•
House Wren	○							•
Winter Wren								•
Bl.-tailed Gnatcatcher	○					•		

Species	Copper Flat Mine Permit Area				Las Animas/Percha Creeks			
	Spr	Sum	Fal	Win	Spr	Sum	Fal	Win
A=Abundant, C=Common, U=Uncommon, R=Rare; ○ = Not recorded but likely occurs in proper habitat; • = observed, observation method along Las Animas/Percha Creeks did not yield relative commonality.								
Blue-Gray Gnatcatcher		○					•	
Golden-crowned Kinglet								•
Ruby-crowned Kinglet	○	○	○	U	•	○	○	•
Eastern Bluebird								•
Western Bluebird	○	○	○	○	•	○	○	•
Mountain Bluebird	○	○	○	C			•	
Townsend's Solitaire				R	•			•
Hermit Thrush					•			•
Rufous-backed Robin					•			•
American Robin	○	U	○	R	•	•	○	•
Northern Mockingbird	○	C	○	○	•	•	○	•
American Dipper						•		
Curve-billed Thrasher	○	U	○	○	•		•	•
Crissal Thrasher	○	U	○	○	•			•
Bendire's Thrasher								
Brown Thrasher		R						•
Sage Thrasher				R				
European Starling	○	○	○	○	•	•	•	•
American Pipit								•
Sprague's Pipit			○					
Cedar Waxwing					•			•
Phainopepla	○	○	○	○	•	○	•	•
Orange-crowned Warbler	○	○	○				•	•
Bl.-throated Gray Warbler	○				○			
Lucy's Warbler		○			•	•		
Virginia's Warbler		○			•		•	
Grace's Warbler						•		
MacGillivray's Warbler							•	
Northern Parula					•			
Yellow-rumped Warbler	○	R	○	○	•	○	•	•
Red-faced Warbler						•		
Wilson's Warbler	○	○	○				•	

Species	Copper Flat Mine Permit Area				Las Animas/Percha Creeks			
	Spr	Sum	Fal	Win	Spr	Sum	Fal	Win
A=Abundant, C=Common, U=Uncommon, R=Rare; ○ = Not recorded but likely occurs in proper habitat; • = observed, observation method along Las Animas/Percha Creeks did not yield relative commonality.								
Pine Warbler								•
Tennessee Warbler					•		•	
Yellow-breasted Chat		○				•		
Ch.-collared Longspur				R				•
Green-tailed Towhee		R		R				•
Spotted Towhee		R		R	•	○	○	•
Rufous-crowned Sparrow		A		C	•			•
Canyon Towhee		C		A	•	•	•	•
Chipping Sparrow	○	○	○	A	•	○	○	•
Brewer's Sparrow	○		○	C	•		•	•
Vesper Sparrow	○	○	○	○				•
Lark Sparrow		○					•	
Black-throated Sparrow	○	A	○	C	•		•	•
Black-chinned Sparrow	○					•		
Sage Sparrow	○		○	A				•
Baird's Sparrow	○							•
Grasshopper Sparrow				R				•
Clay-colored Sparrow								•
Lark Bunting	○		○	○	•			
Indigo Bunting						•		
Lazuli Bunting					•			
Varied Bunting						•		
Song Sparrow				R	•		•	•
Lincoln's Sparrow	○		○	○	•		•	•
White-crowned Sparrow	○		○	A	•		•	•
White-throated Sparrow								•
Swamp Sparrow								•
American Tree Sparrow								•
Dark-eyed Junco	○	○	○	C	•		•	•
Summer Tanager					•	•	•	•
Hepatic Tanager					•			
Western Tanager					•			

Species	Copper Flat Mine Permit Area				Las Animas/Percha Creeks			
	Spr	Sum	Fal	Win	Spr	Sum	Fal	Win
A=Abundant, C=Common, U=Uncommon, R=Rare; ○ = Not recorded but likely occurs in proper habitat; • = observed, observation method along Las Animas/Percha Creeks did not yield relative commonality.								
Northern Cardinal						○		
Pyrrhuloxia				○	•	•		•
Blue Grosbeak		C			•	•	•	
Red-winged Blackbird	○	○	○	○	•	○	•	•
Western Meadowlark	○	U	○	R	•	○	○	•
Yellow-headed Blackbird	○	○		○				•
Brewer's Blackbird	○	○	○	○				•
Rusty Blackbird								•
Common Grackle					•			
Great-tailed Grackle	○	○	○	○	•	○	○	•
Brown-headed Cowbird		U				•		•
Hooded Oriole	○				•	•		
Bullock's Oriole	○						•	
Scott's Oriole	○					•		
Purple Finch								•
Cassin's Finch		R	○	R				•
House Finch	○	C	○	○	•	•	•	•
Red Crossbill								•
Pine Siskin	○	○	○	○				•
Lesser Goldfinch		U		C	•	•	•	•
Lawrence's Goldfinch								•
American Goldfinch			○		•			•
Evening Grosbeak								•
House Sparrow		U			•	•	•	•

Comment 5. The pit lake may be an important resource for migrating waterfowl and other birds. The migratory seasons should be covered by monitoring in addition to winter and summer surveys.

The summer and winter 2011 surveys crossed the pit lake but focused monitoring of this feature was not completed. Morning bird surveys were conducted at the pit lake during a total of five visits between August 2012 and May 2013. On November 21, 2012 one waterfowl was flushed as the surveyor arrived at the pit lake prior to sunrise and a species could not be determined due to darkness. After nocturnal waterfowl use was observed, two nighttime bird surveys were also completed and two afternoon monitoring visits were also completed during the spring of 2013.

Six waterfowl were flushed as a surveyor arrived during a nighttime bird survey at the pit lake in April 2013. Only one bird was positively identified to species, it was a Canvasback. When returning the next day in the afternoon, 23 waterfowl were present, including Cinnamon Teals, Canvasbacks, American Widgeons, Blue-winged Teals and Northern Shoveler. Pictures of waterfowl were also captured by game cameras installed at the pit lake - mallards were captured on game cameras but never observed in person. A Great Blue Heron was observed during a May 2013 survey and heron tracks were also observed along the lake fringe during other visits. Great Blue Herons were also observed on pit lake cameras on four occasions. Killdeer were heard on two occasions during in person surveys. Spotted sandpipers were observed on one occasion and also captured once by a game camera. One morning in April 2013, a Great Horned Owl was heard calling from the hills to the west of the pit lake as the surveyor arrived at the pit lake but direct use of the lake by owls was never observed.

In general, passerine bird activity (as also observed during the winter bird survey and spring/summer surveys) was determined to be relatively low at the pit lake. One to two hour surveys often yielded very few encounters. The most active species included Rock wrens, Northern mockingbirds, Northern flickers, Common ravens, Mourning doves, White-winged doves and Gambel's quail. Most frequently, these species were heard calling from the hills surrounding the pit lake, typically from the higher tiers to the north of the lake. A Western jay, Red-tailed hawk, Eurasian collared dove, Ash-throated flycatcher, and an unidentified hummingbird were only observed once, either by a distant call or a quick fly-over.
The only passerine activity observed directly at the pit-lake were a group of 6-8 Violet-green swallows that would feed high above the pit lake, swooping down occasionally to drink from the lake. This group was observed feeding for about five minutes before returning to the tiered cliff faces to the northwest of the lake, and then returned to feed again. This behavior was only observed in May, approximately two hours after sunrise. On two occasions, once in April 2013 and once before in 2011, a large group of Turkey Vultures were observed flying down to the water's edge but drinking wasn't directly observed on either occasion. Other activity observed at the pit lake included a small flock of Horned larks landing near the boat ramp and feeding for short period. A small flock of Chipping sparrows were observed flying from the saltbush on the top tier to the south of the pit lake, to the saltcedar to the immediate west of the boat ramp. They were observed hopping to and drinking from the pit lake.

Limited overall passerine bird activity is likely attributed to the general lack of vegetation substrate in areas immediately surrounding the pit lake. Invertebrate activity was also observed to be lower than is typical at water bodies in southwestern deserts. No songbird nests were observed in the isolated saltcedar patches that occur near the lake and relatively low song bird activity was observed at all in the saltcedar patches. Passerine bird nests were also not observed in rocky, unvegetated areas surrounding the pit lake.

Comment 6. Please incorporate winter observations from Appendix 5-B, Winter Bird Survey Report, into summary Tables 5-2 and 5-3.

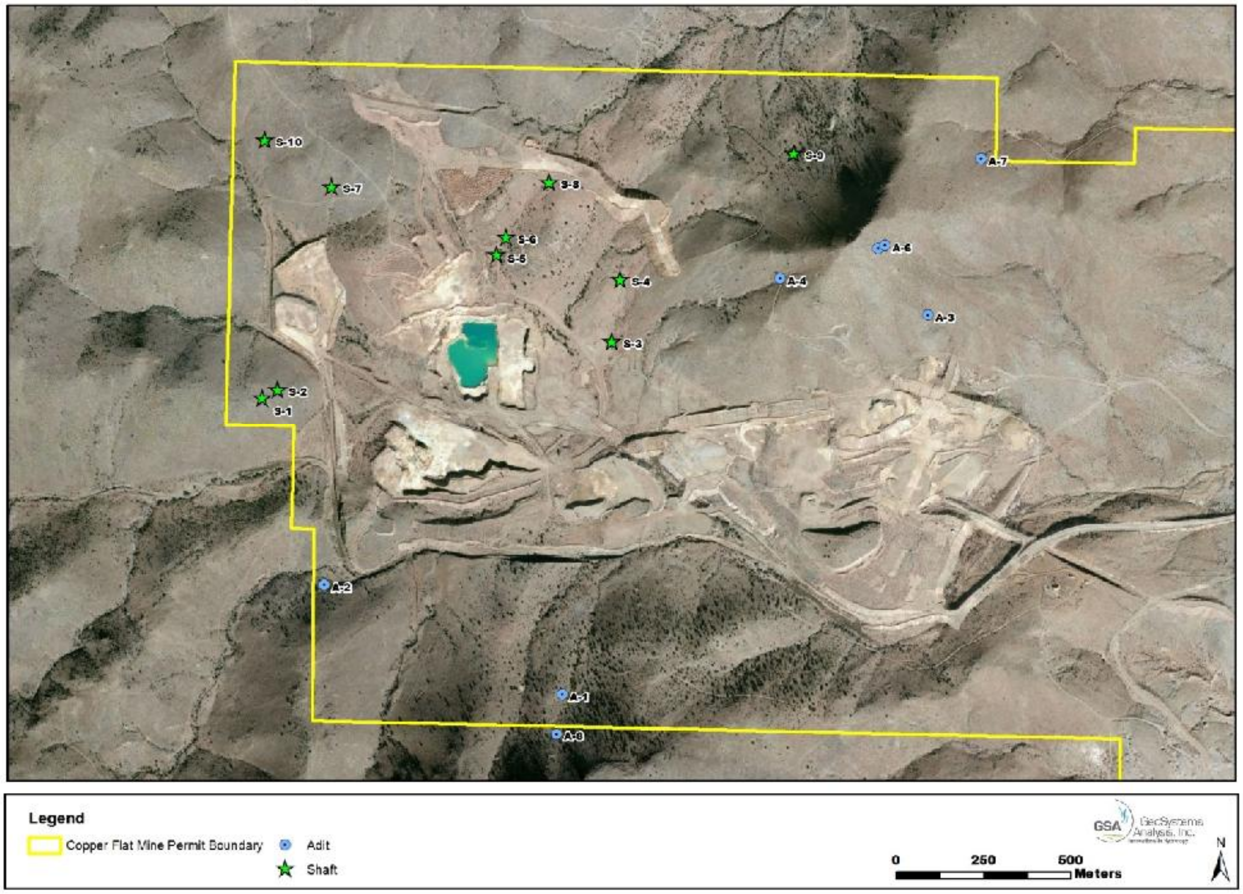
Please see the amended versions of Tables 5-2 and 5-3 included in the response to NMG&F comment #4.

Comment 7. Any abandoned historic mine features, which comprise more than a shallow blind shaft in extent, should be evaluated to determine use by roosting or hibernating bats, especially if the features are expected to be disturbed or destroyed by future mining.

Staff biologists visited all the historic mine features (shafts and adits) identified using locations provided by New Mexico Copper Corporation map (Figure 5A-3). Each historic feature was assigned a unique identifier; adits were assigned an “A” and then numbered sequentially while shafts were assigned with an “S” at the beginning of the identifier. A total of ten shafts and seven adits technically fall within the Copper Flat permit area but one additional adit (hereafter referred to as “A-8”) was also surveyed because it was only about 50 feet from the permit area boundary and it looked like a promising feature for bat use. Each adit and shaft was initially assessed during the summer of 2012, when a team of two observers initially monitored bat use at each feature from before dusk until typically at least two hours after dark. During this preliminary observation period, biologists equipped with night vision goggles and click counters, were stationed nearby (typically about 20-30 feet away) in locations with a clear view of the adit or shaft opening. Click counters were used to count the number of bats observed entering and exiting each feature. Each feature was also photographed during this initial visit and shafts that had collapsed entirely were not surveyed during future visits. Bat activity was only observed at one feature (A-2) during this initial session. Two unidentified bats were observed entering and exiting the opening. This feature was observed a second time during August 2012 but no activity was observed during the second monitoring session.

Each of the historic mine features were also visited during the hibernation season of 2013 (late February – early March) unless the entry was observed to be entirely collapsed during the initial survey. Several species of bats in New Mexico are obligate cave, mine or rock crevice species; of these, the Townsend’s big-eared bat (Corynorhinus townsendii) is a regionally listed sensitive species and was the focus of these

Figure 5A-3. Historic Mine Adits and Shafts Monitored for Bat Use



survey efforts. However, all evidence of bat use was noted, and species such as *Myotis thysanodes* (another cave, mine or rock crevice obligate) were recorded if observed.

Features were evaluated externally for stability and internal surveys were conducted where deemed safe. All adits were deemed safe to enter through external evaluation. Only adits were surveyed internally, as the logistical difficulty and relative danger involved with performing internal surveys of shafts was considered beyond the scope of this effort. However, all shafts identified by New Mexico Copper Corporation personnel were visited and evaluated for possible bat use externally. Despite the relative complexity of several adits, no colonies of hibernating bats were observed. However, warm early season temperatures at the Copper Flat site in 2013 were more reflective of spring/summer temperatures (outside ambient temperatures approached 28°C during survey efforts), and it is possible that hibernacula had already been abandoned. Other bat biologists in New Mexico reported early emergence at known hibernation sites in 2013, likely due to warn early season temperatures. Indeed, many bats in the Southwest are facultative hibernators or engage in facultative torpor bouts and may arouse at any time environmental conditions are favorable to do so (for drinking or foraging purposes, etc.). For this reason, it is difficult to fully rely on single-visit cold-season surveys to document hibernation use. Unfortunately, bats do not leave evidence of hibernaculum use in the form of feces or prey waste due to markedly decreased activity and metabolism, and the only way to confirm hibernation habitat use is to observe hibernating bats. Nonetheless, surveys were conducted in the generally optimal timeframe to observe hibernation activity, and no hibernating bats were observed in the eight adits surveyed internally. Also, several features were complex enough (with workings extending several hundred meters or more underground) to house hibernating bats despite external environmental conditions, and again, none were noted.

Internal surface temperatures of surveyed adits ranged from 11.4°C – 16.2°C. Internal ambient temperatures ranged from 15.1°C – 25.1°C. Internal relative humidity ranged from 14.1% – 50.0%. The large differences in relative humidity and internal ambient temperatures among adits is due primarily to varying feature complexity; relatively short adits with greater exposure to external conditions realize greater fluctuations in environmental variables throughout the day. All internal surface temperatures were measured using noncontact infrared digital thermometry with a Fluke Raytek Minitemp MT6. Internal and external ambient temperatures as well as relative humidity were measured using a Kestrel 3000 weather meter. Of the eight adits surveyed internally, two had strong evidence of heavy or extended bat use. Of the four shafts surveyed externally, two were identified as being possible bat habitats due to apparent relative complexity and large internal temperature gradation (as measured with noncontact infrared thermometry). However, neither of these shafts showed evidence of bat use during external surveys with night-vision equipment during previous survey work. All of the adits surveyed internally had strong evidence of use by small mammals, including middens and feces from woodrats (Neotoma spp.). Additionally, the most complex adit surveyed (A-4), located on Animas Peak, had strong evidence of long-term and heavy use by striped skunks (Mephitis mephitis), a known predator of roosting and hibernating bats.

Despite the fact that no evidence of hibernation-season use was seen, several adits did show sign of significant bat use. Heavy deposition of bat feces was identified at two complex adits located on the north slope of Black Peak (Adits A-1 and A-8). Bat feces can be distinguished from other small mammal feces by the presence of moth scales, seen as “sparkle” in crushed feces. Other evidence of bat use includes surface staining, from repeated roost use and urination, as well as the presence of prey item waste materials, including insect/beetle elytra, etc. Other adits had a small amount of sign, possibly evidence of temporary use as night roosts, etc., but this is expected of any rock crevice, cave, or mine feature in the Southwest, and not necessarily indicative of relative importance of the feature to local bat populations. The two adits identified as possibly significant habitat resources for bats at the project site were actively surveyed (using mist-netting) for bat use during the warm season of mid May 2013. As most bats are occupying breeding season habitat by this time, capture of pregnant females in close proximity to these adits would warrant assumption that these features are maternity habitats, and therefore of large, at least local population-level significance.

Active capture surveys of the two previously identified adits were conducted using mist nets placed in relative close proximity (within ~15m) of the mine feature entrance, but not in such a way as to block access to bats leaving or entering the feature, and thus possibly disturbing a colony. Adit A-8 was surveyed first, and three bats were observed leaving the feature after dusk. One of these individuals was captured – a scrotal male Townsend's big-eared bat. Both of the other observed individuals were also Townsend's big-eared bats. Townsend's big-eared bats are readily identifiable on the wing by experienced observers due to their characteristic large ears and medium body size. Because of the relatively low number of individuals discovered to be using this adit during this survey, it is safe to assume that this feature is not being utilized as maternity habitat in 2013. The evidence of heavy use recorded during the internal survey may simply have collected over many years, may be reflective of previous use as maternity habitat, or may simply indicate use as night/day roost habitat.

The second previously identified adit, A1, was surveyed after A8, also using the methodology described above. In this case, only one bat was observed leaving the mine feature, also confirmed to be a Townsend's big-eared bat in flight. It is not uncommon to have high percentages of suitable habitat features occupied by Townsend's big-eared bats, at least for roosting purposes. Indeed, at abandoned mine sites in Nevada, up to 70% of suitable features have been shown to be utilized by Townsend's at some point during the year (Sherwin et al., 2009). However, this level of occupancy generally consists of only one or two individuals, which may be highly transitory, and again, is not indicative of the relative importance of that feature on a landscape level. More important are habitats proven to be used as maternity or hibernation areas, rather than those which might simply house a few individuals for roosting purposes for a short time period.

Comment 8. Section 5.4.1.3, page 5-9, please report in text or tabular form, on the relative abundance of large and medium size mammal sightings/sign, by location or habitat type. Include a comparison to the reference plots.

Raw data from the 2011 pellet count survey at Copper Flat were reanalyzed to describe relative abundance by habitat stratum. Within strata results of pellet count transects are shown below in Table 5A-3, which summarizes the frequency that pellets of various wildlife species were encountered within individual plots placed along the stratified pellet count transects. Pellets were most frequently encountered in plots at the CDS On stratum, though the pronounced frequency of pellets in this stratum was mostly attributed to increased Jackrabbit pellets. Mule deer pellets were most frequently encountered in the CDG On and CDS On strata. Cottontail pellets were abundant across strata. Carnivore pellets (mostly coyote) were relatively uncommon throughout strata. Pellet frequency was observed to be higher in the on-site CDS and CDG strata versus their off-site comparisons. The WR/DA On stratum included pellets from each of the different wildlife pellet groups observed though pellet frequency was lower in this stratum compared to the other on-site strata. Pellets from coyotes, packrats, gray fox, and bobcats were observed either within or just outside pellet count transects.

Table 5A-3
Frequency that Pellets were tallied in Pellet Count Plots within a Transect by Stratum

Stratum	Mule Deer	Cottontail	Jackrabbit	Predator	Other
CDG Off	13%	90%	57%	0%	0%
CDS Off	32%	94%	16%	0%	0%
Arroyo On	10%	100%	50%	0%	20%
CDG On	52%	96%	40%	0%	2%
CDS On	50%	87%	77%	0%	1%
WR/DA On	18%	84%	48%	2%	0%

Similar habitats were sampled within the permit area as well as outside the permit area when relatively similar off-site analogs could be located. "On" refers to strata sampled within the permit area while "Off" refers to their offsite comparison. Acronyms are as follows; Chihuahuan Desert Grassland (CDG), Chihuahuan Desert Shrubland (CDS), and Waste Rock/Disturbed Area (WR/DA).

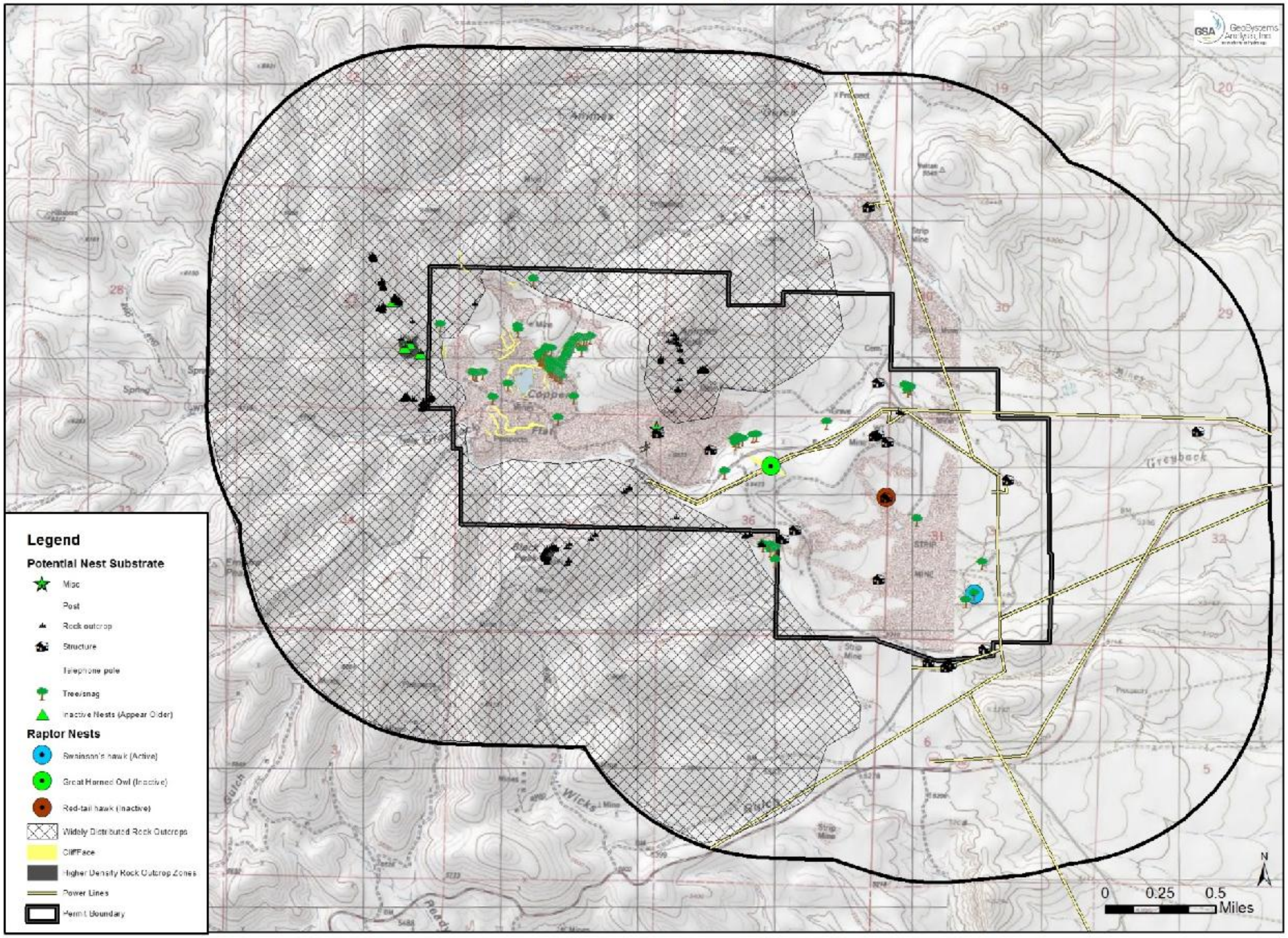
Comment 9. Please conduct a survey for raptor nests in all suitable habitat within one mile of any potential mine-related disturbance.

A raptor nest survey was completed during late-April through late-May 2013. Nests housing other birds of prey, such as owls, were also included in the survey. Potential nesting substrate including powerline poles, telephone poles, rock outcrops, large trees, snags, cliff faces, suitable structures, and towers were mapped during this effort while surveying was completed. Substrates with the highest probability for nesting were also resurveyed for the presence of nests during mid- to late-May. Raptor nests identified during the 2011 walking transects were revisited during the 2013 raptor nest survey to determine whether they were currently active since site fidelity is common in some raptor species.
A map showing suitable nesting substrate documented during field surveys is provided as Figure 5A-4. Towers still present from prior mining at Copper Flat are represented as structures on the map as are abandoned buildings. Areas with dense rock outcrop clusters are shown as either the individual surveyed rock outcrop (symbolized as a rocky point) or as a dark grey outline. When rock outcrops were observed to be more widely distributed, they are depicted with a cross-hatch on the map because individual outcrops were typically surveyed from the distance with binoculars and not always visited with a GPS. Trees and snags are both shown with the tree symbol on the map.

During the 2013 field season, only one active raptor nest was observed, as shown with a blue point on the map. This active Swainson's hawk nest was found in an isolated cottonwood tree behind the tailing dam. A mother with fledglings was observed in the nest in early-May; the same tree housed a Swainson's hawk nest during the 2011 survey. A red-tail hawk nest identified in a tower behind the tailing dam during the 2011 survey, as shown with the red point on the map, was revisited during 2013 but currently inactive. A Great Horned Owl nest that had been previously observed on a rock wall along a road cut during the 2011 survey is shown as a yellow point on the map. No activity was observed here during 2013 either. Many of the larger rock outcrops, particularly near Black Peak and areas west of the pit lake, contained significant white wash but nesting couldn't be confirmed. Portions to the west and southwest of the permit area were also difficult to survey due to the steep terrain, so it's possible that the areas are currently more active than our surveys were able to determine. Seven raptor sized stick nests, each in relatively poor condition, were observed in this general portion of the survey area (as shown with yellow triangles on the map) but activity was considered unlikely due to their poor structure and maintenance. If nothing else, the numerous rock outcrops surrounding the permit area to the south and west continue to be regular roosting habitats for a variety of raptor species.

Raptor species observed during various survey efforts in and around the mine can be determined by reviewing the revised versions of Tables 5-2 and 5-3 which are presented earlier in this addendum. Swainson's hawk and Red-tailed hawk were the only raptor species observed during the nest search. One Great Horned Owl was also observed.

Raptor Nest Survey Map



Comment 10. Please conduct focused monitoring of wildlife use of the pit lake. This might include diurnal and nocturnal passive observation sessions, track counts, or spot-lighting surveys.

Focused monitoring at the pit lake during the 2012-2013 field seasons consisted of:

- Regular bird surveys, as previously described in this addendum;
- Mist netting bats;
- Nocturnal observation sessions;
- Amphibian surveys; and
- Installation of three night vision game cameras.

In the Southwest, limiting habitat features for bats generally do not include foraging or roosting habitats, but instead center on water availability on the landscape. Nearly all bat species found in North America must drink in flight, and therefore pooled water resources are important, particularly in arid areas such as New Mexico. At Copper Flat, very little perennial pooled water exists, and of that which does, only one source is large enough to serve as a resource for all bats which might occur in the area – the pit lake. After documenting a variety of bat species through acoustic surveys, additional active survey work for bats was deemed necessary at the pit lake in order to address comments by NMDGF biologists about wildlife use of this resource. Indeed, although acoustic surveys are a well-regarded method for documenting bat occupancy and relative abundance, combining acoustic work with active capture surveys is often more effective at recording all species in a given area because some species with low amplitude echolocation calls may be missed during acoustic work.

Because water is the most common limiting feature in the Southwest, bats can be reliably captured at water sources using mist-nets. However, in order to effectively survey a water source, full-coverage of the water is necessary, which can prove difficult with large bodies of water, etc. Despite the fact that large bodies of water are difficult to fully cover with active capture methodology, any coverage of a water source can prove valuable when bats are captured as morphometric measurements can then be taken, reproductive conditions assessed, etc. In mid-April (2013), staff biologists utilized active capture methods (mist-netting) at the pit lake in an attempt to provide additional focused assessment of bat use of this resource.

On 12 April 2013, biologists erected two 18-meter mist nets near the ramp area of the pit lake. This is the most accessible area, and the lake maintains a relatively shallow depth for a number of meters from the ramp area. However, many areas of the pit lake are very deep, and working in this environment is logistically difficult due to compacted sediments, fluctuating water levels, etc. Unfortunately, although bats were present and were utilizing the resource in relatively close proximity to the nets, no bats were captured. However, several individuals observed drinking from the pit lake were identified as silver-haired bats (Lasionycteris noctivagans). Silver-haired bats can be readily identified by experienced observers due to their dark pelage (different from any other bat species found in this area), and patch of silver or frosty hair on the dorsum. Interestingly, silver-haired bats are migratory, and generally prefer forested environments. The individuals observed at the Copper Flat pit lake may have been en route to breeding grounds at higher latitudes or to higher elevation areas in New Mexico. Additionally, at least one other species was observed (multiple individuals), but could not be identified to species (likely a Myotis sp.).

On 13 April 2013, biologists again returned to the pit lake and this time erected nets on the northwest side of the lake. This area includes several small spits which extend into the lake proper, and provide an area to place mist nets that cover different drinking/foraging flyways. One 9-meter and one 12-meter net were used, but no bats were captured. Silver-haired bats were again observed utilizing the resource, as were other unidentifiable individuals of another species.

Although it is unfortunate that this survey work did not realize results in the form of captures, it was valuable in confirming that bats are utilizing the pit lake as a water resource, and in identifying at least one species which does so. Full coverage of a water source is necessary to reliably capture bats that are utilizing that specific resource, and it is functionally impossible to fully cover the pit lake when mist-netting due to its large size, extreme depths, etc. Also, little is known about bat use of water sources at active and abandoned mine sites, and verifying that bats utilize a water source such as the pit lake is valuable. It is even more interesting contextually when considering that one of the species recorded using the pit lake is migratory, and almost certainly does not utilize the Copper Flat area for breeding purposes, etc. Also, interestingly, no Townsend's big-eared bats were observed using the pit lake during two nights of netting, but this is likely due to the relative difficulty of observing bats on the wing.

An amphibian survey of the pit lake was completed over two nights and two days during late-April through mid-May 2013. During each survey, a biologist disturbed the pit lake fringe with a net to attempt to flush out any amphibians hidden along the bank and also used a spotlight to search for eye shine during nocturnal surveys. Biologists also listened for amphibian activity during other various monitoring visits to the pit lake beginning August 2012. However, amphibians were never observed at the pit lake during any of the survey visits. Other in-person nocturnal or diurnal passive observation sessions also did not yield any observations of game species or predators.

Two 8MP Bushnell Trophy Cam HD game cameras with night vision sensors were installed along the pit lake perimeter in August 2012 and left in place until May 2013. Initially, two cameras were strategically placed in locations where it was possible for mammals to approach the shoreline; much of the lake is surrounded by unstable rock walls, thus the paths selected were predicted to capture ungulate and carnivore use. These cameras also sometimes captured waterfowl use, so a third camera with a direct view of the lake surface was installed on a rock cliff along the lake during early November 2012 in order to directly assess waterfowl activity. Although the specific placement of the third camera did enable supplemental observations between in-person monitoring visits, wave movement on the pit lake sometimes caused falsely triggered photos to overwhelm data storage capacity. Game camera locations are shown in Figure 5A-5. Photos were uploaded from each of the cameras on a regular basis, typically monthly, and batteries were replaced during these visits as necessary.

Figure 5A-5. Pit Lake Game Camera Locations

After returning to the office, photos were sorted to isolate false triggers (caused by waves, wind, blowing debris, human activity, branch movement, etc.) from actual wildlife triggers. It's possible that very distant or small wildlife (particularly small birds or insects) that are sometimes difficult to see were overlooked during this review. A list of positive triggers was compiled and used to summarize visitation frequency. A biologist conservatively identified photos to the species, family, class, or order; depending on the image clarity, distance from the camera, and wildlife discernibility. When more than one species of waterfowl was present, unidentified/mixed waterfowl was attributed in the database. A table summarizing the game camera captures is included below (Table 5A-4). Figure 5A-5 includes sample photographs recorded at the lake.

Overall, waterfowl visitation (listed in Table 5A-4 as either canvasback, mallard, or unidentified/mixed waterfowl) triggered the game cameras most frequently. Waterfowl caused the cameras to trigger more than 100 times through the capture period. The higher frequency of waterfowl captures versus other types of wildlife can be partially attributed to the fact that camera 3 was placed in a location with a clear view of the water's surface and intended to only capture waterfowl. A waterfowl photo was first captured on 3 September 2012, and visitation was photographed fairly regularly (2-6 times per month) through April 2013. Coyotes were the second most regular visitors with 37 total captures. The cameras recorded a variety of birds including Spotted sandpiper, Great blue heron, and others. Mule deer triggered the cameras a total of 11 times and were captured drinking from the lake on one photo. Cattle were regular visitors, too, particularly from September through January. Striped skunk (16 triggers), Rock squirrel (10), and mice (16) were each captured on multiple occasions. A gray fox was confirmed on one photo and another Canidae photo appeared to also capture a gray fox.

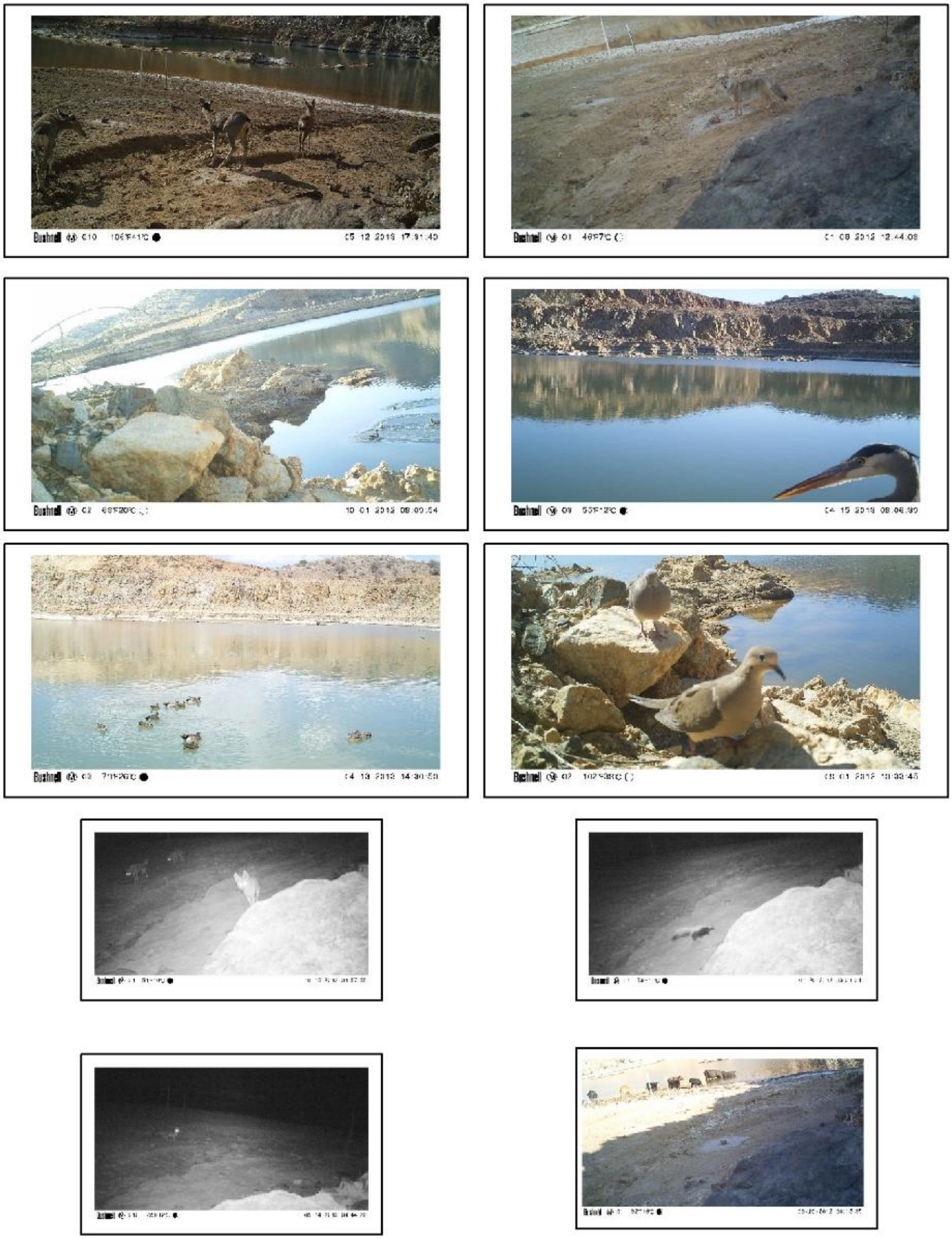
Table 5A-4

Summary of Game Camera Observations from the Pit Lake

	Sum of Individuals within a Photo	Total Number of Camera Triggers
Canine (Gray fox)	1	1
Canvasback	5	2
Chipping sparrow	1	1
Cow	89	26
Coyote	40	37
Dove	3	2
Gray fox	1	1
Great Blue Heron	11	11
Horned lark	1	1
Lepidopteran	1	1
Mallard	39	13
Mouse	16	16

	Sum of Individuals within a Photo	Total Number of Camera Triggers
Mule deer	17	11
Odonata	1	1
Rock squirrel	10	10
Rock wren	4	4
Rodent	3	3
Say's Phoebe	2	2
Spotted sandpiper	1	1
Striped skunk	16	16
Unidentified avian	14	14
Unknown close-up	3	3
White-winged dove	3	3
Unidentified/mixed waterfowl	434	103
Grand Total	716	283

Figure 5A-6. Sample Game Camera Photos from the Pit Lake



New Mexico Mining and Mineral Division Comment

Comment 1. Correct or remove sentence (pg 18 MORP) that refers to a coachwhip as a lizard.

Based on another review of the section, it appears that coachwhip was not referred to as a lizard in the Draft BDR; it was referred to as a reptile, which is technically correct.

References

Parametrix, Inc. 2012. Copper Flat Baseline Data Characterization Report – Section 5 (Wildlife). Developed under contract with New Mexico Copper Corporation.

C – Golder Technical Memorandum

TECHNICAL MEMORANDUM

Date: [illegible]
Project No.: [illegible]
To: [illegible]
Company: [illegible]
From: [illegible]
cc: [illegible]
Email: [illegible]

RE: RESPONSE TO MMD COMMENTS ON THE BDR

[illegible]

[illegible]

[illegible]

1.0 RESPONSE TO COMMENTS

[illegible]

[illegible]

MMD Comment No. 1: Section 1, Introduction

"Please provide a geo-referenced map, at least 1:6,000 scale or larger to identify the individual soil units, 21 soil pits and 183 log sites of the soil survey. A supplementary table should identify the location of soil pits and log sites along with a brief description of family-level taxonomy at each location. Any notes that that identify special characteristics such as $CaCO_3$ content, rock content, induration or gradation of character from one soil to another should be included with this table."

Response:

MMD Comment No. 2: Section 1, Introduction

"In reference to Table 5; Please provide constituent concentrations of [Na+], [Mg++], and [Ca++] from paste extracts that were used to calculate SAR."

Response:

MMD Comment No. 3: Section 1, Introduction

"Please provide a clarifying discussion of the methods cited to conduct hydrometer and sieve tests as it is not clear if pretreatment methods were employed to remove carbonates from samples before dispersion or sieving."

Response:

MMD Comment No. 4: Section 1, Introduction

"During sieving, were fine and very fine sand fractions separated and accounted for? Please provide more discussion. Note, the only indication for sand size partitioning was for tailings substrate, on page 44."

Response:

[illegible]

MMD Comment No. 5: Section 1, Introduction

"On page 3 of the introduction, the scale for 1:6,000 is equivalent to 1 inch = 500 feet rather than 0.5 inches=1,000 feet. Please update."

Response:

[illegible]

MMD Comment No. 6: Section 2.2, Criteria for Topdressing Suitability

"Table 1. MMD agrees with the observation, p. 7 that soils dominated by coarse grained materials (up to 70% rock content) can produce vigorous vegetation if the remaining fine earth fraction is sufficiently loamy. On long steep slopes rocky substrates increase resistance to erosion. Please include stone with the cobble + gravel component for a maximum content of rock in the 'fair' limit to range of 35-70%. Please note, MMD regards 'good', 'fair' and 'unsuitable' as qualifying characteristics in general, but 'fair' materials, such as relatively high rock content may be more appropriate for steep slopes."

Response:

[illegible]

MMD Comment No. 7: Section 2.2, Criteria for Topdressing Suitability

"Table 1. Hot-water extractable boron should be limited to no more than 5 parts per million for suitable materials. Please correct Table 1 to demonstrate this."

Response:

[illegible]

MMD Comment No. 8: Section 2.2, Criteria for Topdressing Suitability

"Table 1. Calcium carbonate limits for 'good' material is listed as 15% $CaCO_3$ equivalent and for 'fair' materials as 15-40%. After review of pertinent literature, a series of discussions with other reclamation practitioners and our own experience with carbonate-rich soils materials in the field these limits are not judged appropriate for topdressing. There is a great deal of literature on the deleterious effects of $CaCO_3$ on agronomic and native plants ability to utilize P, Mg, and other metals. Elevated $CaCO_3$ in subsoil horizons may not be problematic or, may indeed increase available water to shallow rooted vegetation, in some situations. However, $CaCO_3$ content should not be above 10 percent equivalent in the upper six to twelve inches in a reconstructed soil profile. Please adjust $CaCO_3$ limits for 'good' materials to less than 10% and for 'fair' materials to 10-40%. No suitable materials should be salvaged from indurated horizons that are continuously cemented, regardless of $CaCO_3$ content."

Response:

[illegible]

[illegible]

[illegible]

MMD Comment No. 9: Section 2.2, Criteria for Topdressing Suitability

"Table 1. MMD views available water holding capacity (AWHC) as a critical component in evaluating soil suitability. Please define AWHC as bulk volumetric water holding capacity of soil materials to hold water between -0.033 and -1.5 Mpa of tension, corrected for rock content."

Response:

MMD Comment No. 10: Section 2.2, Criteria for Topdressing Suitability

"Either as part of Table 1 or a separate table, please estimate a range of values or a bulk value for each of the criteria listed in Table 1 for each soil unit and, if variation exists, for depth phases of soil units. AWHC and the method used to estimate it should be included as part of this table and discussion."

Response:

MMD Comment No. 11: Section 2.2, Criteria for Topdressing Suitability

"In reference to Section 3.1, with map units 102, 101 and 109 NMCC has differentiated several depth phases to estimate the median thickness of suitable salvage within individual soil unit phases. Please describe how these depth phases were determined among soil units with multiple depth phases and units which were not described by backhoe pits."

Response:

[illegible]

2.0 REFERENCES

[illegible]

[illegible]

[illegible]

[illegible] *Larrea tridentata* [illegible]

[illegible] *Larrea tridentata* [illegible] *Parthenium incanum* [illegible]

[illegible]

[illegible]

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ATTACHMENT 1
SUPPLEMENTAL SOILS INVESTIGATION,
JULY 8, 2013

REPORT

SUPPLEMENTAL SOILS INVESTIGATION

Copper Flat Project

Submitted To: [illegible]

Submitted By: [illegible]

Distribution: [illegible]

July 8, 2013

123-80002A

Table of Contents

List of Charts

List of Tables

List of Figures

List of Plates

List of Appendices

1.0 INTRODUCTION

[illegible]

[illegible] *describe the environment of the proposed permit area and, to the extent practicable, the affected area* [illegible]

[illegible]

1.1 Previous Studies

[illegible]

[illegible]

1.2 General Environmental Setting

Prosopis gladulosa *Larrea tridentata* *Flourensia cernua*

1.3 Cover Performance Objectives

2.0 METHODS

2.1 Field Methods

2.2 Soil Sampling and Laboratory Methods

3.0 SOIL RESOURCES CHARACTERIZATION

[illegible]

3.1 Soils of the Tailing Storage Facility

[illegible]

[illegible]

[illegible]

[illegible]

3.2 Soils of the East WRDF

[illegible]

[illegible]

3.3 Laboratory Characterization

[illegible]

3.3.1 Physical Properties

[illegible]

[illegible]

[illegible]

3.3.2 Chemical Properties

[illegible]

3.4 Reclamation Suitability

[illegible]

Chart 1: Copper Flat Soils – Clay Content vs. Rock Fragments

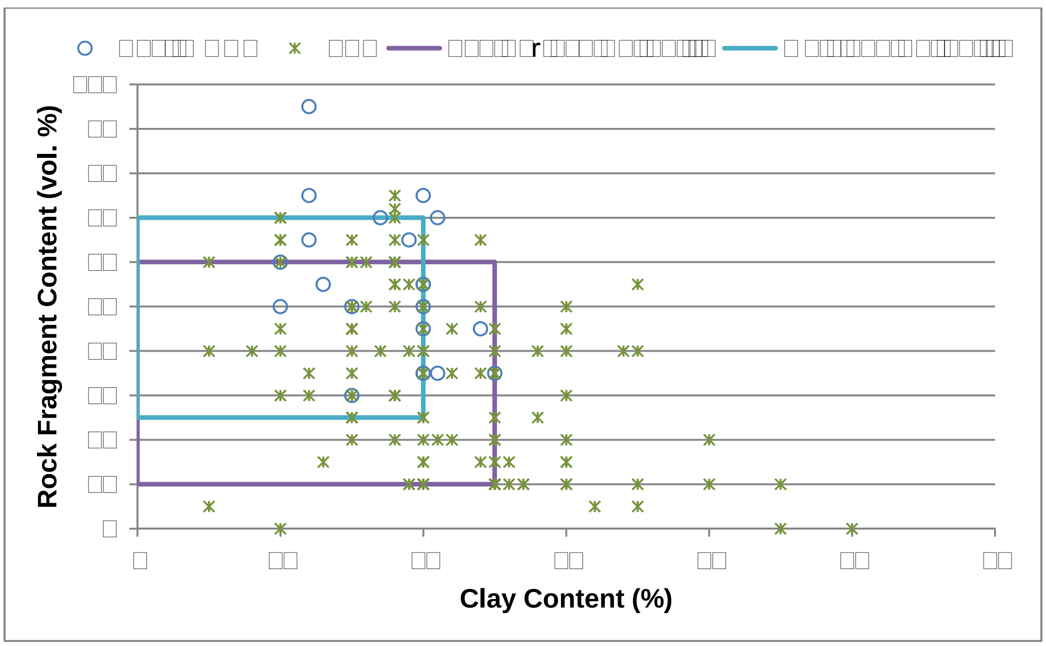

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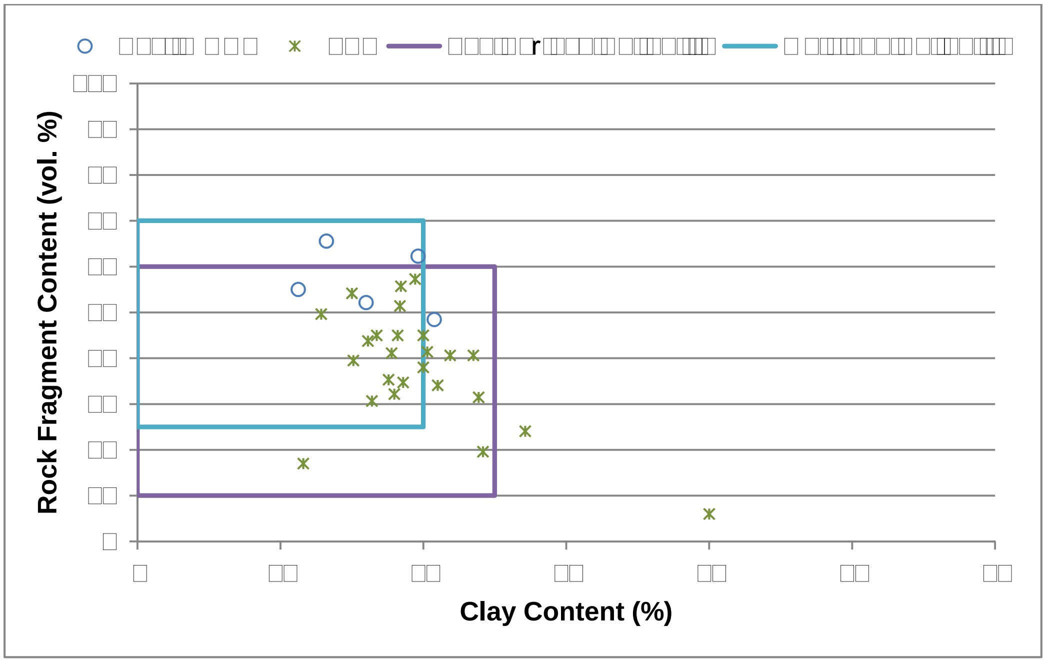
Chart 2: Copper Flat Soils - Weighted Average Clay vs. Rock Fragments



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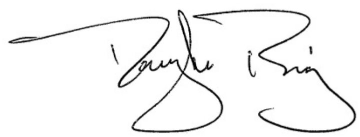
[illegible]

4.0 COVER VOLUMETRIC ESTIMATES

5.0 CLOSING

[illegible]

GOLDER ASSOCIATES INC.



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6.0 REFERENCES

TABLES

Table 1: Analytical Methods for Chemical and Physical Soil Characterization

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Table 2: Field Descriptions

Pit ID/ Depth (feet)	Sand	Clay	USDA Texture Class	Field Estimates vol %				Reaction with HCl	Color	Notes
				Gravel	Cobble	Stone	Total			
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Pit ID/ Depth (feet)			USDA Texture Class	Field Estimates vol %				Reaction with HCl	Color	Notes
	Sand	Clay		Gravel	Cobble	Stone	Total			
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Table 2: Field Descriptions

Pit ID/ Depth (feet)			USDA Texture Class	Field Estimates vol %				Reaction with HCl	Color	Notes
	Sand	Clay		Gravel	Cobble	Stone	Total			
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-	[illegible]	[illegible]	[illegible]	
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[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-	[illegible]	[illegible]	[illegible]	
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Table 3: Physical Properties and Secondary Interpretations

Pit ID/ Depth (feet)	Particle Size Distribution (%)			USDA Texture Class	Very Fine Sand wt%	Rock Fragments					RUSLE		AWC (in/ft)	Wind Erosion
						Lab.[1] wt %	Field Estimates vol %							
	Sand	Silt	Clay				Gravel	Cobble	Stone	Total	Kf	Kw		
East Waste Rock Dump Facility Soils														
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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Tailing Storage Facility Soils														
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Table 3: Physical Properties and Secondary Interpretations

Pit ID/ Depth (feet)	Particle Size Distribution (%)			USDA Texture Class	Very Fine Sand wt%	Rock Fragments					RUSLE		AWC (in/ft)	Wind Erosion
						Lab.[1] wt %	Field Estimates vol %							
	Sand	Silt	Clay				Gravel	Cobble	Stone	Total	Kf	Kw		
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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Notes:

[illegible]

Table 4: Chemical Properties

Pit ID/ Depth (feet)	Paste pH	Saturated Paste Extract EC (dS/m)	Saturation Percentage	Nitrate as N (mg/kg)	Phosphorus (mg/kg)	Potassium (mg/kg)	$CaCO_3$ Equivalent Percent
East Waste Rock Dump Facility Soils							
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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Tailing Storage Facility Soils							
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Notes:

[illegible]

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Table 5: AB-DTPA Extractable Metals for the Soil Samples

Pit ID/ Depth (feet)	AB-DTPA Extractable Metals (mg/kg)							
	Arsenic	Cadmium	Copper	Lead	Manganese	Mercury	Molybdenum	Nickel
East Waste Rock Dump Facility Soils								
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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Tailing Storage Facility Soils								
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Table 6: Acid-Base Accounts

Pit ID/ Depth (feet)	Paste pH	Pyritic Sulfur Basis			Total Sulfur (%)	Extractable Sulfur Forms			Residual (%)
		ANP (t/kt)	AGP (t/kt)	ABA (t/kt)		Hot Water (%)	HCl (%)	HNO_3 (%)	
East Waste Rock Dump Facility Soils									
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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Tailing Storage Facility Soils									
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Notes:

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Table 7: Estimated Reclamation Cover Requirements

Disturbance Type	Surface Area (acres)	Cover Thickness (ft)	Reclamation Cover Requirement (yd^3)
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
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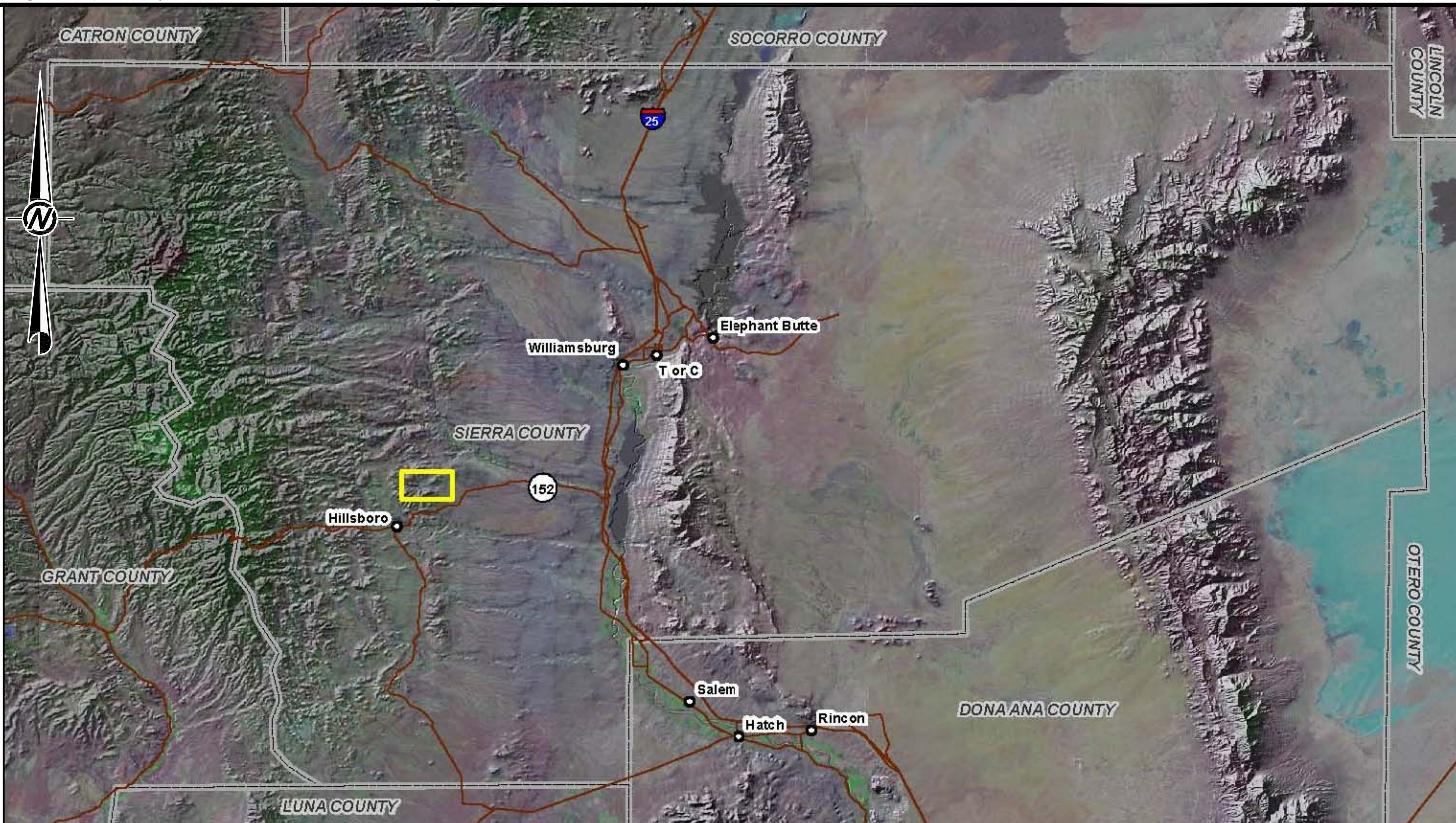
FIGURES

Drawing file: K:\2012 Projects\12380002A\COPPER FLAT FIG01.dwg Jun 25, 2013 – 10:47am



LEGEND

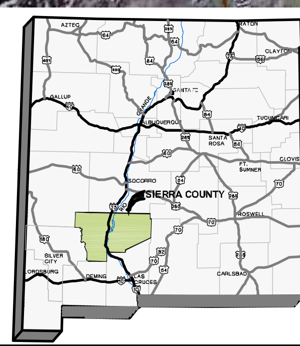
CITY/TOWN

SITE LOCATION

ROAD

12 0 12

SCALE MILES



SOURCE: FIGURE 1-1 (INTERA, 2012). IMAGEERY FROM UNIVERSITY OF MARYLAND NLCD.

PROJECT

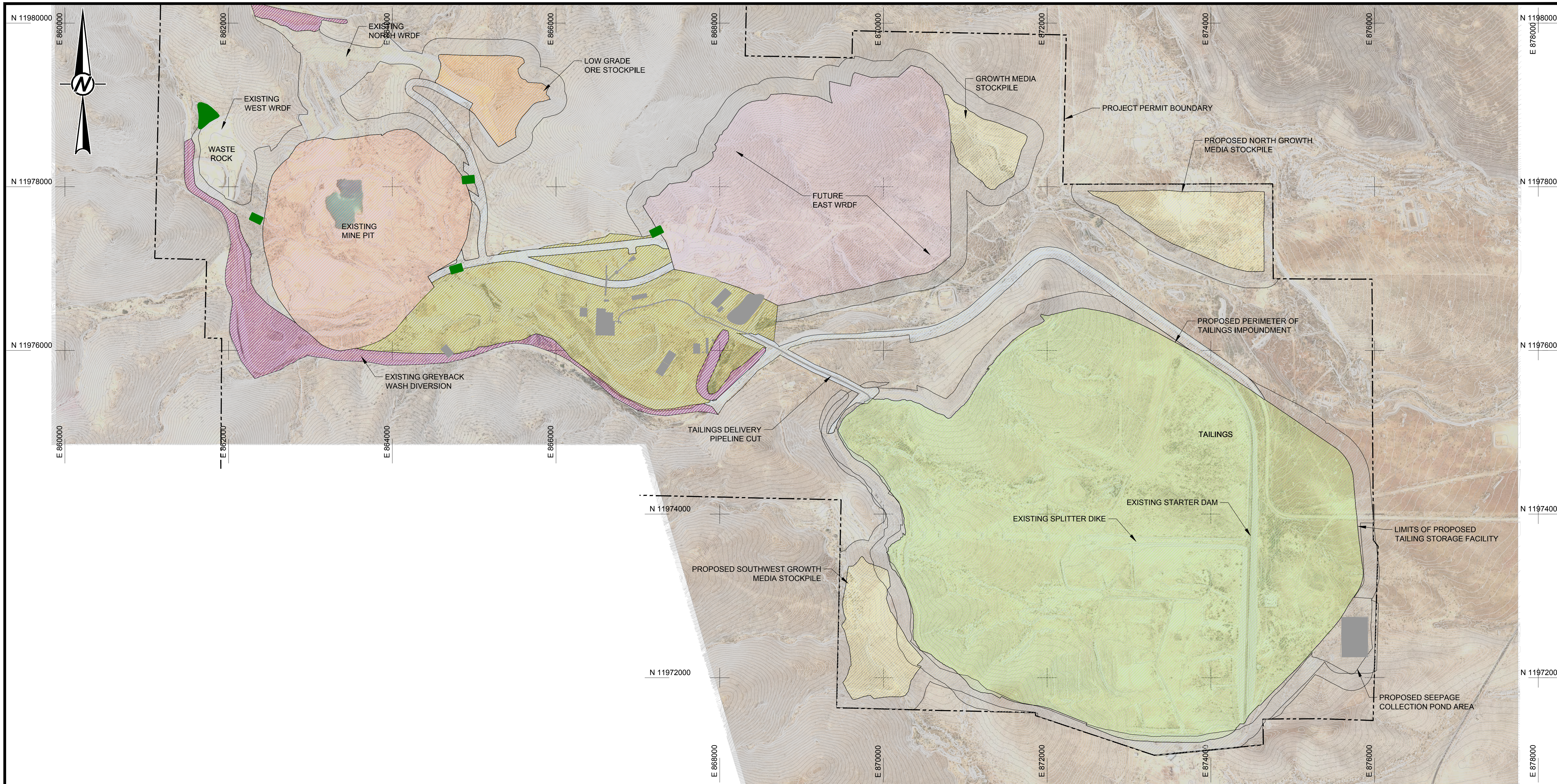
NEW MEXICO COPPER CORPORATION
COPPER FLAT PROJECT
SIERRA COUNTY, NEW MEXICO

TITLE

SITE LOCATION

Golder Associates

PROJECT No.	123-80002A		FILE No.	COPPER FLAT FIG01
DESIGN	EC	06/25/13	SCALE AS SHOWN	REV. 0
CADD	CM	06/25/13		
CHECK	EC	06/25/13	**FIGURE 1**	
REVIEW	BN	06/25/13		



LEGEND

- PERMIT BOUNDARY
- PLANT FACILITY
- SEDIMENT COLLECTION PONDS
- ANCILLARY
- DIVERSION
- HAUL ROAD

NOTES

1. WRDF - WASTE ROCK DISPOSAL FACILITY.

REFERENCES

1. EXISTING FIVE (5) FOOT TOPOGRAPHY AND PERMIT BOUNDARY PROVIDED BY NEW MEXICO COPPER CORPORATION.
2. TOPOGRAPHY IN THE MINE AREA AND TAILINGS STORAGE FACILITY REPRESENTS EXISTING CONDITIONS AND DISTURBANCE ASSOCIATED WITH QUINTANA 1981-82 MINING OPERATIONS.

NOT FOR CONSTRUCTION

0 600 1200 1800
SCALE FEET

PROJECT
NEW MEXICO COPPER CORPORATION
COPPER FLAT PROJECT
SIERRA COUNTY, NEW MEXICO

TITLE

FACILITY LAYOUT

Golder Associates

PROJECT No.		123-80002A	FILE No.	SITE INVESTIGATION
DESIGN	EC	06/25/13	SCALE AS SHOWN	REV. 0
CADD	CM	06/25/13	DRAWING	
CHECK	EC	06/25/13	FIGURE 2	
REVIEW	DR	06/28/13		

PLATES

APPENDIX A
LABORATORY REPORT

ANALYTICAL SUMMARY REPORT

May 14, 2013

Golder Associates Inc
5200 Pasadena NE Ste C
Albuquerque, NM 87113

Workorder No.: B13050229 Quote ID: B2958

Project Name: 123-80002A Supplemental Soils

Energy Laboratories Inc Billings MT received the following 48 samples for Golder Associates Inc on 5/2/2013 for analysis.

Sample ID	Client Sample ID	Collect Date	Receive Date	Matrix	Test
B13050229-001	TP3 0-1	12/21/12 0:00	05/02/13	Soil	ABDPTA extractable metals Metals, NH4OAc Extractable Acid/Base Potential Coarse Fragments Conductivity Nitrate as N, KCL Extract pH, Saturated Paste Phosphorus-Olsen ABDTPA extraction for metals NH4AC Soil Extraction Saturated Paste Extraction Particle Size Analysis Saturation Percentage Sulfur Forms Texture Very Fine Sand
B13050229-002	TP3 1-2	12/21/12 0:00	05/02/13	Soil	Same As Above
B13050229-003	TP3 2-7	12/21/12 0:00	05/02/13	Soil	Same As Above
B13050229-004	TP3 7-9	12/21/12 0:00	05/02/13	Soil	Same As Above
B13050229-005	TP3 9-11	12/21/12 0:00	05/02/13	Soil	Same As Above
B13050229-006	TP5 0-1	01/03/13 0:00	05/02/13	Soil	Same As Above
B13050229-007	TP5 1-3	01/03/13 0:00	05/02/13	Soil	Same As Above
B13050229-008	TP5 3-7	01/03/13 0:00	05/02/13	Soil	Same As Above
B13050229-009	TP7 0-1.5	12/17/12 0:00	05/02/13	Soil	Coarse Fragments Conductivity Lime as CaCO3, % pH, Saturated Paste Saturated Paste Extraction Particle Size Analysis Saturation Percentage Texture Very Fine Sand
B13050229-010	TP7 1.5-4	12/17/12 0:00	05/02/13	Soil	Same As Above
B13050229-011	TP7 6-8	12/17/12 0:00	05/02/13	Soil	Same As Above
B13050229-012	TP7 8-10	12/17/12 0:00	05/02/13	Soil	Same As Above
B13050229-013	TP7 10-12	12/17/12 0:00	05/02/13	Soil	Same As Above

ANALYTICAL SUMMARY REPORT

B13050229-014	TP9 6-8	12/17/12 0:00	05/02/13	Soil	ABDPTA extractable metals Metals, NH4OAc Extractable Acid/Base Potential Coarse Fragments Conductivity Nitrate as N, KCL Extract pH, Saturated Paste Phosphorus-Olsen ABDTPA extraction for metals NH4AC Soil Extraction Saturated Paste Extraction Particle Size Analysis Saturation Percentage Sulfur Forms Texture Very Fine Sand
B13050229-015	TP9 8-10	12/17/12 0:00	05/02/13	Soil	Same As Above
B13050229-016	TP9 10-11	12/17/12 0:00	05/02/13	Soil	Same As Above
B13050229-017	TP12 0-1	01/02/13 0:00	05/02/13	Soil	Same As Above
B13050229-018	TP12 1-3	01/02/13 0:00	05/02/13	Soil	Same As Above
B13050229-019	TP12 3-7	01/02/13 0:00	05/02/13	Soil	Same As Above
B13050229-020	TP12 8-11	01/02/13 0:00	05/02/13	Soil	Same As Above
B13050229-021	TP12 11-13	01/02/13 0:00	05/02/13	Soil	Same As Above
B13050229-022	TP16 0-2	12/20/12 0:00	05/02/13	Soil	Same As Above
B13050229-023	TP16 2-4	12/20/12 0:00	05/02/13	Soil	Same As Above
B13050229-024	TP16 4-7	12/20/12 0:00	05/02/13	Soil	Same As Above
B13050229-025	TP16 7-10	12/20/12 0:00	05/02/13	Soil	Same As Above
B13050229-026	TP16 10-17	12/20/12 0:00	05/02/13	Soil	Same As Above
B13050229-027	TP17 0-2	12/18/12 0:00	05/02/13	Soil	Coarse Fragments Conductivity Lime as CaCO3, % pH, Saturated Paste Saturated Paste Extraction Particle Size Analysis Saturation Percentage Texture Very Fine Sand
B13050229-028	TP17 2-4	12/18/12 0:00	05/02/13	Soil	Same As Above
B13050229-029	TP17 4-6	12/18/12 0:00	05/02/13	Soil	Same As Above
B13050229-030	TP17 6-10	12/18/12 0:00	05/02/13	Soil	Same As Above
B13050229-031	TP21 7-11	12/19/12 0:00	05/02/13	Soil	Same As Above
B13050229-032	TP21 11-14	12/19/12 0:00	05/02/13	Soil	Same As Above
B13050229-033	TP21 14-18	12/19/12 0:00	05/02/13	Soil	Same As Above
B13050229-034	TP24 0-3	12/18/12 0:00	05/02/13	Soil	Same As Above
B13050229-035	TP24 3-5	12/18/12 0:00	05/02/13	Soil	Same As Above
B13050229-036	TP24 5-10	12/18/12 0:00	05/02/13	Soil	Same As Above
B13050229-037	TP24 10-14	12/18/12 0:00	05/02/13	Soil	Same As Above

ANALYTICAL SUMMARY REPORT

B13050229-038	TP24 14-16	12/18/12 0:00	05/02/13	Soil	Same As Above
B13050229-039	TP25 2-5	12/13/12 0:00	05/02/13	Soil	Same As Above
B13050229-040	TP27 0-2	12/19/12 0:00	05/02/13	Soil	ABDPTA extractable metals Metals, NH4OAc Extractable Acid/Base Potential Coarse Fragments Conductivity Nitrate as N, KCL Extract pH, Saturated Paste Phosphorus-Olsen ABDTPA extraction for metals NH4AC Soil Extraction Saturated Paste Extraction Particle Size Analysis Saturation Percentage Sulfur Forms Texture Very Fine Sand
B13050229-041	TP27 2-3	12/19/12 0:00	05/02/13	Soil	Same As Above
B13050229-042	TP27 3-7	12/19/12 0:00	05/02/13	Soil	Same As Above
B13050229-043	TP27 7-13	12/19/12 0:00	05/02/13	Soil	Same As Above
B13050229-044	TP27 13-14	12/19/12 0:00	05/02/13	Soil	Same As Above
B13050229-045	TP31 1-2	01/03/13 0:00	05/02/13	Soil	Coarse Fragments Conductivity Lime as CaCO3, % pH, Saturated Paste Saturated Paste Extraction Particle Size Analysis Saturation Percentage Texture Very Fine Sand
B13050229-046	TP31 2-5	01/03/13 0:00	05/02/13	Soil	Same As Above
B13050229-047	TP31 5-8	01/03/13 0:00	05/02/13	Soil	Same As Above
B13050229-048	TP31 8-16	01/03/13 0:00	05/02/13	Soil	Same As Above

The analyses presented in this report were performed by Energy Laboratories, Inc., 1120 S 27th St., Billings, MT 59101, unless otherwise noted. Any exceptions or problems with the analyses are noted in the Laboratory Analytical Report, the QA/QC Summary Report, or the Case Narrative.

The results as reported relate only to the item(s) submitted for testing.

If you have any questions regarding these test results, please call.

Report Approved By:

Sonya Mallett

LABORATORY ANALYTICAL REPORT

Prepared by Billings, MT Branch

Client: Golder Associates Inc
Project: 123-80002A Supplemental Soils
Workorder: B13050229

Report Date: 05/14/13
Date Received: 05/02/13

	Analysis	Coarse Frags	Sand	Silt	Clay	Very Fine Sand	Texture	pH	Saturation	Cond-Sat Paste	Neut Potential	Acid Potential	Acid/Base Potential	S, Total
	Units	%	%	%	%	wt%		s_u_	%	mmhos/cm	t/kt	t/kt	t/kt	%
Sample ID	**Client Sample ID**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**
B13050229-001	TP3 0-1	35	49	27	24	6	SCL	7.50	31.4	0.5	206	0	206	0.01
B13050229-002	TP3 1-2	28	48	31	21	0	L	7.50	25.3	0.6	606	0	606	< 0.01
B13050229-003	TP3 2-7	35	44	37	19	1	L	7.70	27.3	1.1	422	0	422	< 0.01
B13050229-004	TP3 7-9	45	46	33	21	4	L	7.90	29.6	1.8	303	0	303	0.01
B13050229-005	TP3 9-11	46	50	33	17	3	L	7.60	29.8	4.5	331	0	331	0.07
B13050229-006	TP5 0-1	37	54	26	20	3	SCL	7.40	29.9	0.6	286	0	286	0.02
B13050229-007	TP5 1-3	27	46	34	20	0	L	7.50	30.2	0.4	456	0	456	0.01
B13050229-008	TP5 3-7	36	58	29	13	2	SL	7.60	30.4	0.4	394	0	394	< 0.01
B13050229-009	TP7 0-1.5	19	50	24	26	5	SCL	7.60	33.5	0.4				
B13050229-010	TP7 1.5-4	14	39	26	35	6	CL	7.70	46.1	0.7				
B13050229-011	TP7 6-8	31	56	22	22	4	SCL	7.80	29.4	0.9				
B13050229-012	TP7 8-10	42	64	17	19	3	SL	7.90	28.4	0.9				
B13050229-013	TP7 10-12	41	60	21	19	8	SL	7.80	34.4	1.1				
B13050229-014	TP9 6-8	35	54	29	17	6	SL	7.60	29.9	2.8	464	0	463	0.07
B13050229-015	TP9 8-10	53	66	18	16	6	SL	7.70	27.8	1.9	375	0	375	0.03
B13050229-016	TP9 10-11	42	54	28	18	8	SL	7.70	31.5	2.7	297	0	297	0.07
B13050229-017	TP12 0-1	17	60	21	19	9	SL	7.70	25.8	0.5	47	0	47	0.03
B13050229-018	TP12 1-3	20	30	43	27	4	CL	7.60	35.1	1.4	406	0	406	0.01
B13050229-019	TP12 3-7	65	59	23	18	4	SL	7.50	25.7	2.8	192	0	192	0.02
B13050229-020	TP12 8-11	21	66	22	12	10	SL	7.60	23.6	4.6	147	0	147	0.02
B13050229-021	TP12 11-13	18	52	33	15	10	L	7.40	27.9	4.8	225	0	225	0.02
B13050229-022	TP16 0-2	20	53	26	21	6	SCL	7.60	28.7	0.6	113	0	113	0.01
B13050229-023	TP16 2-4	19	40	34	26	5	L	7.70	33.7	0.6	336	0	336	< 0.01
B13050229-024	TP16 4-7	8	48	39	13	10	L	7.60	35.3	2.1	156	0	156	0.02
B13050229-025	TP16 7-10	12	29	52	19	3	SiL	7.70	31.4	1.5	189	0	189	0.01
B13050229-026	TP16 10-17	55	57	25	18	3	SL	7.70	26.2	1.2	117	0	117	0.02
B13050229-027	TP17 0-2	19	34	36	30	1	CL	7.70	44.3	0.5				
B13050229-028	TP17 2-4	14	23	45	32	0	CL	7.80	38.4	0.3				
B13050229-029	TP17 4-6	28	51	29	20	6	L	7.80	33.1	0.3				
B13050229-030	TP17 6-10	40	77	15	8	7	SL	7.90	32.2	0.4				
B13050229-031	TP21 7-11	55	51	25	24	6	SCL	7.60	42.6	4.5				
B13050229-032	TP21 11-14	39	51	25	24	7	SCL	7.50	37.0	3.3				
B13050229-033	TP21 14-18	17	49	33	18	16	L	7.60	38.5	3.2				
B13050229-034	TP24 0-3	35	35	31	34	3	CL	7.80	41.7	0.5				
B13050229-035	TP24 3-5	33	37	35	28	3	CL	7.70	37.8	0.8				
B13050229-036	TP24 5-10	15	45	33	22	7	L	7.90	31.9	1.3				
B13050229-037	TP24 10-14	36	57	25	18	4	SL	7.80	28.3	2.0				
B13050229-038	TP24 14-16	55	59	23	18	4	SL	7.70	28.6	4.0				
B13050229-039	TP25 2-5	61	67	15	18	5	SL	8.00	29.1	0.3				
B13050229-040	TP27 0-2	32	53	23	24	3	SCL	7.60	33.5	0.5	117	0	117	0.01

LABORATORY ANALYTICAL REPORT

Prepared by Billings, MT Branch

Client: Golder Associates Inc
Project: 123-80002A Supplemental Soils
Workorder: B13050229

Report Date: 05/14/13
Date Received: 05/02/13

	Analysis	Coarse Frags	Sand	Silt	Clay	Very Fine Sand	Texture	pH	Saturation	Cond-Sat Paste	Neut Potential	Acid Potential	Acid/Base Potential	S, Total
	Units	%	%	%	%	wt%		s_u_	%	mmhos/cm	t/kt	t/kt	t/kt	%
Sample ID	**Client Sample ID**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**
B13050229-041	TP27 2-3	42	45	27	28	4	CL	7.60	36.7	0.7	208	0	208	0.01
B13050229-042	TP27 3-7	51	62	20	18	5	SL	7.70	28.0	0.7	261	0	261	< 0.01
B13050229-043	TP27 7-13	59	67	15	18	5	SL	8.00	26.9	0.6	267	0	266	0.01
B13050229-044	TP27 13-14	51	69	15	16	4	SL	8.00	25.0	0.5	231	0	231	0.02
B13050229-045	TP31 1-2	31	48	28	24	8	L	8.10	39.2	0.6				
B13050229-046	TP31 2-5	44	63	17	20	6	SCL	8.00	31.5	0.7				
B13050229-047	TP31 5-8	53	67	13	20	6	SCL	8.00	30.4	0.6				
B13050229-048	TP31 8-16	53	61	17	22	7	SCL	7.90	33.5	0.9				

LABORATORY ANALYTICAL REPORT

Prepared by Billings, MT Branch

Client: Golder Associates Inc
Project: 123-80002A Supplemental Soils
Workorder: B13050229

Report Date: 05/14/13
Date Received: 05/02/13

	Analysis	S, H2O Extr	S, HCL Extr	S, HNO3 Extr	S, Residual	Lime	Phos, Olsen	Nitrate as N	Potassium	As-ABDTPA	Cd-ABDTPA	Cu-ABDTPA	Hg-ABDTPA	Mn-ABDTPA
	Units	%	%	%	%	%	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Sample ID	Client Sample ID	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results
B13050229-001	TP3 0-1	< 0.01	< 0.01	< 0.01	0.01		9	3	96	0.06	< 0.1	1.8	< 0.1	2.6
B13050229-002	TP3 1-2	< 0.01	< 0.01	< 0.01	0.01		11	2	45	0.09	< 0.1	0.9	< 0.1	1.8
B13050229-003	TP3 2-7	< 0.01	< 0.01	< 0.01	0.01		8	1	57	0.15	< 0.1	0.7	< 0.1	0.7
B13050229-004	TP3 7-9	< 0.01	< 0.01	< 0.01	0.01		7	1	91	0.10	< 0.1	0.3	< 0.1	0.4
B13050229-005	TP3 9-11	0.06	< 0.01	< 0.01	0.01		7	< 1	72	0.10	< 0.1	0.5	< 0.1	0.9
B13050229-006	TP5 0-1	< 0.01	< 0.01	< 0.01	0.01		10	9	150	0.08	< 0.1	8.0	< 0.1	6.1
B13050229-007	TP5 1-3	< 0.01	< 0.01	< 0.01	0.01		7	3	90	0.09	< 0.1	2.9	< 0.1	2.4
B13050229-008	TP5 3-7	< 0.01	< 0.01	< 0.01	0.01		7	1	69	0.11	< 0.1	0.9	< 0.1	1.1
B13050229-009	TP7 0-1.5					4.5								
B13050229-010	TP7 1.5-4					3.2								
B13050229-011	TP7 6-8					40.8								
B13050229-012	TP7 8-10					25.3								
B13050229-013	TP7 10-12					26.4								
B13050229-014	TP9 6-8	0.04	< 0.01	0.02	0.01		6	< 1	210	0.06	< 0.1	25.7	< 0.1	1.8
B13050229-015	TP9 8-10	< 0.01	< 0.01	0.01	0.01		6	< 1	56	0.10	< 0.1	10.8	< 0.1	1.2
B13050229-016	TP9 10-11	0.03	< 0.01	0.02	0.02		7	1	80	0.07	< 0.1	30.5	< 0.1	1.5
B13050229-017	TP12 0-1	< 0.01	< 0.01	0.01	0.02		7	5	260	0.08	< 0.1	4.8	< 0.1	2.6
B13050229-018	TP12 1-3	< 0.01	< 0.01	< 0.01	0.01		8	4	110	0.10	< 0.1	2.6	< 0.1	1.2
B13050229-019	TP12 3-7	< 0.01	< 0.01	< 0.01	0.02		9	3	99	0.12	< 0.1	4.4	< 0.1	1.4
B13050229-020	TP12 8-11	< 0.01	< 0.01	< 0.01	0.02		5	1	60	0.07	< 0.1	1.1	< 0.1	0.5
B13050229-021	TP12 11-13	< 0.01	< 0.01	< 0.01	0.02		6	1	86	0.10	< 0.1	1.6	< 0.1	0.9
B13050229-022	TP16 0-2	< 0.01	< 0.01	< 0.01	0.01		7	6	360	0.08	< 0.1	4.2	< 0.1	3.7
B13050229-023	TP16 2-4	< 0.01	< 0.01	< 0.01	0.01		9	2	110	0.10	< 0.1	3.9	< 0.1	2.6
B13050229-024	TP16 4-7	< 0.01	< 0.01	< 0.01	0.02		6	1	140	0.07	< 0.1	1.4	< 0.1	0.6
B13050229-025	TP16 7-10	< 0.01	< 0.01	< 0.01	0.02		6	5	120	0.23	< 0.1	1.3	< 0.1	0.4
B13050229-026	TP16 10-17	< 0.01	< 0.01	< 0.01	0.02		6	4	110	0.10	< 0.1	2.2	< 0.1	1.3
B13050229-027	TP17 0-2					16.1								
B13050229-028	TP17 2-4					61.7								
B13050229-029	TP17 4-6					36.1								
B13050229-030	TP17 6-10					37.5								
B13050229-031	TP21 7-11					6.7								
B13050229-032	TP21 11-14					10.6								
B13050229-033	TP21 14-18					20.6								
B13050229-034	TP24 0-3					14.2								
B13050229-035	TP24 3-5					26.1								
B13050229-036	TP24 5-10					39.2								
B13050229-037	TP24 10-14					24.4								
B13050229-038	TP24 14-16					20.3								
B13050229-039	TP25 2-5					11.7								
B13050229-040	TP27 0-2	< 0.01	< 0.01	< 0.01	0.01		7	6	140	0.08	< 0.1	3.5	< 0.1	2.3

LABORATORY ANALYTICAL REPORT

Prepared by Billings, MT Branch

Client: Golder Associates Inc
Project: 123-80002A Supplemental Soils
Workorder: B13050229

Report Date: 05/14/13
Date Received: 05/02/13

	Analysis	S, H2O Extr	S, HCL Extr	S, HNO3 Extr	S, Residual	Lime	Phos, Olsen	Nitrate as N	Potassium	As-ABDTPA	Cd-ABDTPA	Cu-ABDTPA	Hg-ABDTPA	Mn-ABDTPA
	Units	%	%	%	%	%	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Sample ID	Client Sample ID	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results
B13050229-041	TP27 2-3	< 0.01	< 0.01	< 0.01	0.01		7	3	110	0.06	< 0.1	2.2	< 0.1	1.3
B13050229-042	TP27 3-7	< 0.01	< 0.01	< 0.01	0.01		7	2	52	0.07	< 0.1	0.8	< 0.1	0.6
B13050229-043	TP27 7-13	< 0.01	< 0.01	0.01	0.01		6	< 1	42	0.07	< 0.1	0.6	< 0.1	0.6
B13050229-044	TP27 13-14	< 0.01	< 0.01	< 0.01	0.02		5	< 1	71	0.08	< 0.1	0.5	< 0.1	0.7
B13050229-045	TP31 1-2					16.9								
B13050229-046	TP31 2-5					16.1								
B13050229-047	TP31 5-8					17.8								
B13050229-048	TP31 8-16					5.2								

LABORATORY ANALYTICAL REPORT

Prepared by Billings, MT Branch

Client: Golder Associates Inc
Project: 123-80002A Supplemental Soils
Workorder: B13050229

Report Date: 05/14/13
Date Received: 05/02/13

	Analysis	Mo-ABDTPA	Ni-ABDTPA	Pb-ABDTPA
	Units	mg/kg	mg/kg	mg/kg
Sample ID	Client Sample ID	Results	Results	Results
B13050229-001	TP3 0-1	< 0.1	< 0.1	1.0
B13050229-002	TP3 1-2	< 0.1	< 0.1	0.9
B13050229-003	TP3 2-7	< 0.1	< 0.1	0.4
B13050229-004	TP3 7-9	< 0.1	< 0.1	0.3
B13050229-005	TP3 9-11	< 0.1	< 0.1	0.3
B13050229-006	TP5 0-1	< 0.1	0.1	1.3
B13050229-007	TP5 1-3	< 0.1	< 0.1	0.7
B13050229-008	TP5 3-7	< 0.1	< 0.1	0.3
B13050229-009	TP7 0-1.5			
B13050229-010	TP7 1.5-4			
B13050229-011	TP7 6-8			
B13050229-012	TP7 8-10			
B13050229-013	TP7 10-12			
B13050229-014	TP9 6-8	0.9	< 0.1	0.4
B13050229-015	TP9 8-10	0.2	< 0.1	0.3
B13050229-016	TP9 10-11	0.3	< 0.1	0.5
B13050229-017	TP12 0-1	< 0.1	< 0.1	1.3
B13050229-018	TP12 1-3	< 0.1	< 0.1	0.6
B13050229-019	TP12 3-7	< 0.1	0.4	0.6
B13050229-020	TP12 8-11	< 0.1	< 0.1	0.3
B13050229-021	TP12 11-13	< 0.1	< 0.1	0.5
B13050229-022	TP16 0-2	< 0.1	0.1	1.0
B13050229-023	TP16 2-4	< 0.1	< 0.1	1.0
B13050229-024	TP16 4-7	< 0.1	< 0.1	0.9
B13050229-025	TP16 7-10	< 0.1	< 0.1	0.9
B13050229-026	TP16 10-17	< 0.1	< 0.1	0.6
B13050229-027	TP17 0-2			
B13050229-028	TP17 2-4			
B13050229-029	TP17 4-6			
B13050229-030	TP17 6-10			
B13050229-031	TP21 7-11			
B13050229-032	TP21 11-14			
B13050229-033	TP21 14-18			
B13050229-034	TP24 0-3			
B13050229-035	TP24 3-5			
B13050229-036	TP24 5-10			
B13050229-037	TP24 10-14			
B13050229-038	TP24 14-16			
B13050229-039	TP25 2-5			
B13050229-040	TP27 0-2	< 0.1	< 0.1	1.4

LABORATORY ANALYTICAL REPORT

Prepared by Billings, MT Branch

Client: Golder Associates Inc
Project: 123-80002A Supplemental Soils
Workorder: B13050229

Report Date: 05/14/13
Date Received: 05/02/13

	Analysis	Mo-ABDTPA	Ni-ABDTPA	Pb-ABDTPA
	Units	mg/kg	mg/kg	mg/kg
Sample ID	Client Sample ID	Results	Results	Results
B13050229-041	TP27 2-3	< 0.1	< 0.1	1.0
B13050229-042	TP27 3-7	< 0.1	< 0.1	0.4
B13050229-043	TP27 7-13	< 0.1	< 0.1	0.3
B13050229-044	TP27 13-14	< 0.1	< 0.1	0.2
B13050229-045	TP31 1-2			
B13050229-046	TP31 2-5			
B13050229-047	TP31 5-8			
B13050229-048	TP31 8-16			

QA/QC Summary Report

Prepared by Billings, MT Branch

Client: Golder Associates Inc

Project: 123-80002A Supplemental Soils

Report Date: 05/14/13

Work Order: B13050229

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: ASA10-3								Batch: R204392	
Sample ID: B13050229-001A DUP	Sample Duplicate				Run: MISC-SOIL_130510A			05/10/13 09:59	
Conductivity, sat. paste	0.470	mmhos/cm	0.10				2.2	30	
Sample ID: B13050229-011A DUP	Sample Duplicate				Run: MISC-SOIL_130510A			05/10/13 09:59	
Conductivity, sat. paste	0.880	mmhos/cm	0.10				1.1	30	
Sample ID: B13050229-021A DUP	Sample Duplicate				Run: MISC-SOIL_130510A			05/10/13 09:59	
Conductivity, sat. paste	4.90	mmhos/cm	0.10				1.9	30	
Sample ID: B13050229-031A DUP	Sample Duplicate				Run: MISC-SOIL_130510A			05/10/13 09:59	
Conductivity, sat. paste	4.56	mmhos/cm	0.10				2.0	30	
Sample ID: B13050229-041A DUP	Sample Duplicate				Run: MISC-SOIL_130510A			05/10/13 09:59	
Conductivity, sat. paste	0.650	mmhos/cm	0.10				1.5	30	
Sample ID: LCS-1305100959	Laboratory Control Sample				Run: MISC-SOIL_130510A			05/10/13 09:59	
Conductivity, sat. paste	7.00	mmhos/cm	0.10	90	50	150			

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

QA/QC Summary Report

Prepared by Billings, MT Branch

Client: Golder Associates Inc
Project: 123-80002A Supplemental Soils

Report Date: 05/14/13
Work Order: B13050229

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: ASA15-5								Batch: R204392	
Sample ID: B13050229-001A DUP	Sample Duplicate				Run: MISC-SOIL_130510A			05/10/13 09:59	
Sand	50	%	1.0				2.0	40	
Silt	27	%	1.0				0.0	40	
Clay	23	%	1.0				4.3	40	
Sample ID: B13050229-011A DUP	Sample Duplicate				Run: MISC-SOIL_130510A			05/10/13 09:59	
Sand	56	%	1.0				0.0	40	
Silt	23	%	1.0				4.4	40	
Clay	21	%	1.0				4.7	40	
Sample ID: B13050229-021A DUP	Sample Duplicate				Run: MISC-SOIL_130510A			05/10/13 09:59	
Sand	53	%	1.0				1.9	40	
Silt	32	%	1.0				3.1	40	
Clay	15	%	1.0				0.0	40	
Sample ID: LCS-1305100959	Laboratory Control Sample				Run: MISC-SOIL_130510A			05/10/13 09:59	
Sand	42	%	1.0	102	50	150			
Silt	34	%	1.0	97	50	150			
Clay	24	%	1.0	100	50	150			
Sample ID: B13050229-001A DUP	Sample Duplicate				Run: MISC-SOIL_130510A			05/13/13 09:17	
Very Fine Sand	7	wt%	1				28	50	
Sample ID: B13050229-011A DUP	Sample Duplicate				Run: MISC-SOIL_130510A			05/13/13 09:17	
Very Fine Sand	4	wt%	1				23	50	
Sample ID: B13050229-021A DUP	Sample Duplicate				Run: MISC-SOIL_130510A			05/13/13 09:17	
Very Fine Sand	10	wt%	1				1.0	50	
Sample ID: LCS-1305130917	Laboratory Control Sample				Run: MISC-SOIL_130510A			05/13/13 09:17	
Very Fine Sand	8	wt%	1	98	50	150			

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

QA/QC Summary Report

Prepared by Billings, MT Branch

Client: Golder Associates Inc

Project: 123-80002A Supplemental Soils

Report Date: 05/14/13

Work Order: B13050229

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: **ASA15-5**									Batch: R204457
Sample ID: **B13050229-025A DUP**	Sample Duplicate				Run: MISC-SOIL_130513A				05/13/13 08:54
Sand	30	%	1.0				3.4	40	
Silt	51	%	1.0				1.9	40	
Clay	19	%	1.0				0.0	40	
Sample ID: **B13050229-035A DUP**	Sample Duplicate				Run: MISC-SOIL_130513A				05/13/13 08:54
Sand	37	%	1.0				0.0	40	
Silt	35	%	1.0				0.0	40	
Clay	28	%	1.0				0.0	40	
Sample ID: **B13050229-045A DUP**	Sample Duplicate				Run: MISC-SOIL_130513A				05/13/13 08:54
Sand	48	%	1.0				0.0	40	
Silt	28	%	1.0				0.0	40	
Clay	24	%	1.0				0.0	40	
Sample ID: **LCS-1305130854**	Laboratory Control Sample				Run: MISC-SOIL_130513A				05/13/13 08:54
Sand	42	%	1.0	102	50	150			
Silt	34	%	1.0	97	50	150			
Clay	24	%	1.0	100	50	150			
Sample ID: **B13050229-025A DUP**	Sample Duplicate				Run: MISC-SOIL_130513A				05/13/13 08:54
Very Fine Sand	4	wt%	1				29	50	
Sample ID: **B13050229-035A DUP**	Sample Duplicate				Run: MISC-SOIL_130513A				05/13/13 08:54
Very Fine Sand	3	wt%	1				0.0	50	
Sample ID: **B13050229-045A DUP**	Sample Duplicate				Run: MISC-SOIL_130513A				05/13/13 08:54
Very Fine Sand	7	wt%	1				13	50	
Sample ID: **LCS-1305130854**	Laboratory Control Sample				Run: MISC-SOIL_130513A				05/13/13 08:54
Very Fine Sand	7	wt%	1	88	50	150			

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

QA/QC Summary Report

Prepared by Billings, MT Branch

Client: Golder Associates Inc

Project: 123-80002A Supplemental Soils

Report Date: 05/14/13

Work Order: B13050229

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: **ASA24-5**								Batch: 130508013	
Sample ID: **LCS**	Laboratory Control Sample				Run: FIA201-B_130508A			05/08/13 10:55	
Phosphorus, Olsen	13.8	mg/kg	1.0	103	50	150			
Sample ID: **B13050229-001ADUP**	Sample Duplicate				Run: FIA201-B_130508A			05/08/13 11:02	
Phosphorus, Olsen	8.38	mg/kg	1.0				9.8	30	
Sample ID: **B13050229-001AMS**	Sample Matrix Spike				Run: FIA201-B_130508A			05/08/13 11:03	
Phosphorus, Olsen	19.8	mg/kg	1.0	101	50	150			
Sample ID: **B13050229-016ADUP**	Sample Duplicate				Run: FIA201-B_130508A			05/08/13 11:22	
Phosphorus, Olsen	6.91	mg/kg	1.0				2.3	30	
Sample ID: **B13050229-016AMS**	Sample Matrix Spike				Run: FIA201-B_130508A			05/08/13 11:23	
Phosphorus, Olsen	18.0	mg/kg	1.0	107	50	150			
Sample ID: **B13050229-026ADUP**	Sample Duplicate				Run: FIA201-B_130508A			05/08/13 11:41	
Phosphorus, Olsen	6.23	mg/kg	1.0				2.6	30	
Sample ID: **B13050229-026AMS**	Sample Matrix Spike				Run: FIA201-B_130508A			05/08/13 11:43	
Phosphorus, Olsen	17.3	mg/kg	1.0	107	50	150			

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

QA/QC Summary Report

Prepared by Billings, MT Branch

Client: Golder Associates Inc

Project: 123-80002A Supplemental Soils

Report Date: 05/14/13

Work Order: B13050229

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: ASA33-8								Batch: 13050901-NNS2	
Sample ID: LCS	Laboratory Control Sample				Run: FIA201-B_130510A			05/09/13 12:16	
Nitrate as N, KCL Extract	7.03	mg/kg	1.0	95	50	150			
Sample ID: B13042185-001ADUP	Sample Duplicate				Run: FIA201-B_130510A			05/09/13 12:19	
Nitrate as N, KCL Extract	5.43	mg/kg	1.0				3.0	30	
Sample ID: B13042185-001AMS	Sample Matrix Spike				Run: FIA201-B_130510A			05/09/13 12:20	
Nitrate as N, KCL Extract	10.5	mg/kg	1.0	94	50	150			
Sample ID: B13050229-014ADUP	Sample Duplicate				Run: FIA201-B_130510A			05/09/13 12:29	
Nitrate as N, KCL Extract	0.942	mg/kg	1.0					30	
Sample ID: B13050229-014AMS	Sample Matrix Spike				Run: FIA201-B_130510A			05/09/13 12:30	
Nitrate as N, KCL Extract	6.16	mg/kg	1.0	101	50	150			
Sample ID: B13050229-024ADUP	Sample Duplicate				Run: FIA201-B_130510A			05/09/13 12:39	
Nitrate as N, KCL Extract	1.06	mg/kg	1.0				8.8	30	
Sample ID: B13050229-024AMS	Sample Matrix Spike				Run: FIA201-B_130510A			05/09/13 12:39	
Nitrate as N, KCL Extract	6.47	mg/kg	1.0	101	50	150			
Sample ID: B13050347-001BMS	Sample Matrix Spike				Run: FIA201-B_130510A			05/09/13 12:48	
Nitrate as N, KCL Extract	1100	mg/kg-dry	10	97	50	150			
Sample ID: B13050347-001BDUP	Sample Duplicate				Run: FIA201-B_130510A			05/09/13 12:49	
Nitrate as N, KCL Extract	68.4	mg/kg-dry	10				44	30	R

Qualifiers:

RL - Analyte reporting limit.

R - RPD exceeds advisory limit.

ND - Not detected at the reporting limit.

QA/QC Summary Report

Prepared by Billings, MT Branch

Client: Golder Associates Inc
Project: 123-80002A Supplemental Soils

Report Date: 05/14/13
Work Order: B13050229

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: ASAM10-3.2								Batch: R204392	
Sample ID: B13050229-001A DUP	Sample Duplicate				Run: MISC-SOIL_130510A			05/10/13 09:59	
pH, sat. paste	7.50	s.u.	0.10				0.0	10	
Sample ID: B13050229-011A DUP	Sample Duplicate				Run: MISC-SOIL_130510A			05/10/13 09:59	
pH, sat. paste	7.80	s.u.	0.10				0.0	10	
Sample ID: B13050229-021A DUP	Sample Duplicate				Run: MISC-SOIL_130510A			05/10/13 09:59	
pH, sat. paste	7.50	s.u.	0.10				1.3	10	
Sample ID: B13050229-031A DUP	Sample Duplicate				Run: MISC-SOIL_130510A			05/10/13 09:59	
pH, sat. paste	7.60	s.u.	0.10				0.0	10	
Sample ID: B13050229-041A DUP	Sample Duplicate				Run: MISC-SOIL_130510A			05/10/13 09:59	
pH, sat. paste	7.60	s.u.	0.10				0.0	10	
Sample ID: LCS-1305100959	Laboratory Control Sample				Run: MISC-SOIL_130510A			05/10/13 09:59	
pH, sat. paste	6.90	s.u.	0.10	97	90	110			

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

QA/QC Summary Report

Prepared by Billings, MT Branch

Client: Golder Associates Inc
Project: 123-80002A Supplemental Soils

Report Date: 05/14/13
Work Order: B13050229

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: Sobek Modified								Batch: R204457	
Sample ID: B13050229-001A DUP	Sample Duplicate				Run: MISC-SOIL_130513A			05/10/13 10:43	
Sulfur, Total	0.0148	%	0.010				0.3	50	
Sulfur, Hot Water Extractable	0.00340	%	0.010					50	
Sulfur, HCl Extractable	0.00140	%	0.010					50	
Sulfur, HNO3 Extractable	ND	%	0.010					50	
Sulfur, Residual	0.0100	%	0.010				0.0	50	
Sample ID: B13050229-016A DUP	Sample Duplicate				Run: MISC-SOIL_130513A			05/10/13 11:23	
Sulfur, Total	0.0676	%	0.010				2.2	50	
Sulfur, Hot Water Extractable	0.0282	%	0.010				7.4	50	
Sulfur, HCl Extractable	ND	%	0.010					50	
Sulfur, HNO3 Extractable	0.0200	%	0.010				0.0	50	
Sulfur, Residual	0.0200	%	0.010				0.0	50	
Sample ID: B13050229-026A DUP	Sample Duplicate				Run: MISC-SOIL_130513A			05/10/13 12:04	
Sulfur, Total	0.0159	%	0.010				0.6	50	
Sulfur, Hot Water Extractable	ND	%	0.010					50	
Sulfur, HCl Extractable	ND	%	0.010					50	
Sulfur, HNO3 Extractable	ND	%	0.010					50	
Sulfur, Residual	0.0200	%	0.010				0.0	50	
Sample ID: LCS-SOL0715130510122	Laboratory Control Sample				Run: MISC-SOIL_130513A			05/10/13 12:22	
Sulfur, Total	0.158	%	0.010	98	50	200			
Sulfur, Hot Water Extractable	0.0495	%	0.010	124	50	200			
Sulfur, HCl Extractable	0.00800	%	0.010	80	50	200			
Sulfur, HNO3 Extractable	0.0600	%	0.010	86	50	200			
Sulfur, Residual	0.0400	%	0.010	200	50	200			
Sample ID: B13050229-001A DUP	Sample Duplicate				Run: MISC-SOIL_130513A			05/10/13 10:43	
Neutralization Potential	200	t/kt	0.10				1.4	50	
Acid Potential	0	t/kt	1.0					50	
Acid/Base Potential	200	t/kt					1.4	50	
The acid-base potential was calculated from the HNO3 extractable sulfur %									
Sample ID: B13050229-016A DUP	Sample Duplicate				Run: MISC-SOIL_130513A			05/10/13 11:23	
Neutralization Potential	300	t/kt	0.10				0.0	50	
Acid Potential	0.62	t/kt	1.0					50	
Acid/Base Potential	300	t/kt					0.0	50	
The acid-base potential was calculated from the HNO3 extractable sulfur %									
Sample ID: B13050229-026A DUP	Sample Duplicate				Run: MISC-SOIL_130513A			05/10/13 12:04	
Neutralization Potential	120	t/kt	0.10				0.5	50	
Acid Potential	0	t/kt	1.0					50	
Acid/Base Potential	120	t/kt					0.5	50	
The acid-base potential was calculated from the HNO3 extractable sulfur %									

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

QA/QC Summary Report

Prepared by Billings, MT Branch

Client: Golder Associates Inc
Project: 123-80002A Supplemental Soils

Report Date: 05/14/13
Work Order: B13050229

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: Sobek Modified								Batch: R204457	
Sample ID: LCS-SOL0715130510122 Laboratory Control Sample					Run: MISC-SOIL_130513A			05/10/13 12:22	
Neutralization Potential	74	t/kt	0.10	92	50	200			
Acid Potential	1.9	t/kt	1.0	94	50	200			
Acid/Base Potential	72	t/kt		95	50	200			

The acid-base potential was calculated from the HNO3 extractable sulfur %

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

QA/QC Summary Report

Prepared by Billings, MT Branch

Client: Golder Associates Inc
Project: 123-80002A Supplemental Soils

Report Date: 05/14/13
Work Order: B13050229

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: SW6010B									Batch: 71062
Sample ID: LCS-71062	Laboratory Control Sample				Run: ICP201-B_130507A			05/07/13 18:47	
Potassium	250	mg/kg	10	81	50	150			
Sample ID: B13050229-001A DUP	Sample Duplicate				Run: ICP201-B_130507A			05/07/13 18:53	
Potassium	80	mg/kg	10				18	50	
Sample ID: B13050229-002AMS2	Sample Matrix Spike				Run: ICP201-B_130507A			05/07/13 19:00	
Potassium	4800	mg/kg	10	96	70	130			
Sample ID: B13050229-016A DUP	Sample Duplicate				Run: ICP201-B_130507A			05/07/13 19:40	
Potassium	81	mg/kg	10				1.1	50	
Sample ID: B13050229-017AMS2	Sample Matrix Spike				Run: ICP201-B_130507A			05/07/13 19:47	
Potassium	5200	mg/kg	10	98	70	130			
Sample ID: B13050229-026A DUP	Sample Duplicate				Run: ICP201-B_130507A			05/07/13 20:26	
Potassium	99	mg/kg	10				9.9	50	
Sample ID: B13050229-040AMS2	Sample Matrix Spike				Run: ICP201-B_130507A			05/07/13 20:52	
Potassium	4800	mg/kg	10	94	70	130			

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

QA/QC Summary Report

Prepared by Billings, MT Branch

Client: Golder Associates Inc
Project: 123-80002A Supplemental Soils

Report Date: 05/14/13
Work Order: B13050229

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: **SW6020**									Batch: 71085
Sample ID: **LCS-71085**	Laboratory Control Sample				Run: ICPMS202-B_130508A				05/08/13 13:25
Arsenic	0.210	mg/kg	0.020	66	50	150			
Cadmium	0.108	mg/kg	0.10	108	50	150			
Copper	3.70	mg/kg	0.10	80	50	150			
Lead	2.57	mg/kg	0.10	107	50	150			
Manganese	7.78	mg/kg	0.10	63	50	150			
Molybdenum	0.291	mg/kg	0.10	141	50	150			
Nickel	0.508	mg/kg	0.10	63	50	150			
Sample ID: **B13050229-001A DUP**	Sample Duplicate				Run: ICPMS202-B_130508A				05/08/13 13:31
Arsenic	0.0572	mg/kg	0.020				0.4	30	
Cadmium	0.0192	mg/kg	0.10					30	
Copper	1.74	mg/kg	0.10				4.4	30	
Lead	0.959	mg/kg	0.10				7.1	30	
Manganese	2.41	mg/kg	0.10				6.6	30	
Mercury	0.000360	mg/kg	0.10					30	
Molybdenum	0.0162	mg/kg	0.10					30	
Nickel	0.0528	mg/kg	0.10					30	
Sample ID: **B13050229-002AMS**	Sample Matrix Spike				Run: ICPMS202-B_130508A				05/08/13 13:36
Arsenic	0.634	mg/kg	0.020	109	50	150			
Cadmium	0.577	mg/kg	0.10	57	50	150			
Copper	1.52	mg/kg	0.10	57	50	150			
Lead	1.45	mg/kg	0.10	56	50	150			
Manganese	2.35	mg/kg	0.10	57	50	150			
Molybdenum	0.618	mg/kg	0.10	61	50	150			
Nickel	0.614	mg/kg	0.10	56	50	150			
Sample ID: **B13050229-016A DUP**	Sample Duplicate				Run: ICPMS202-B_130508A				05/08/13 14:15
Arsenic	0.0727	mg/kg	0.020				2.5	30	
Cadmium	0.0106	mg/kg	0.10					30	
Copper	28.4	mg/kg	0.10				7.0	30	
Lead	0.479	mg/kg	0.10				4.3	30	
Manganese	1.45	mg/kg	0.10				4.5	30	
Mercury	0.000380	mg/kg	0.10					30	
Molybdenum	0.305	mg/kg	0.10				3.9	30	
Nickel	0.0340	mg/kg	0.10					30	
Sample ID: **B13050229-017AMS**	Sample Matrix Spike				Run: ICPMS202-B_130508A				05/08/13 14:21
Arsenic	0.693	mg/kg	0.020	122	50	150			
Cadmium	0.670	mg/kg	0.10	64	50	150			
Copper	5.65	mg/kg	0.10		50	150			A
Lead	2.07	mg/kg	0.10	75	50	150			
Manganese	3.41	mg/kg	0.10	78	50	150			
Molybdenum	0.714	mg/kg	0.10	69	50	150			

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

A - The analyte level was greater than four times the spike level. In accordance with the method % recovery is not calculated.

QA/QC Summary Report

Prepared by Billings, MT Branch

Client: Golder Associates Inc

Project: 123-80002A Supplemental Soils

Report Date: 05/14/13

Work Order: B13050229

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: SW6020									Batch: 71085
Sample ID: B13050229-017AMS	Sample Matrix Spike				Run: ICPMS202-B_130508A				05/08/13 14:21
Nickel	0.623	mg/kg	0.10	54	50	150			
Sample ID: B13050229-026A DUP	Sample Duplicate				Run: ICPMS202-B_130508A				05/08/13 15:00
Arsenic	0.101	mg/kg	0.020				1.1	30	
Cadmium	0.00946	mg/kg	0.10					30	
Copper	2.27	mg/kg	0.10				2.9	30	
Lead	0.646	mg/kg	0.10				1.4	30	
Manganese	1.31	mg/kg	0.10				3.9	30	
Mercury	0.000330	mg/kg	0.10					30	
Molybdenum	0.00672	mg/kg	0.10					30	
Nickel	0.0470	mg/kg	0.10					30	

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

QA/QC Summary Report

Prepared by Billings, MT Branch

Client: Golder Associates Inc

Project: 123-80002A Supplemental Soils

Report Date: 05/14/13

Work Order: B13050229

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: USDA23c								Batch: R204392	
Sample ID: B13050229-009A DUP	Sample Duplicate				Run: MISC-SOIL_130510A			05/10/13 09:11	
Lime as CaCO3	4.50	%	0.10				0.0	30	
Sample ID: B13050229-032A DUP	Sample Duplicate				Run: MISC-SOIL_130510A			05/10/13 09:11	
Lime as CaCO3	10.4	%	0.10				1.9	30	
Sample ID: B13050229-046A DUP	Sample Duplicate				Run: MISC-SOIL_130510A			05/10/13 09:11	
Lime as CaCO3	16.1	%	0.10				0.0	30	
Sample ID: LCS-1305100911	Laboratory Control Sample				Run: MISC-SOIL_130510A			05/10/13 09:11	
Lime as CaCO3	7.50	%	0.10	94	50	150			

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

QA/QC Summary Report

Prepared by Billings, MT Branch

Client: Golder Associates Inc

Project: 123-80002A Supplemental Soils

Report Date: 05/14/13

Work Order: B13050229

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: USDA27a									Batch: R204392
Sample ID: B13050229-001A DUP	Sample Duplicate				Run: MISC-SOIL_130510A				05/10/13 09:59
Saturation	30.9	%	0.10				1.6	20	
Sample ID: B13050229-011A DUP	Sample Duplicate				Run: MISC-SOIL_130510A				05/10/13 09:59
Saturation	28.9	%	0.10				1.7	20	
Sample ID: B13050229-021A DUP	Sample Duplicate				Run: MISC-SOIL_130510A				05/10/13 09:59
Saturation	27.7	%	0.10				0.7	20	
Sample ID: B13050229-031A DUP	Sample Duplicate				Run: MISC-SOIL_130510A				05/10/13 09:59
Saturation	42.5	%	0.10				0.2	20	
Sample ID: B13050229-041A DUP	Sample Duplicate				Run: MISC-SOIL_130510A				05/10/13 09:59
Saturation	37.3	%	0.10				1.6	20	
Sample ID: LCS-1305100959	Laboratory Control Sample				Run: MISC-SOIL_130510A				05/10/13 09:59
Saturation	35.9	%	0.10	95	50	150			

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

Standard Reporting Procedures

Lab measurement of analytes considered field parameters that require analysis within 15 minutes of sampling such as pH, Dissolved Oxygen and Residual Chlorine, are qualified as being analyzed outside of recommended holding time.

Solid/soil samples are reported on a wet weight basis (as received) unless specifically indicated. If moisture corrected, data units are typically noted as –dry. For agricultural and mining soil parameters/characteristics, all samples are dried and ground prior to sample analysis.

Workorder Receipt Checklist

Golder Associates Inc — B13050229

Login completed by:	Gina McCartney	Date Received:	5/2/2013
Reviewed by:	BL2000\jklier	Received by:	lg
Reviewed Date:	5/3/2013	Carrier name:	Return-FedEx Ground

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on shipping container/cooler?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on sample bottles?	Yes ☐	No ☐	Not Present ☑
Chain of custody present?	Yes ☑	No ☐	
Chain of custody signed when relinquished and received?	Yes ☑	No ☐	
Chain of custody agrees with sample labels?	Yes ☑	No ☐	
Samples in proper container/bottle?	Yes ☑	No ☐	
Sample containers intact?	Yes ☑	No ☐	
Sufficient sample volume for indicated test?	Yes ☑	No ☐	
All samples received within holding time? (Exclude analyses that are considered field parameters such as pH, DO, Res Cl, Sulfite, Ferrous Iron, etc.)	Yes ☑	No ☐	
Temp Blank received?	Yes ☐	No ☑	Not Applicable ☐
Container/Temp Blank temperature:	°C No Ice		
Water - VOA vials have zero headspace?	Yes ☐	No ☐	No VOA vials submitted ☑
Water - pH acceptable upon receipt?	Yes ☐	No ☐	Not Applicable ☑

Contact and Corrective Action Comments:

Container temperature for Cooler 1 was 15.9°C, Cooler 2 was 14.6°C, Cooler 3 was 16.1°C, Cooler 4 was 16.8°C and Cooler 5 was 17.2°C.

ENERGY LABORATORIES

Chain of Custody and Analytical Request Record

PLEASE PRINT- Provide as much information as possible.

Company Name: Golder Assoicates Inc.	Project Name, PWS, Permit, Etc. 123-80002A Supplemental Soils	Sample Origin State: NM	EPA/State Compliance: Yes ☐ No ☐
Report Mail Address: 5200 Pasadena NE Suite C Albuquerque, NM 87113	Contact Name: Emily Clark Phone/Fax: 505-821-3043	Email: eclark@golder.com	Sampler: (Please Print) Emily Clark
Invoice Address: Same	Invoice Contact & Phone: Toni Sanchez 505-821-3043	Purchase Order:	Quote/Bottle Order: B2958

Special Report/Formats – ELI must be notified prior to sample submittal for the following:

☐ DW ☐ A2LA
☐ GSA ☐ EDD/EDT(Electronic Data)
☐ POTW/WWTP Format:________
☐ State: ________ ☐ LEVEL IV
☐ Other: ________ ☐ NELAC

Number of Containers / Sample Type: A W S V B O / Air Water Soils/Solids Vegetation Bioassay Other

ANALYSIS REQUESTED

RUSH — Contact ELI prior to RUSH sample submittal for charges and scheduling – See Instruction Page

Comments: Cooler #1 15.9, #2 14.6, #3 16.1, #4 16.8, #5 17.2

Shipped by: Fed Ex / Cooler ID(s): / Receipt Temp 15.9 °C / On Ice: Yes (No) / Custody Seal Y N / Intact Y N / Signature Match Y N

	SAMPLE IDENTIFICATION (Name, Location, Interval, etc.)	Collection Date	Collection Time	MATRIX	Group 1	Group 2	SEE ATTACHED	Normal Turnaround (TAT)	RUSH	Comments	LABORATORY USE ONLY
1	TP3 0-1	12-21-12				X	X			Collection	B13050229001
2	TP3 1-2	"				X	X			Dates provided	-002
3	TP3 2-7	"				X	X			per sample	-003
4	TP3 7-9	"				X	X			Containers	-004
5	TP3 9-11	"				X	X			gm 5-2-13	-005
6	TP5 0-1	1/3/13				X	X				-006
7	TP5 1-3	"				X	X				-007
8	TP5 3-7	"				X	X				-008
9	TP7 0-1.5	12-17-12			X		X				-009
10	TP7 1.5-4	"			X		X				-010

Custody Record MUST be Signed	Relinquished by (print): Michael Petersen	Date/Time: 09:00 4/30/13	Signature: [signature]	Received by (print):	Date/Time:	Signature:
	Relinquished by (print):	Date/Time:	Signature:	Received by (print):	Date/Time:	Signature:
	Sample Disposal: Return to Client: ______	Lab Disposal: ______		Received by Laboratory:	Date/Time: 5-2-13 9:00	Signature: [signature]

In certain circumstances, samples submitted to Energy Laboratories, Inc. may be subcontracted to other certified laboratories in order to complete the analysis requested. This serves as notice of this possibility. All sub-contract data will be clearly notated on your analytical report. Visit our web site at www.energylab.com for additional information, downloadable fee schedule, forms, and links.

ENERGY LABORATORIES

Chain of Custody and Analytical Request Record

Page ____ of ____

PLEASE PRINT- Provide as much information as possible.

Company Name: Golder Associates Inc	Project Name, PWS, Permit, Etc. 123-80002A Supplemental Soils	Sample Origin State: NM	EPA/State Compliance: Yes ☐ No ☐
Report Mail Address: 5200 Pasadena NE, Suite C, Albuquqerque, NM 87113	Contact Name: Emily Clark; Phone/Fax: 505-821-3043	Email: eclark@golder.com	Sampler: (Please Print) Emily Clark
Invoice Address: Same	Invoice Contact & Phone: Toni Sanchez 505-821-3043	Purchase Order:	Quote/Bottle Order: B2958

Special Report/Formats – ELI must be notified prior to sample submittal for the following:

☐ DW ☐ A2LA
☐ GSA ☐ EDD/EDT (Electronic Data)
☐ POTW/WWTP Format: ________
☐ State: ________ ☐ LEVEL IV
☐ Other: ________ ☐ NELAC

Number of Containers; Sample Type: A W S V B O; Air Water Soils/Solids Vegetation Bioassay Other

ANALYSIS REQUESTED: Group 1; Group 2

SEE ATTACHED — Normal Turnaround (TAT) — RUSH

Contact ELI prior to RUSH sample submittal for charges and scheduling – See Instruction Page

Comments: Cooler #1 15.9, #2 14.6, #3 16.1, #4 16.8, #5 17.2

Collection date provided per sample containers gms 5-2-13

Shipped by: RtenFedEx Grnd
Cooler ID(s):
Receipt Temp: See comments
On Ice: Yes (No)
Custody Seal (Y) N
Intact (Y) N
Signature Match (Y) N

SAMPLE IDENTIFICATION (Name, Location, Interval, etc.)	Collection Date	Collection Time	MATRIX	Group 1	Group 2	SEE ATTACHED	LABORATORY USE ONLY
1 TP7 6-8	12-17-12			X		X	B13050229-011
2 TP7 8-10	"			X		X	-012
3 TP7 10-12	"			X		X	-013
4 TP9 6-8	"				X	X	-014
5 TP9 8-10	"				X	X	-015
6 TP9 10-11	"				X	X	-016
7 TP12 0-1	1-2-13				X	X	-017
8 TP12 1-3	"				X	X	-018
9 TP12 3-7	"				X	X	-019
10 TP12 8-11	"				X	X	-020

Custody Record MUST be Signed

Relinquished by (print):	Date/Time:	Signature:	Received by (print):	Date/Time:	Signature:
Relinquished by (print):	Date/Time:	Signature:	Received by (print):	Date/Time:	Signature:
Sample Disposal: Return to Client: ____	Lab Disposal: ____		Received by Laboratory:	Date/Time: 5-2-13 9:00	Signature: Susie Sanchez

In certain circumstances, samples submitted to Energy Laboratories, Inc. may be subcontracted to other certified laboratories in order to complete the analysis requested. This serves as notice of this possibility. All sub-contract data will be clearly notated on your analytical report. Visit our web site at www.energylab.com for additional information, downloadable fee schedule, forms, and links.

Chain of Custody and Analytical Request Record

ENERGY LABORATORIES

Page ____ of ____

PLEASE PRINT- Provide as much information as possible.

Company Name: Golder Assoicates Inc.	Project Name, PWS, Permit, Etc. 123-80002A Supplemental Soils	Sample Origin State: NM	EPA/State Compliance: Yes ☐ No ☐
Report Mail Address: 5200 Pasadena NE Suite C Albuquerque, NM 87113	Contact Name: Emily Clark Phone/Fax: 505-821-3043	Email: eclark@golder.com	Sampler: (Please Print) Emily Clark
Invoice Address: Same	Invoice Contact & Phone: Toni Sanchez 505-821-3043	Purchase Order:	Quote/Bottle Order: B2958

Special Report/Formats – ELI must be notified prior to sample submittal for the following:

☐ DW ☐ GSA ☐ POTW/WWTP ☐ State: ______ ☐ Other: ______

☐ A2LA ☐ EDD/EDT(Electronic Data) Format: ______ ☐ LEVEL IV ☐ NELAC

Number of Containers / Sample Type: A W S V B O / Air Water Soils/Solids Vegetation Bioassay Other

ANALYSIS REQUESTED: Group 1, Group 2

RUSH — Contact ELI prior to RUSH sample submittal for charges and scheduling – See Instruction Page

Comments: Cooler #1 15.9, #2 14.6, #3 16.1, #4 16.8, #5 17.2

Collection Dates provided per Sample Containers gm 5-2-13

Shipped by: FedEx Grd

Cooler ID(s):

Receipt Temp: See Comments

On Ice: Yes No

Custody Seal: Y N

Intact: C Y N

Signature Match: Y N

SAMPLE IDENTIFICATION (Name, Location, Interval, etc.)	Collection Date	Collection Time	MATRIX	Group 1	Group 2	SEE ATTACHED	Normal Turnaround (TAT)	RUSH	LABORATORY USE ONLY
1 TP12 11-13	1-2-13				X	X			B13050229-021
2 TP16 0-2	12-20-12				X	X			-022
3 TP16 2-4	"				X	X			-023
4 TP16 4-7	"				X	X			-024
5 TP16 7-10	"				X	X			-025
6 TP16 10-17	"				X	X			-026
7 TP17 0-2	12-18-12			X		X			-027
8 TP17 2-4	"			X		X			-028
9 TP17 4-6	"			X		X			-029
10 TP17 6-10	"			X		X			-030

Custody Record MUST be Signed

Relinquished by (print):	Date/Time:	Signature:	Received by (print):	Date/Time:	Signature:
Michael Petersen	9:00 4/30/2013	[signature]			
Sample Disposal: Return to Client: ____		Lab Disposal: ____	Received by Laboratory:	5-2-13 9:00	[signature]

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Chain of Custody and Analytical Request Record

ENERGY LABORATORIES

Page ____ of ____

PLEASE PRINT- Provide as much information as possible.

Company Name: Golder Assoicates Inc.	Project Name, PWS, Permit, Etc. 123-80002A Supplemental Soils	Sample Origin State: NM	EPA/State Compliance: Yes ☐ No ☐
Report Mail Address: 5200 Pasadena NE Suite C Albuquerque, NM 87113	Contact Name: Emily Clark Phone/Fax: 505-821-3043	Email: eclark@golder.com	Sampler: (Please Print) Emily Clark
Invoice Address: Same	Invoice Contact & Phone: Toni Sanchez 505-821-3043	Purchase Order:	Quote/Bottle Order: B2958

Special Report/Formats – ELI must be notified prior to sample submittal for the following:

☐ DW ☐ A2LA
☐ GSA ☐ EDD/EDT(Electronic Data)
☐ POTW/WWTP Format: ________
☐ State: ________ ☐ LEVEL IV
☐ Other: ________ ☐ NELAC

Number of Containers
Sample Type: A W S V B O
Air Water Soils/Solids Vegetation Bioassay Other

ANALYSIS REQUESTED: Group 1, Group 2

SEE ATTACHED

Normal Turnaround (TAT)

RUSH — Contact ELI prior to RUSH sample submittal for charges and scheduling – See Instruction Page

Comments: Cooler #1 15.9, #2 14.6, #3 16.1, #4 16.8, #5 17.1
Collection dates provided per sample containers gm 5-2-13

Shipped by: Rlen FedEx Grd
Cooler ID(s):
Receipt Temp: See comments
On Ice: Yes (No)
Custody Seal: Y N
Intact: Y N
Signature Match: Y N

SAMPLE IDENTIFICATION (Name, Location, Interval, etc.)	Collection Date	Collection Time	MATRIX	Group 1	Group 2	SEE ATTACHED	LABORATORY USE ONLY
1 TP21 7-11	12-19-12			X		X	B13050229-031
2 TP21 11-14	"			X		X	-032
3 TP21 14-18	"			X		X	-033
4 TP24 0-3	12-18-12			X		X	-034
5 TP24 3-5	"			X		X	-035
6 TP24 5-10	"			X		X	-036
7 TP24 10-14	"			X		X	-037
8 TP24 14-16	"			X		X	-038
9 TP 25 2-5	12-13-12			X		X	-039
10 TP27 0-2	12-19-12				X	X	-040

Custody Record MUST be Signed

Relinquished by (print): Michael Petersen	Date/Time: Tu 4/30/13	Signature: [signature]	Received by (print):	Date/Time:	Signature:
Relinquished by (print):	Date/Time:	Signature:	Received by (print):	Date/Time:	Signature:
Sample Disposal: Return to Client: ____	Lab Disposal: ____		Received by Laboratory:	Date/Time: 5-2-13 9:00	Signature: Gina Gancze

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ENERGY LABORATORIES

Chain of Custody and Analytical Request Record

Page ____ of ____

PLEASE PRINT- Provide as much information as possible.

Company Name: Golder Associates Inc	Project Name, PWS, Permit, Etc. 123-80002A Supplemental Soils	Sample Origin State: NM	EPA/State Compliance: Yes ☐ No ☐
Report Mail Address: 5200 Pasadena NE Suite C Albuququerque, NM 87113	Contact Name: Emily Clark; Phone/Fax: 505-821-3043	Email: eclark@golder.com	Sampler: (Please Print) Emily Clark
Invoice Address: Same	Invoice Contact & Phone: Toni Sanchez 505-821-3043	Purchase Order:	Quote/Bottle Order: B2958

Special Report/Formats – ELI must be notified prior to sample submittal for the following:

☐ DW ☐ A2LA
☐ GSA ☐ EDD/EDT(Electronic Data)
☐ POTW/WWTP Format: ________
☐ State: ________ ☐ LEVEL IV
☐ Other: ________ ☐ NELAC

Number of Containers; Sample Type: A W S V B O; Air Water Soils/Solids Vegetation Bioassay Other

ANALYSIS REQUESTED: Group 1; Group 2

RUSH: Contact ELI prior to RUSH sample submittal for charges and scheduling – See Instruction Page

Comments: Cooler #1 15.9; #2 14.6; #3 16.1; #4 16.8; #5 17.2; Collection Dates provided per sample containers gm 5-2-13

Shipped by: Kitchen Fed Ex Ground
Cooler ID(s):
Receipt Temp: See Comments
On Ice: Yes (No)
Custody Seal (Y) N
Intact (Y) N
Signature Match (Y) N

SAMPLE IDENTIFICATION (Name, Location, Interval, etc.)	Collection Date	Collection Time	MATRIX	Group 1	Group 2	SEE ATTACHED	Normal Turnaround (TAT)	RUSH	LABORATORY USE ONLY
1 TP 27 2-3	12-19-12				X	X			B13050229-041
2 TP 27 3-7	"				X	X			-042
3 TP 27 7-13	"				X	X			-043
4 TP 27 13-14	"				X	X			-044
5 TP31 1-2	1-3-13			X		X			-045
6 TP31 2-5	"			X		X			-046
7 TP31 5-8	"			X		X			-047
8 TP31 8-16	"			X		X			-048
9						X			
10						X			

Custody Record MUST be Signed

Relinquished by (print):	Date/Time:	Signature:	Received by (print):	Date/Time:	Signature:
Michael Peterson	9:00 4/30/2013	Michael Peterson			
Sample Disposal: Return to Client: ____		Lab Disposal: ____	Received by Laboratory:	5-2-13 9:00	Dina Stanege

In certain circumstances, samples submitted to Energy Laboratories, Inc. may be subcontracted to other certified laboratories in order to complete the analysis requested. This serves as notice of this possibility. All sub-contract data will be clearly notated on your analytical report. Visit our web site at www.energylab.com for additional information, downloadable fee schedule, forms, and links.

ATTACHMENT 2
ELECTRONIC LABORATORY DATA
PROVIDED BY STETSON ENGINEERS

Attachment 2: Electronic Laboratory Data Provided by Stetson Engineers
Part 1

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Attachment 2: **Electronic Laboratory Data Provided by Stetson Engineers Part 2**

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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D – THEMAC Technical Memorandum

TECHNICAL MEMORANDUM

TO: Chris Eustice, Sr. Environmental Engineer,
New Mexico Mining and Minerals Division
FROM: New Mexico Copper Corporation
DATE: July 17, 2013
SUBJECT: Responses to Select Comments on Copper Flat Baseline Data Report

602.D.13 Baseline Data Report

Section 7- Geology 602.D.13(f)

MMD #1 / NMCC #15 comment: "After receipt of recent information from NMCC regarding the "coarsely crystalline porphyry" rock-type, it appears that NMCC's conclusion is that this is not a unique rock-type as originally hypothesized, but is instead part of the quartz monzanite [*sic*]. MMD recommends modification of Table 7.2 in the BDR to reflect this updated hypothesis as it relates to the major material types in the proposed project area."

MMD #1 / NMCC #15 response: Table 7-2 Amendment is presented below. Previous discussions on Copper Flat lithologies occurred in the Copper Flat BDR (Intera, 2012) and the April 2012 version of the Copper Flat Geochemical Characterization Report (SRK Consulting, April 2012). Both of these reports were appended to the Copper Flat Permit Application Package submitted to the New Mexico Mining and Minerals Division in July 2012. From 2009 through 2012, NMCC conducted exploration drilling and mapping projects to evolve the geologic understanding of the ore body and surrounding areas. As a result, NMCC has simplified the lithological terminology. Generally, the fundamental rock classifications reported in the BDR and April 2012 Geochemical Characterization Report are still appropriate, but the distinctions between the rock types have been simplified and the contacts found to be more gradational. Coarse crystalline porphyry (CCP) is a type of CFQM, representative of the increasing size of phenocrysts observed towards the northeast in the CFQM. Table 7-2 Amendment provides a cross reference that updates the rock lithologies from earlier interpretations to the current understanding. Additional detail about the geology at Copper Flat is presented in the *Geochemical Characterization Report for the Copper Flat Project*, prepared by SRK Consulting and submitted in June 2013.

Table 7-2 Amendment. Terminology- cross reference for Copper Flat lithologies

<table>
<tr><th>BDR Section 7 terminology[1]</th><th>SRK Geochemical Characterization Terminology[2]</th><th>Additional SRK sample terminology</th><th>Geology section in this report</th><th>Percentage of waste (from Geologic Block Model)</th><th>Percentage of ore (from Geologic Block Model)</th></tr>
<tr><td>Biotite Breccia</td><td>Biotite Breccia</td><td></td><td rowspan="3">Quartz Monzonite Breccia</td><td rowspan="3">5.7</td><td rowspan="3">22.5</td></tr>
<tr><td>Quartz Breccia</td><td>Quartz Feldspar Breccia</td><td></td></tr>
<tr><td>-</td><td>-</td><td>K-Spar breccia</td></tr>
<tr><td>Quartz Monzonite with potassic, argillic and/or meteoric alteration</td><td>-</td><td>-</td><td rowspan="3">Quartz Monzonite (CFQM)</td><td rowspan="3">93.2</td><td rowspan="3">77.5</td></tr>
<tr><td>-</td><td>Quartz Monzonite (CFQM)</td><td>-</td></tr>
<tr><td>Coarsely Crystalline Porphyry (CCP)</td><td>Coarse Crystalline Porphyry (CCP)</td><td>-</td></tr>
<tr><td>Andesite</td><td>Andesite</td><td>-</td><td>Andesite</td><td rowspan="3">1.1</td><td rowspan="3">0.0</td></tr>
<tr><td>-</td><td>Dolerite</td><td>-</td><td>Diabase</td></tr>
<tr><td>-</td><td>Latite</td><td>-</td><td>Latite</td></tr>
</table>

[1] Copper Flat BDR (Intera, 2012)
[2] Copper Flat Geochemical Characterization (SRK Consulting, April 2012)
CFQM – Copper Flat Quartz Monzonite

MMD #2 / NMCC #16 comment: "Pg. 7-10, Section 7.5.2.7 states a conceptual model will be developed to describe predicted geochemical trends of reactivity from waste management facilities, final pit walls (pit lake chemistry) and the tailing facility. In addition, this model will be used to provide quantitative numerical predictions of the potential impacts of seepage or runoff from mining facilities to regional groundwater. Because these models relate to the MMD requirement to address "probable hydrologic consequences", MMD will require submittal of this information in a revised or amended BDR/PAP prior to MMD being able to deem the PAP technically approvable."

MMD #2 / NMCC #16 response: NMCC submits reports titled *Geochemical Characterization Report for the Copper Flat Project, New Mexico*, (submitted June 2013) and *Predictive Geochemical Modeling of Pit Lake Water Quality at the Copper Flat Project, New Mexico,* (anticipated submission August/September 2013) prepared by SRK Consulting. These two reports present the predictive models for the WRDF and TSF, and the predictive model for the pit, respectively.

MMD #3 / NMCC #17 comment: "Pg. 7-11, Section 7.5.1.3 states that a single comprehensive report of the complete geochemical testing program, including both static and kinetic testing analysis, and results will be provided when completed. Because the geochemical program relates to the requirement to address "probable hydrologic consequences," MMD will require this document to be submitted in a revised BDR, or as an addendum to the BDR, prior to MMD being able to deem the BDR/PAP as technically approvable."

MMD #3 / NMCC #17 response: NMCC submits report titled *Geochemical Characterization Report for the Copper Flat Project, New Mexico*, prepared by SRK Consulting. This report presents the complete geochemical testing program.

MMD #4 / NMCC #18 comment: "Appendix 7-D, page 6 of 6, states that a geologic block model is required to determine the relative percentages of each material type and determine if the number of samples selected for each material type is adequate for the characterization program. MMD will require this evaluation to be submitted prior to MMD being able to deem the BDR/PAP as technically approvable."

MMD #4 / NMCC #18 response: NMCC submits report titled *Geochemical Characterization Report for the Copper Flat Project, New Mexico*, prepared by SRK Consulting. This report presents the relative percentages of each material type according to the geologic block model, and explains that the sample set is adequate in terms of number of samples for each material type.

MMD #5 / NMCC #19 comment: "Appendix 7-E, Section 5 states that the 1997 and 2010 geochemical databases are comparable although the 1997 data show a trend toward having a generally greater acid generating potential than the 2010 data. A possible explanation in the appendix is that there may be a bias in the 1997 sample collection toward high sulfide/highly weathered materials. Although not discussed in this appendix, the opposite is also a possible explanation; that there may be a bias in the 2010 sample collection toward materials that are low sulfide/low weathered materials. Hopefully the block model analysis will shed light on the overall adequacy of the characterization program."

MMD #5 / NMCC #19 response: NMCC submits report titled *Geochemical Characterization Report for the Copper Flat Project, New Mexico*, prepared by SRK Consulting. This report explains that the sample set is adequate and representative based on the geologic block model.

Section 9- Prior Mining Operations 602.D.13(h)

MMD # 1/ NMCC #30 comment: The last sentence of Section 9.1 "Mining History" indicates that "More detail about copper exploration can be found in Section 11.3" However, "Section 11.3 Soil Survey" neither mentions nor provides any detail about copper exploration activities. Please correct.

MMD # 1/ NMCC #30 response: The statement at the end of Section 9.1 is incorrect. However, more information about the ore body at Copper Flat can be found in Section 7.3 of the Baseline Data Report.

Section 10- Cultural Resources – Summary 602.D.13(i)

MMD #1/ NMCC #31 comment: Throughout Section 10, the authors describe the permit area as being situated within the "Las Animas Historic Mining District" that is "yet to be defined" but also seems to interchangeably define the permit area as also being situated within the "Hillsboro Mining District" and/or/also as the "Las Animas Historic District". Also, within Section 11 "Present and Historic Land Use" the area is defined as the "Hillsboro District". This is confusing and suggests that there are two separately defined Districts, and it seems as though the intent is to describe the permit area as being in the "Hillsboro Mining District" which is situated within a larger encompassing "Las Animas Historic District" that is yet to be delineated or defined. Please provide clarification.

MMD #1/ NMCC #31 response: These terms have been clarified in the final cultural resources report submitted to BLM and SHPO, which will be provided to MMD upon approval by BLM and SHPO.

MMD #2/ NMCC #32 comment: MMD previously provided comments to NMCC, upon submittal of the Sampling and Analysis Plan (SAP) suggesting that locations the four (4) referenced cultural resource surveys be depicted on Figure 10-1 of the SAP. Please provide an updated Figure 10-1 with the needed information to be inserted into the SAP.

MMD #2/ NMCC #32 response: Please see *Cultural Resource Inventory of the Copper Flat Mine Permit Area, Sierra County, New Mexico*, dated May 2012 for additional information about surveys within the permit boundary. This document is not produced for public review, but was submitted to MMD under separate cover.

MMD #3/ NMCC #33 comment: Please describe any cultural surveys that have been conducted in the areas of the water supply pipeline and associated well field and update Figure

10-1 of the SAP to include those survey locations and include with the submittal of the response to the comment above.

MMD #3/ NMCC #33 response: NMCC submits, under separate cover to MMD, *Cultural Resource Survey for Pipeline and Aquifer Testing, Copper Flat Mine, Sierra County, New Mexico*, October 2011, which details the surveys completed along the water supply pipeline as part of right of way applications with the BLM.

MMD #4/ NMCC #34 comment: Section 10.2 “Eligibility and Management Summary” indicates within the last paragraph of the Subsection that “Detailed management recommendations will be presented in a future cultural resources report” and also indicates that “avoidance will most likely not be feasible for all for all of these resources, it is recommended that they be included in a testing and data recovery plan…” This testing and data recovery plan should be provided.

MMD #4/ NMCC #34 response: The testing and data recovery plan will be developed upon approval of the final cultural resources report being reviewed by BLM and SHPO. Subsequent to approval by BLM and SHPO, a copy of this report will be provided to MMD.

Section 11 Present and Historic Land Use 602.D(13)(j)

MMD #1/ NMCC #35 comment: Section 11.3 “Soils Survey” seems out of place and makes reference within this section to a Section 6.0 “Topsoil Survey and Sampling Results” where the soils surveys are discussed in detail. Section 11.3 “Soils Survey seems irrelevant and out of place under Section 11 “Present and Historic Land Use” and perhaps this information would be better presented within Section 6 “Soils Survey.” Please provide clarification.

MMD #1/ NMCC #35 response: Observation noted. Please refer to Golder memorandum and Soils Investigation Survey submitted with this BDR Amendment and Section 6.0 of the original BDR for data about soil at Copper Flat.

MMD #2/ NMCC #36 comment: Please update this section to include a description (present and historic land use) of the water supply pipeline, associated well field, and the electrical power supply lines.

MMD #2/ NMCC #36 response: The present and historic land use of the buried water supply pipeline, associated well field, and the electrical power supply lines is discussed in *Cultural Resource Survey for Pipeline and Aquifer Testing, Copper Flat Mine, Sierra County, New Mexico*, October 2011, submitted under separate cover to MMD, and touched on in Section 11.2 of the *Baseline Data Characterization Report for Copper Flat Mine, Sierra County, New Mexico*, 2012. The present and historic land use for these areas, located east of the permit boundary, is and was largely ranching. The pipeline, well field, and electrical power supply lines were developed during exploration and construction phases in the late 1970s and early 1980s by Quintana. Water from the well field was transported via the pipeline during Quintana’s construction and operation of the Copper Flat mine, which began full production in March 1982. Use of the mine well field and associated water supply pipeline ceased by the end of 1985 when the Quintana mining operation was closed, however power lines, water wells and the buried water supply pipeline were left in place. The water wells and the majority of the buried water supply pipeline (with the exception of a mile length on New Mexico State Land) are on Bureau of Land Management (BLM) land and are considered the property of BLM. The electrical power supply lines are owned and maintained by local or regional power companies and are used for power supply to communities in the area.

MMD #3/ NMCC #37 comment: Please provide a description of land capability and productivity based up Soil Conservation Service land use capability classes or similar classification.

MMD #3/ NMCC #37 response: The land capability classification system was developed by the Soil Conservation Service (now the Natural Resource Conservation Service [NRCS]) and groups soils primarily on the basis their capability to produce common cultivated crops and pasture plants (SCS 1961). Soils are grouped according to their limitations for field crops, the risk of damage (i.e. erosion) if they are used for crops, and the way they respond to agricultural management. Land capability classification is not a substitute for soil interpretations for suitability and limitations for rangeland, woodland, or engineering purposes including reclamation.

Land capability classes for Copper Flat were acquired from the NRCS Soil Survey, Custom Soil Resource Report for Sierra County Area, New Mexico (Soil Survey Staff, 2013). All NRCS map unit components, including miscellaneous areas, are assigned a capability class (numerical) and subclass (letter). Risks of soil degradation or limitation for use become progressively greater from class 1 to 8.

The non-irrigated capability classes for the Copper Flat soils are 6e, 7s, and 7e. Soils occurring on the steeper slopes of the piedmont hills are classified as 7e or 7s. These soils are unsuited for cultivation because they are susceptible to erosion or have a limited rooting zone (depth to bedrock) and are stony. The soils of the fan piedmont in and around the tailing impoundment are classified as 6e and are also considered unsuitable for cultivation due to erosion susceptibility. The soils of the fan remnant along the eastern portion of the Permit Area are classified as class 7s because they are shallow (petrocalcic), droughty and/or stony. Class 6 and 7 soils have severe to very severe limitations for cultivation that restrict their uses to mainly rangeland, forestland, or wildlife habitat. There are no soils in the Copper Flat Permit Area or surrounding area that are considered prime farmland.

NMOSE #3/ NMCC #148 comment: "Table 7.1 and Figure 7.1 & Figure 7.2. These tables and figures reference BLM 1999 without referencing sources for the map: (Harley, 1934; Seager et. al., 1982; Hedlund, 1977; Alminas et.al., 1975, and possibly Dunn, 1982). This may be important consideration of the regional or local geology that are applied to the conceptual model and flow model. The BLM 1999 reference may remain, but it may not be as useful to reviewers as references for the original authors. Note that Section 8 figures are clearly referenced."

NMOSE #3/ NMCC #148 response: Table 7-1: Stratigraphy of the Copper Flat Area references BLM (1999, Tables 3-1 and 3-2). BLM (1999) *Table 3-1: Stratigraphic Column for the Project Area* references Harley (1934), Seager et al. (1982), Hedlund (1977), and Alminas et al. (1975). BLM (1999) *Table 3-2: Geologic History of the Copper Flats Area* references Harley (1934). These references are provided in the References Section, below.

Figure 7-1: Regional Surface Geology is referenced as from BLM (1999) and represents BLM (1999) *Figure 3-2: Generalized Regional Surface Geology*, which references Harley (1934), Seager et al. (1982), Hedlund (1977), and Alminas et al. (1975). These references are provided in the References Section, below.

Figure 7-2: Schematic Geologic Cross Section (A-A') is referenced as from BLM (1999) and represents BLM (1999) *Figure 3-3: Schematic Geologic Cross Section A-A'*, which references Harley (1934), Seager et al. (1982), Hedlund (1977), and Alminas et al. (1975). These references are provided in the References Section, below.

NMOSE #4/ NMCC #149 comment: "Figure 7.5. Add description of fault systems in legend beneath label for fault (e.g., Hunter fault system N20E, Patten Fault system N50W). Note that Section 8 figures have been labeled."

NMOSE #4/ NMCC #149 response: Figure 7-5 Amendment (attached) presents an updated Copper Flat Geologic Map with all faults labeled. Faults include Hunter fault/fault zone, Patten fault/fault zone, Aker fault, Olympia fault, Greer fault, and Lewellyn fault.

Three principal structural zones are present at Copper Flat and surrounding area, the most prominent of which is a northeast-striking fault that trends N 20°-40°E that includes the Hunter and parallel faults or the Hunter fault zone. In addition, west-northwest striking zones of structural weakness (N50°-70°W) are marked by the Patten, Aker, and Greer faults, and east-northeast striking zones are marked by the Olympia and Lewellyn faults. All faults have a near-vertical dip; the Hunter fault system dips 80°W, the Patten dips approximately 70°S-80°S, and both the Olympia and Lewellyn fault systems dip between 80°S and 90°S.

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Hedlund, D.C., 1977, Miscellaneous Field Studies Map MF-900A, Hillsboro and San Lorenzo Quadrangles, Sierra and Grant Counties, New Mexico: U.S. Geological Survey MF-900A.

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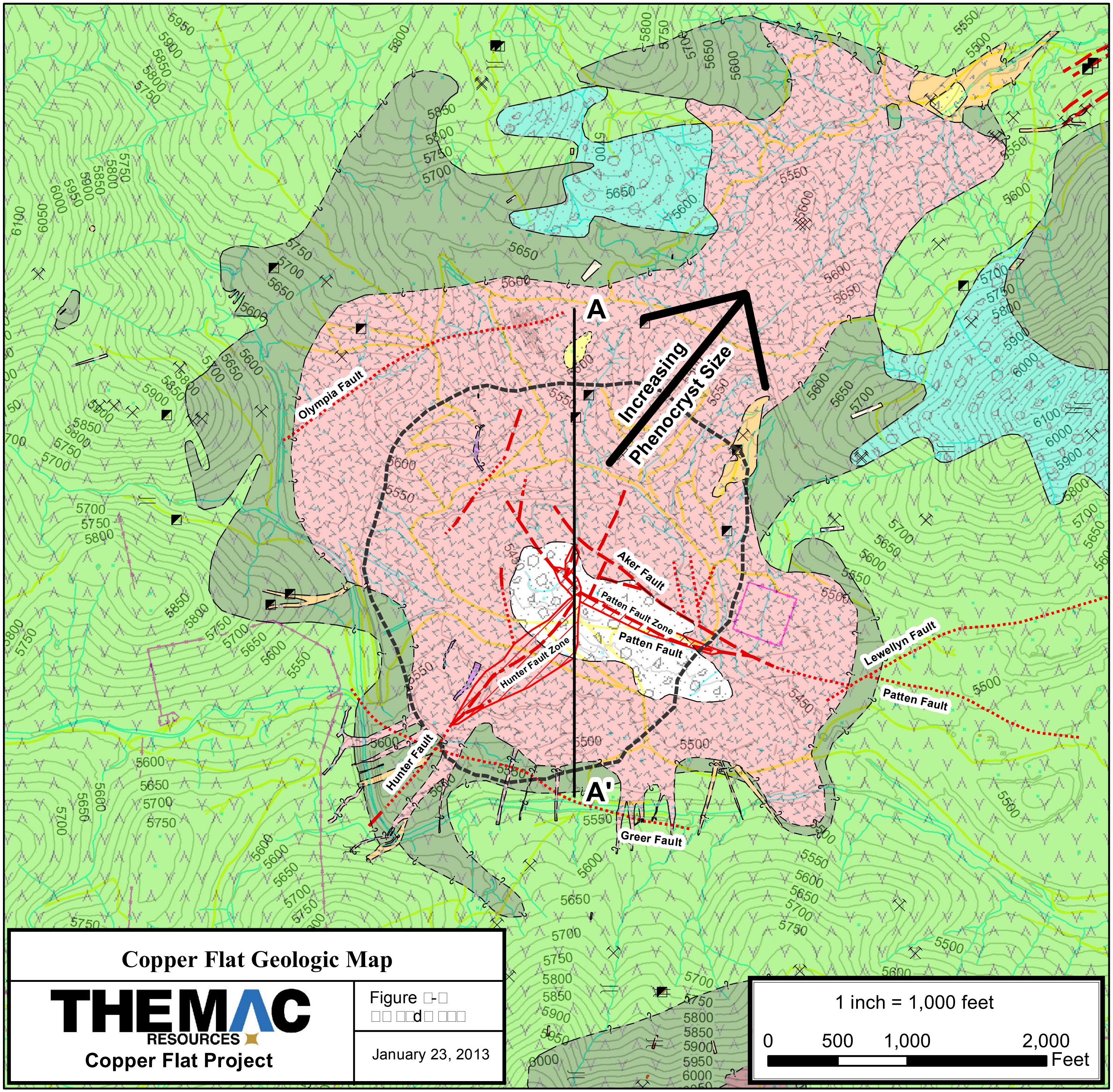
SRK Consulting, April 2012, Geochemical characterization report for the Copper Flat Project, New Mexico. Report prepared for THEMAC Resources Group, Ltd., April 2012.

SRK Consulting, May 2013, Geochemical Characterization Report for the Copper Flat Project, New Mexico. Report prepared for THEMAC Resources Group, Ltd., May 2013.

Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Web Soil Survey. Available online at http://websoilsurvey.nrcs.usda.gov/. Accessed [July/16/2013].



Copper Flat Geologic Map

THEMAC RESOURCES

Copper Flat Project

Figure

January 23, 2013

Legend

Roads

Fences

Drainages

Final Pit Outline

Structures

Approximately Located

Inferred Location

Fault Zones

Contact Type

Location Certain

Approximate Location

Contact Concealed

Contact Inferred

Lithology

Diabase

Silicified Breccia

Latite

Quartz Breccia (Breccia Pipe)

Quartz Monzonite (CFQM)

Andesite Breccia

Fine-Grained Andesite

Coarse-Grained Andesite

Workings

Adit

Prospect

Shaft

Coordinate System: NAD_1983_UTM_Zone_13N
Projection: Transverse_Mercator
False_Easting: 500000.000000
False_Northing: 0.000000
Central_Meridian: -105.000000
Scale_Factor: 0.999600
Latitude_Of_Origin: 0.000000
Linear Unit: Meter

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E – John Shomaker & Associates Technical Memorandum

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TECHNICAL MEMORANDUM

To: Katie Emmer, THEMAC Resources kemmer@themacresourcesgroup.com
New Mexico Copper Corporation

From: Steven T. Finch, Jr., Principal Hydrogeologist-Geochemist
Annie McCoy, Senior Hydrogeologist

Date: July 8, 2013

Subject: Baseline data characterization report comment resolution and amendment, Copper Flat Mine

The purpose of this technical memorandum is to address Mining and Minerals Division (MMD) and Office of the State Engineer (OSE) comments on Section 8 – Surface Water and Groundwater Information in the *Baseline Data Characterization Report for Copper Flat Mine, Sierra County, New Mexico* (BDR) prepared by INTERA in February 2012, and in so doing, serve as an amendment to the BDR. This technical memorandum is organized into sections based on the reviewing state agency (MMD or OSE), and sub-sections numbered according to numbering provided in state agency review documents and numbering provided in the spreadsheet prepared by New Mexico Copper Corporation (NMCC) to address agency comments.

MMD Comments on BDR

MMD #1 / NMCC #20 comment: "Page 8-3, Section 8.1.2.1.2 states that the NMED SWQB has collected flow data along Las Animas Creek, however there are no historical data available in published reports. Although perhaps not published, this data should be available through a request for information to NMED SWQB. Although the historical and baseline flow data (quantity data) presented appear to adequately document Las Animas flow at this time, MMD recommends incorporation of any additional quantity data from NMED SWQB related to Las Animas creek as further documentation of historic flow variability."

MMD #1 / NMCC #20 resolution: All pertinent data are useful for establishing baseline conditions and the New Mexico Environmental Department Surface Water Quality Bureau (NMED SWQB) data were requested and reviewed in June of 2011 by INTERA during data collection. INTERA decided not to include the unpublished data in the Baseline Data Report, but did cite NMED SWQB's report *Water quality survey summary for the Lower Rio Grande tributaries, 2004* (NMED, 2009). Based on MMD's recommendation, flow data and water-quality data collected by NMED SWQB for Las Animas Creek and Percha Creek are summarized in the attached table, stream thermograph, and NMED SWQB report (2009).

MMD #2 / NMCC #21 comment: "Section 8.2.4.1. The crystalline bedrock aquifer appears adequately characterized for the BDR. However, MMD recommends submittal of groundwater quality data for GWQ-5R, GWQ11-24 A&B and GWQ11-25 A&B (which were all installed after the 4th quarter monitoring for the BDR) in a revised or amended BDR as further documentation of groundwater quality within the crystalline bedrock aquifer."

MMD #2 / NMCC #21 resolution: The monitoring data for GWQ-5R, GWQ11-24 (A, B), and GWQ11-25 (A, B) are part of the NMCC Stage 1 Abatement Plan, and data will be provided to NMED and MMD.

MMD #3 / NMCC #22 comment: "Pg. 8-21, Section 8.2.4.1 states that nine wells were used for water elevations, however only 8 (or 12, depending on whether you count wells like GWQ96-22A&B as one well or two) appear to have been measured (GWQ-5R, GWQ96-22A&B, GWQ96-23A&B, GWQ11-24A&B, GWQ11-25A&B, LRG 04158, LRG 04159, Pague). Please make appropriate change to this section."

MMD #3 / NMCC #22 resolution: Water-level elevations measured in four nested piezometers (GWQ96-22(A, B), GWQ96-23(A, B), GWQ11-24(A, B), and GWQ11-25(A, B)) and four additional wells (GWQ-5R, LRG 04158, LRG 04159, and Pague) completed in crystalline bedrock are presented in the Copper Flat BDR Table 8-9 (INTERA, 2012).

MMD #4 / NMCC #23 comment: "Pg. 8-22, Section 8.2.4.1.1 refers to GWQ-5 as a crystalline bedrock aquifer well and is used to compare groundwater chemistry trends to other crystalline bedrock wells. Figure 8-20 also identifies GWQ-5 as a crystalline bedrock well. However, it seems somewhat doubtful to this reviewer that GWQ-5 is a crystalline bedrock well given the description that "GWQ-5 was a 20-ft deep rock-lined hand dug well…". It seems more likely to this reviewer that GWQ-5 was representative of the Grayback alluvial aquifer system based on the description of its completion and its location in the Grayback arroyo. Please make appropriate change to this section."

MMD #4 / NMCC #23 resolution: The Copper Flat BDR Section 8.2.4.1.1 refers to groundwater chemistry from GWQ-5 as "likely representing shallow groundwater originating from the Copper Flat area that was influenced by the oxidation of the ore body prior to open pit mining…" Well GWQ-5 was a 20.5-ft-deep well buried during the Quintana mining operations; it is no longer available for monitoring. GWQ-5 was replaced by GWQ-5R, which was completed to a total depth of 120 ft with a screen interval from 80 to 120 ft. Lithologies logged for GWQ-5R include 17.7 ft of overburden overlying 102.3 ft of andesite. BDR Figure 8-20 correctly identifies GWQ-5R as a crystalline bedrock well.

MMD #5 / NMCC #24 through #27 comment: "In reference to Section 8.2.4.3 (Quaternary Alluvium), the groundwater quality within the alluvial aquifer of Las Animas Creek appears adequately characterized in the BDR through the use of monitoring well MW-11. However, the water quality of the alluvium aquifers within Percha Creek, Grayback Arroyo, Hunkidori Gulch and Greenhorn Arroyo appear to be under-characterized for the purposes of the BDR.

a. Percha Creek alluvium: Please provide any historic or recent groundwater quality data for the alluvium within these systems.

b. Grayback alluvium: Historic water quality data for wells GWQ-1, GWQ-3 and GWQ-8 is provided in the BDR, which may represent water quality from the Grayback alluvium due to their locations in or near the Grayback arroyo. However, the BDR does not appear to contain completion/construction data for these wells/sampling locations. Please provide any historic or recent groundwater quality data for the alluvium within these systems. MMD recommends providing the completion data for these three wells/sampling locations.

c. Hunkidori Gulch alluvium and Greenhorn alluvium: Currently there do not appear to be any shallow alluvial wells located within Hunkidori Gulch or Greenhorn arroyo. MMD recommends installation of at least one shallow alluvial well downgradient of the proposed tailings dam within each of these alluvial systems to characterize the potential alluvial aquifer for the BDR, or provide any historic or recent groundwater quality data for the alluvium within these systems."

MMD #5 / NMCC #24 through #27 resolution:

a. Percha Creek alluvium: Murray (1959) and Wilson et al. (1981) provide groundwater-quality data for wells completed along Percha Creek, presented in Table 1 and locations are shown on Figure 1. Several wells are described as being completed in Quaternary-age sand (Murray, 1959), and several wells are described as being completed in the Santa Fe Group (Wilson et al., 1981). Wilson et al. (1981) do not identify any wells completed in Quaternary-age alluvium along Percha Creek. The Copper Flat BDR Section 8.2.4.3 states "Logs from wells drilled along Las Animas and Percha Creeks indicate that upper alluvial gravels extend from the surface to a depth of approximately 20 to 60 ft…," whereas the wells presented in Table 1 below are completed to depths of 154 to 265 ft. The wells identified along Percha Creek in BDR Figure 8-21 and the artesian wells identified in BDR Appendix 8-H are completed in the Santa Fe Group. BDR Figure 8-12 indicates that the alluvial aquifer along Percha Creek only extends from Caballo Reservoir to about 3 miles west of the Reservoir, and there are no known water-quality data from the Percha Creek alluvium.

b. Grayback alluvium: GWQ-1 and GWQ-8 were rehabilitated in November 2012; GWQ-1 total depth is 391 ft with perforations starting at 100 ft, and GWQ-8 total depth is 148 ft with perforations starting at 81 ft. Both wells are completed in the Santa Fe Group. GWQ-3 is completed to a total depth of 33 ft in alluvium and underlying andesite. Historical water-quality data for GWQ-3 are presented in BDR Table 8-11. GWQ11-26 is completed in Grayback Arroyo alluvium up-gradient of the exiting pit, and data will be collected as part of the Stage 1 Abatement Plan monitoring program.

c. Monitoring wells in Hunkidori Gulch downgradient of the Tailings Storage Facility are dry; therefore, no samples were collected. Dry wells in the alluvium include GWQ94-18, IW-1, and IW-3. Monitoring wells in Hunkidori Gulch alluvium include GW94-16, GWQ94-19, and IW-2. Historical data are presented in the Copper Flat BDR (INTERA, 2012), and more recent data can be referenced from the NMCC Stage 1 Abatement Plan status report (due to NMED June 30, 2013).

Table 1. Summary of water quality for wells completed along Percha Creek

well*	total depth, ft	sample date	Ca, mg/L	Mg, mg/L	Na + K, mg/L	HCO_3, mg/L	SO_4, mg/L	Cl, mg/L	F, mg/L	TDS, mg/L	specific conductance, µmhos/cm	reference
16S.5W.20.244	257	-	-	-	-	190	-	8	-	-	365	Murray (1959)
16S.5W.21.144	154 [a]	-	-	-	-	166	-	8	-	-	343	Murray (1959)
16S.5W.22.420	216 [a]	6/14/46 6/7/47	21 22	4.4 2.5	59 74	169 180	36 58	13 11	1.2 1.0	219 283	360 385	Murray (1959)
16S.5W.23.300	226	7/31/47	24	1.6	73	158	52	13	1.2	283	360	Murray (1959)
16S.5W.20.243	190 [b]	5/3/74	46	5.3	-	194	29	4.3	-	-	384	Wilson et al. (1981)
16S.5W.22.313	265 [b]	5/3/74	39	4.0	36.1	181	33	5.1	0.6	242	364	Wilson et al. (1981)
16S.5W.22.412	-	7/10/74	29	2.5	50.2	174	32	6.8	1.0	240	371	Wilson et al. (1981)

* See Figure 1 for locations
[a] completed in Quaternary-age sand
[b] completed in Santa Fe Group

TDS - total dissolved solids
mg/L - milligrams per liter
µmhos/cm - micromhos per centimeter

MMD #6 / NMCC #28 comment: “Table 8-9 identifies well "UNKNOWN" as being in the Qal aquifer system, however this well is shown in Figure 8-20 to be in the Santa Fe Group aquifer. Table 8-9 or Figure 8-20 should be corrected in a revised BDR or addendum to the BDR to correct this discrepancy. Additionally, this well appears to be identified as "15.6.31.431" in Table 8-11. The naming convention for this well should be corrected between the tables and figures if well “15.6.31.431” and well “UNKNOWN” are the same well.

MMD #6 / NMCC #28 resolution: Two wells are located in 15S.6W.31.431, GWQ-7 (also referred to as the old office well) and the Birdie Irwin Well (also referred to as Irwin Well or LRG-4652-S-7), both drilled to total depth of 500 ft in the Santa Fe Group in 1932. Davie and Spiegel (1967) identify a well “15.6.31.431,” owner “unknown.” The well identified as “15.6.31.431” in Table 8-11 and “UNKNOWN” in Figure 8-20 likely represents GWQ-7 or the Birdie Irwin Well. The well identified as “UNKNOWN” in Table 8-9 is a well near Percha Creek that is not shown in Figure 8-20.

MMD #7 / NMCC #29 comment: “MMD recognizes that the results of the aquifer pump tests and associated studies (i.e., geochemical and hydrologic models) are on-going, therefore MMD will withhold comments on these critical studies that help to define the probable hydrological consequences of the proposed operation until they are complete and integrated into the PAP.

MMD #7 / NMCC #29 resolution: NMCC submitted *Geochemical Characterization Report for the Copper Flat Project, New Mexico* in June 2013. *Predictive Geochemical Modeling of Pit Lake Water Quality at the Copper Flat Project, New Mexico*, prepared by SRK Consulting, is expected to be complete and ready for submission in August 2013 and *Model of Groundwater Flow in the Animas Uplift and Palomas Basin, Copper Flat Project, Sierra County, New Mexico*, prepared by John Shomaker & Associates, Inc. is expected to be complete in July 2013.

OSE Comments on BDR

OSE #5 /NMCC #150 comment: “Table 8-1, Spring/seep data. Reported temperature of 81.5 degrees Celsius may be incorrect due to a units or lack of conversion from Fahrenheit. Probably this is closer to 25 degrees Celsius.”

OSE #5 /NMCC #150 resolution: It appears that this temperature value was not converted from degrees Fahrenheit to Celsius, and the correct temperature is 27.5 degrees Celsius.

OSE #6 /NMCC #151 comment: “Figure 8-17, Tailing impoundment cross section. The proposed wells and a fault appear to be controlling the extension of a shallow water level near tailing impoundment. With respect to the water level depths, the cross section lacks control points to the east of well GWQ-21B.”

OSE #6 /NMCC #151 resolution: The 2011 water-level elevation labeled on the Copper Flat BDR Figure 8-17 is based on 2011 water-level data for wells in the vicinity of the existing tailings facility and for MW-4, located about 0.7 mile southeast of the existing tailings facility.

MW-4 has been reasonably projected onto the west-to-east cross-section presented in BDR Figure 8-17 as the groundwater gradient is west-to-east at the site. The approximately 65-ft drop in water level across the inferred fault between GWQ-21B and MW-4 in BDR Figure 8-17 represents an interpretation based on available hydrogeologic data.

OSE #7 /NMCC #152 comment: "Page 8-24, Section 8.2.4.1.5; Figure 8-22; Figure 8-24; and Table 8-11 [page 14 of 34]. Several atypical results occurred in lab results for well GWQ96-22A and GWQ96-23A. In particular, for the most recent samples 2010-2011, sulfate values drop unexpectedly when compared to earlier values (1996-1997) of specific conductance and total dissolved solids. Possibly this may represent lab error, typographical error or some water quality that has not stabilized from mixing with other waters. Further review of this data seems warranted because these parameters (sulfate, TDS, specific conductance) typically show a strong correlation."

OSE #7 /NMCC #152 resolution: It is unlikely that lab error or typographical error is responsible for variations in parameter concentrations in two wells in four consecutive groundwater monitoring events; however, it is possible that such an error is responsible for total dissolved solids (TDS) in GWQ96-22A in April 1997. It should be noted that for 2010-2011 lab results for TDS and sulfate, results are reported to three significant figures as opposed to two significant figures for 1996 and 1997 lab results; this may have an effect on the correlation between TDS and sulfate. The correlation between specific conductance and TDS remained relatively constant in the two wells between 1996 and 2011, with the ratio ranging from 1.2 to 1.7 in GWQ96-22A and from 1.4 to 1.6 in GWQ96-23A. The correlation between sulfate and TDS does appear to have changed between 1996-1997 and 2010-2011 for the two wells; the ratio changed from 0.2 to 0.4, to less than 0.2. TDS and sulfate concentrations appear to be on a decreasing trend in GWQ96-22A, while the trend in GWQ96-23A is more complicated. Stage 1 Abatement Plan monitoring will help define these trends. It should be noted that TDS and sulfate concentrations measured in these two wells between 1996 and 2011 have remained below NMWQCC standards.

OSE #8 / NMCC #153 comment: "Page 8-28, Section 8.2.5.2.5; and Appendix 8-G, Figures G through J. This section asserts no discernible trends in hydrographs for MW-2, MW-5, MW-6 and MW-8. Given that this is a key calibration area for the ground water model because of its proximity to the production well field, more effort would be needed to understand hydrographs in order to adequately simulate Upper Santa Fe Group. For example, MW-5 is an active stock well that shows 50 ft or more of drawdown when pumped for a short duration, followed by water levels full recovery as shown in recent transducer data (2012). Figure H (Appendix 8-G) has a mix of USGS data and other data. It may be that the 1980s data included measure immediately following or during pumping of this well. Similarly, additional effort should be undertaken to evaluate data quality of water levels, well construction details, lithology and other potential factors for the disparate responses of hydrographs, etc."

OSE #8 / NMCC #153 resolution: NMCC submits report titled *Model of Groundwater Flow in the Animas Uplift and Palomas Basin, Copper Flat Project, Sierra County, New Mexico,* prepared by John Shomaker & Associates, Inc. The water-level data have been evaluated; deeper water levels measured in MW-5 in the early 1980s were due to pumping of nearby mine production wells, and the long-term rise in MW-6 is due to well construction and upwelling of deeper groundwater along fault zone.

OSE #9 / NMCC #154 comment: "Table 8-9; Table J1 (Appendix 8-G); and Figure I (Appendix 8-G). Due to different references, there are discrepancies between the elevations and total depths cited (e.g., MW-6 TDs 1000 and 1112 feet). Table J1 (Appendix 8-G) mentions multiple data sources, but the sources for tables or figures are not clearly identified. Or possibly the bottom of screened interval has be used in place of total depth."

OSE #9 / NMCC #154 resolution: Bottom of screened interval was reported in place of total depth for GWQ96-22(A), GWQ96-23(A), GWQ11-24(A), NP-1, MW-6, and MW-8 in Table J1 (Appendix 8-G of the Copper Flat BDR). In cases where measured total depth was shallower than the reported bottom of screened interval, the measured total depth was reported.

OSE #10 / NMCC #155 comment: "Page 8-31, 8.2.4.3.5 Results; and Figure N (Appendix 8-G). In addition to the hydrograph showing responses to wetter years, the alluvial aquifer may be affected by irrigation water usage from surface water diversions from Las Animas Creek and ground water diversion from alluvial aquifer and Santa Fe Group aquifer. Also, changes in leakage or flow from artesian wells may affect alluvial aquifer."

OSE #10 / NMCC #155 resolution: Observation is noted.

OSE #11 / NMCC #156 comment: "Page 8-31, Section 8.2.4.4; Figure 8-13, Figure 8-32 and Figure 8-33. While the BDR's proposed Hydrogeologic Zones (for artesian aquifer) correctly locate reaches of hydrologic change, there may be a simpler explanation. Artesian zones may represent solely a change in sedimentary deposition within Santa Fe Group, which may follow transition from unconfined to confined aquifer with lesser importance given to geological structural influence from faulting. It's unclear what influence the Hawley and Kennedy (2004) reference has on Figures 8-13 and 8-33 given that it geologic map is located in Township 16 South with dashed lines and the area of the production well field and Las Animas Creek is located in 15 South. While his cross section shows similarities BDR cross sections, the Hawley section RA-RA' follows changes in lithology rather than create a confined area from dipping USF beds of laterally-extensive clay layers."

OSE #11 / NMCC #156 resolution: The Copper Flat BDR Appendix 8-H is a technical memorandum describing the artesian wells in Las Animas Creek valley and vicinity. The memo states "The artesian wells are constructed in the Santa Fe Group sediments, and artesian conditions occur where there is a low-permeability confining layer, such as clay, overlying a permeable layer of silt, sand, and gravel. A west-to-east cross-section down Las Animas Creek is presented as Figure 3." Cross-section RA-RA' from Hawley and Kennedy (2004) provided guidance as to depths of transition from Upper Santa Fe Group to Middle and Lower Santa Fe Group in the region, easterly dip of Santa Fe Group units in the region, and offsets in Santa Fe Group units across faults in the region. In some cases, lateral changes in lithology (clay versus sand and gravel) over short distances, based on lithologic logs for wells within close proximity, may best be explained by offsets along faults mapped by Seager et al. (1982) and USGS (2006).

OSE #12 / NMCC #157 comment: "Figure 8-32. This figure references USGS 2006 publication, yet there is no 2006 USGS reference at the end of chapter 8. For the bottom 2/3 of this figure, the faults marked appear to be the same as Seager (1982) except that Seager used more dashes and dots to show uncertainty in the locations when compared to Figure 8-32's use of solid lines. Similarly Figure 8-33, extends fault into Las Animas Creek between LA-96 and L-115, and this does fault is not appear in plan view on Figure 8-32. Both Seager (1982) and Figure 8-32 has several disconnected segments of normal faults. Since the BDR conveys a greater confidence in the fault locations, NMCC should provide more supporting evidence (e.g. field observations, drilling logs, deeper wells that would provide control points) that would help justify the changes to the earlier geologic map. Text and figures should indicate modifications in greater detail."

OSE #12 / NMCC #157 resolution: USGS (2006) reference is included in the References section below. This reference includes a geospatial database with New Mexico faults. The faults are plotted in the Copper Flat BDR Figure 8-32 as they appear in the USGS (2006) shapefile NMfaults_lcc.shp. In BDR Figure 8-33, the fault plotted as a dashed line with question marks represents the potential extension of a fault mapped within 0.25 mile of Las Animas Creek in Figure 8-32. Using Hawley and Kennedy (2004; cross-section RA-RA') for guidance as to depths of transitions between Santa Fe Group units, and offsets in Santa Fe Group units across faults in the region, it is reasonable to consider this fault as forming a graben in which the transition from Upper Santa Fe Group to Middle and Lower Santa Fe Group is deeper and characterized by a clay layer logged at the bottom of PW boreholes.

OSE #13 / NMCC #158 comment: "Page 8-33, Section 8.2.5.1 Pit Lake. Note that pit lake water levels increased from 1997 to 2011 (5436.5 to 5442 feet), and likely so did nearby ground water levels. GWQ96-22 and GWQ96-23 wells were drilled in 1990s, yet earlier water level data was not included in BDR. Historical trend of nearby ground water levels and pit lake level may worth considering rather than only reviewing 2011 measurements."

OSE #13 / NMCC #158 resolution: Water-level data for GWQ96-22 and GWQ96-23 collected in the 1990s were reported in BLM (1999; table A2-1). Water-level data for these wells collected in 2010 and 2011 are presented in the Copper Flat BDR Table 8-9. Table 2, below, shows available water-level data from the 1990s and data collected in 2010 and 2011. Water levels were generally shallower in these wells in 1997 and 1998 compared to 2010 and 2011.

NMCC submits report titled *Model of Groundwater Flow in the Animas Uplift and Palomas Basin, Copper Flat Project, Sierra County, New Mexico,* prepared by John Shomaker & Associates, Inc. This report documents the historical transient calibration of the groundwater flow model, which considers historical water-level data and pit levels.

Table 2. Summary of pit area water-level data

well	measurement date	depth to water, ft	reference
GWQ96-22A	2/5/1997	44.93	BLM (1999)
	1/24/1998	45.92	BLM (1999)
	2/1/1998	46.09	BLM (1999)
	3/1/1998	46.74	BLM (1999)
	4/14/1998	47.27	BLM (1999)
	5/1/1998	47.89	BLM (1999)
	6/1/1998	48.24	BLM (1999)
	7/21/1998	46.00	BLM (1999)
	8/1/1998	45.10	BLM (1999)
	9/1/1998	46.50	BLM (1999)
	1/28/2010	53.69	BDR (INTERA, 2012)
	6/24/2010	48.52	BDR (INTERA, 2012)
	9/27/2010	48.59	BDR (INTERA, 2012)
	6/30/2011	53.62	BDR (INTERA, 2012)
	8/28/2011	54.63	BDR (INTERA, 2012)
	9/8/2011	54.90	BDR (INTERA, 2012)
GWQ96-22B	2/5/1997	45.22	BLM (1999)
	10/7/2010	48.30	BDR (INTERA, 2012)
	6/30/2011	52.95	BDR (INTERA, 2012)
	8/28/2011	54.59	BDR (INTERA, 2012)
	9/8/2011	54.76	BDR (INTERA, 2012)
GWQ96-23A	2/5/1997	35.18	BLM (1999)
	1/24/1998	35.89	BLM (1999)
	2/1/1998	35.82	BLM (1999)
	3/1/1998	35.60	BLM (1999)
	4/14/1998	35.71	BLM (1999)
	5/1/1998	35.91	BLM (1999)
	6/1/1998	35.97	BLM (1999)
	7/21/1998	36.68	BLM (1999)
	8/1/1998	36.32	BLM (1999)
	9/1/1998	36.35	BLM (1999)
	1/28/2010	42.15	BDR (INTERA, 2012)
	6/24/2010	41.97	BDR (INTERA, 2012)
	9/27/2010	41.80	BDR (INTERA, 2012)
	10/6/2010	41.80	BDR (INTERA, 2012)
	5/4/2011	42.02	BDR (INTERA, 2012)
	6/30/2011	40.32	BDR (INTERA, 2012)
	8/28/2011	40.71	BDR (INTERA, 2012)
	9/8/2011	40.74	BDR (INTERA, 2012)
GWQ96-23B	2/5/1997	36.75	BLM (1999)
	10/6/2010	41.72	BDR (INTERA, 2012)
	5/4/2011	41.99	BDR (INTERA, 2012)
	6/30/2011	40.37	BDR (INTERA, 2012)
	8/28/2011	40.87	BDR (INTERA, 2012)
	9/8/2011	41.06	BDR (INTERA, 2012)

OSE #14 / NMCC #159 comment: "Page 8-34, Section 8.2.5.4 Summary of Impacts. Given the local gradients and geology, "stationary" ground water may not adequately describe vertical and horizontal flow."

OSE #14 / NMCC #159 resolution: The Copper Flat BDR Section 8.2.5.4 states "The tailing impoundment sulfate plume appears to be stationary, and monitoring has not indicated significant migration. Evaluating the extent of potential impacts along Grayback Arroyo and directly downgradient of the tailing impoundment sulfate plume is proposed for the NMCC Stage 1 Abatement Plan." These statements were based on available hydrogeologic data, and the word "stationary" was used to describe the sulfate plume, as opposed to groundwater flow.

OSE #15 / NMCC #160 comment: "Page 8-35, Section 8.2.6 Potential Hydrologic Consequences; and Figure 8-39. In the subsequent development and refinement of a ground water model documentation report, modeling objectives should be stated. Are the model grid and dimensions of regional model based on the modeling objectives? Will the proposed regional model adequately evaluate local impacts of the pumping at the production well field and open pit?"

OSE #15 / NMCC #160 resolution: NMCC submits report titled *Model of Groundwater Flow in the Animas Uplift and Palomas Basin, Copper Flat Project, Sierra County, New Mexico*, prepared by John Shomaker & Associates, Inc.

OSE #16 / NMCC #161 comment: "Figure 8-33 and Fig 3(Appendix 8-H). Clarify for these figures. Indicate if the clay-rich layers in Las Animas Creek wells are correlated based on depths indicated from well drilling records or whether dipping clay beds are more conceptual than from specific depths."

OSE #16 / NMCC #161 resolution: Depth intervals of clay-rich layers are based on lithologic logs for individual wells. In some cases, clay layers could be correlated for wells within close proximity, and in some cases relatively thick clay layers could be correlated. The dipping clay beds are generally conceptual and based on the easterly dip of Santa Fe Group units in the region (e.g., Hawley and Kennedy (2004)).

OSE #17 / NMCC #162 comment: "Table 2 (Appendix 8-H), and Pages 8-33 to 8-34, Section 8.2.4.4.2 Data Gaps Addressed – Artesian Well Inventory. Artesian flow rates show a decline at several wells (limited by access issues). Clarify the basis for the conclusion that dewatering by artesian well upward leakage and open flow appears to be mainly responsible for the long-term decline of artesian flow rates (Appendix 8-H). In particular, what does Table 2's total artesian flow rate represent in support, if any, to the conclusion about upward leakage and open flow? If wells are poorly constructed or well seal deteriorates with time, the leakage may partially occur in subsurface, which would appear as decreased flow at surface. Would a better approach for assessing changes at artesian wells include monitoring shut-in pressure of a properly-sealed artesian well?"

OSE #17 / NMCC #162 resolution: The Copper Flat BDR Appendix 8-H states "…it appears a number of artesian wells were drilled without proper annular seals to prevent flow of water from the artesian zone into the overlying alluvium and stream channels. Furthermore, many of the artesian wells were never valved and therefore left open to flow continuously to the land surface." BDR Appendix 8-H concludes "Dewatering by the artesian well upward leakage and open flow, however, appear to be mainly responsible for the long-term decline in artesian flow rates." "Upward leakage," as identified in the BDR as a factor in long-term decline in artesian flow rates, refers to leakage that may occur in the subsurface into the overlying alluvium. Figure 5 in BDR Appendix 8-H shows varying trends for declining artesian flow in Percha and Las Animas Creek valleys over time. This variation is likely due to factors such as upward leakage and open flow affecting wells to varying degrees depending on original well construction, condition of casing, and spatial distribution of wells with open flow.

NMCC installed well GWQ11-27, a properly constructed artesian well in the artesian zone along Las Animas Creek and began monitoring shut-in pressure in the well in July 2012 (JSAI, 2012). These data on pressure changes in the artesian zone as monitored at GWQ11-27 have been incorporated into the groundwater flow model calibration, as documented in the report titled *Model of Groundwater Flow in the Animas Uplift and Palomas Basin, Copper Flat Project, Sierra County, New Mexico*, prepared by John Shomaker & Associates, Inc.

OSE #18 / NMCC #163 comment: Figure 8-36. Figure 8-36 shows FW-3 with an initial flow rate of 125 gpm, however the declaration indicate initial artesian flow at 80 gpm. Murray (1959) indicates the 125 gpm was pressure pumped for 4 hrs to induce 115 feet of drawdown. So, this FW-3 artesian flow rate should be 80 gpm."

OSE #18 / NMCC #163 resolution: Note that Murray (1959) table 1 indicates that Well 65 (*FW-2*) was pumped at 850 gpm for 4 hours to induce 115 ft of drawdown, but the well flows at 125 gpm. This is confirmed on page 12 of Murray (1959), which states "Well 65 (16.5.23.300), which has recently been completed, flows about 125 gallons a minute and is equipped with a turbine pump. The pump is reported to yield approximately 850 gallons a minute, and after 4 hours of pumping, the water level lowers to about 115 feet below the surface."

Note that Davie and Spiegel (1967) indicate a reported flow rate of 200 gpm for well 15.5.28.432 (*FW-3*) on January 22, 1966.

STF:am

Enc: References
Figure 1
Graph showing NMED SWQB stream temperature data
Table showing NMED SWQB stream water-quality data
NMED SWQB 2009 report

References

[BLM] Bureau of Land Management, 1999, Preliminary final environmental impact statement: Copper Flat project: Las Cruces, New Mexico, U.S. Department of the Interior, 491 p.

Davie, W., Jr., and Spiegel, Z., 1967, Las Animas Creek hydrographic survey report, Geology and water resources of Las Animas Creek and vicinity, Sierra County, New Mexico: New Mexico Office of the State Engineer, 34 p. plus tables and figures.

Hawley, J.W., and Kennedy, J.F., 2004, Creation of a digital hydrogeological framework model of the Mesilla Basin and southern Jornada del Muerto Basin: New Mexico Water Resources Research Institute, New Mexico State University, Technical Completion Report 332 prepared for Lower Rio Grande Water Users Organization, 105 p. plus CD-ROM including 2005 Addendum extending model into Rincon Valley and adjacent areas.

INTERA, 2012, Baseline data characterization report for Copper Flat Mine, Sierra County, New Mexico: consultant’s report prepared by INTERA for New Mexico Copper Corporation, June 2012.

[JSAI] John Shomaker & Associates, Inc., 2012, Hydrogeologic analysis of proposed pumping test for New Mexico Copper Corporation supply wells (LRG-4652, LRG-4652-S, LRG-4652-S-2, and LRG-4652-S-3): consultant’s report prepared by John Shomaker & Associates, Inc. for New Mexico Copper Corporation, 16 p. plus figures and attachment.

Murray, C.R., 1959, Ground-water conditions in the nonthermal artesian-water basin south of Hot Springs, Sierra County, New Mexico: New Mexico Office of the State Engineer Technical Report No. 10, 33 p.

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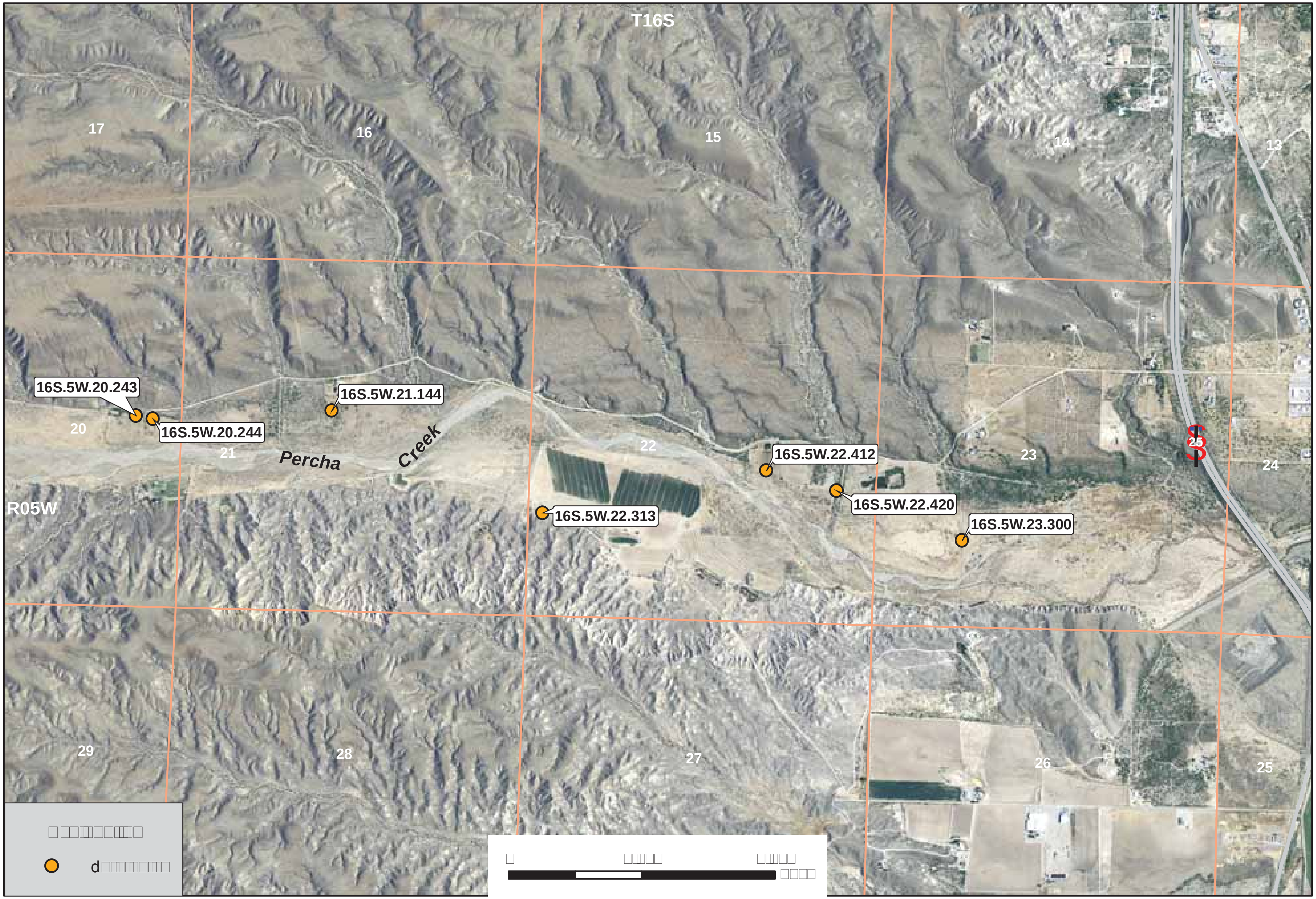
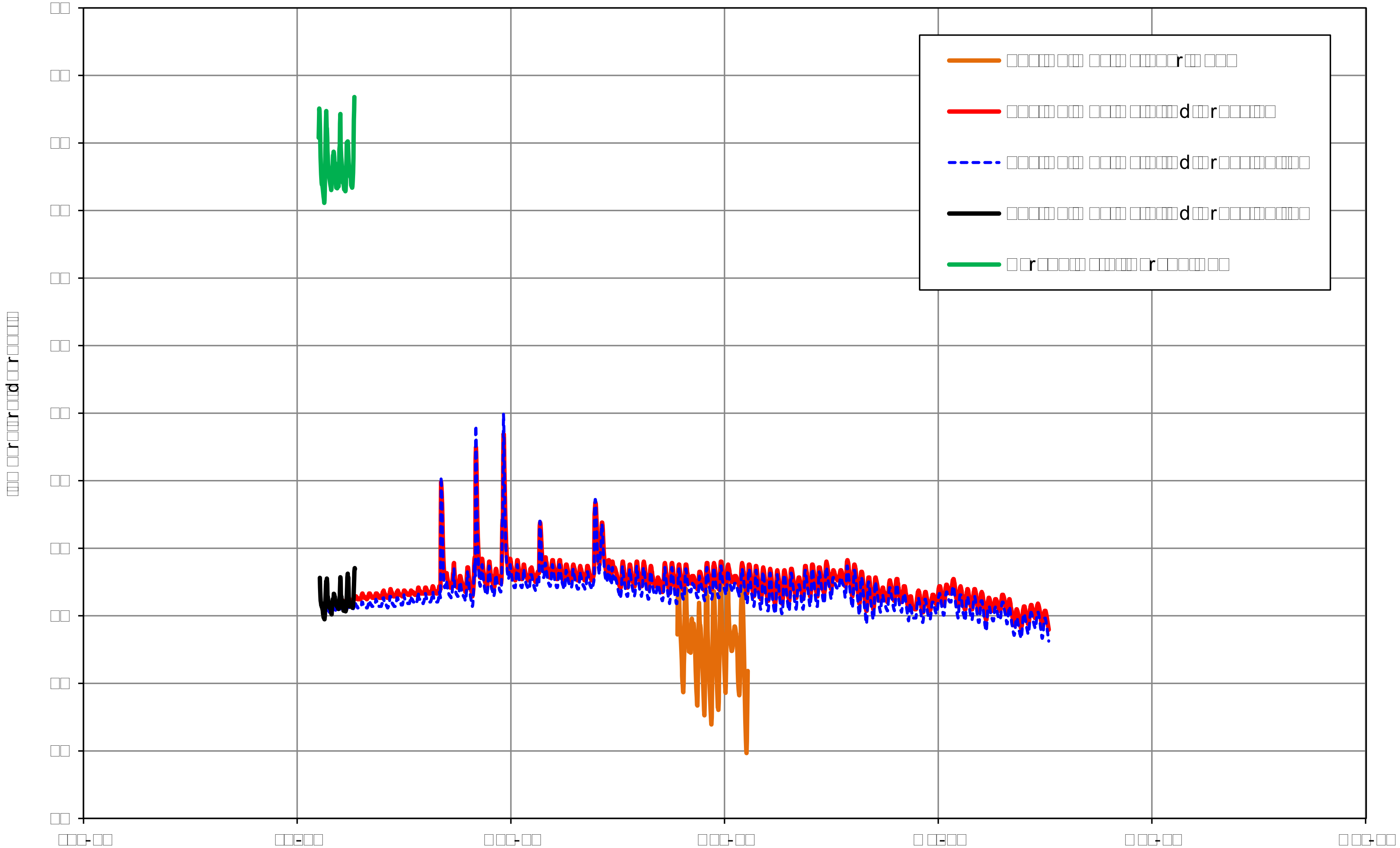


Figure 1. Aerial photograph showing the approximate locations of historical groundwater quality data points along Percha Creek, Sierra County, New Mexico.



Graph showing stream temperature data in Las Animas Creek and Percha Creek collected by New Mexico Environment Department, Surface Water Quality Bureau.

JOHN SHOMAKER & ASSOCIATES, INC.

Table showing NMED SWQB stream water-quality data

location	ID	Latitude	Longitude	Date	No. of data points	Average temperature	Maximum temperature	Average specific conductance	Flow	Alkalinity	Aluminum, dissolved	Aluminum, total	Ammonia	Antimony, dissolved	Antimony, total	Arsenic, dissolved	Arsenic, total	Barium, dissolved	Barium, total
						deg F	deg F	mS/cm	cfs	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
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Table showing NMED SWQB stream water-quality data

location	ID	Latitude	Longitude	Date	Beryllium, dissolved	Beryllium, total	Bicarbonate	Boron, dissolved	Boron, total	Cadmium, dissolved	Cadmium, total	Calcium	Calcium, dissolved	Carbonate	Chloride	Chromium, dissolved	Chromium, total	Cobalt, dissolved	Cobalt, total
					mg/L	mg/L	mg/L	mg/L	mg/L	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
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Table showing NMED SWQB stream water-quality data

location	ID	Latitude	Longitude	Date	Copper, dissolved	Copper, total	Fluoride	Hardness, as CaCO3	Iron, dissolved	Iron, total	Lead, dissolved	Lead, total	Magnesium	Magnesium, dissolved	Manganese, dissolved	Manganese, total	Mercury	Molybdenum, dissolved	Molybdenum, total
					mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
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Table showing NMED SWQB stream water-quality data

location	ID	Latitude	Longitude	Date	Nickel, dissolved	Nickel, total	Nitrate + Nitrite (N)	Phosphorus, Total	Potassium	Selenium	Selenium, dissolved	Silicon, dissolved	Silicon, total	Silver, dissolved	Silver, total	Sodium	Strontium, dissolved	Strontium, total	Sulfate
					mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
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Table showing NMED SWQB stream water-quality data

location	ID	Latitude	Longitude	Date	Thallium, dissolved	Thallium, total	Tin, dissolved	Tin, total	Total Dissolved Solids	Total Kjehldal Nitrogen	Total Suspended Solids	Uranium-234/235/238, dissolved	Uranium-234/235/238, total	Vanadium, dissolved	Vanadium, total	Zinc, dissolved	Zinc, total
					mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
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WATER QUALITY SURVEY SUMMARY
FOR THE
LOWER RIO GRANDE TRIBUTARIES
2004

Prepared by
New Mexico Environment Department
Surface Water Quality Bureau
November 2009

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ACRONYMS

ADB	Assessment Database
ºC	Degrees Celsius
CWA	Clean Water Act
DO	Dissolved Oxygen
EMAP	Environmental Monitoring and Assessment Program
ºF	Degrees Fahrenheit
GIS	Geographic Information Systems
MCWAL	Marginal Coldwater Aquatic Life
mi^2	square miles
NMAC	New Mexico Administrative Code
NMED	New Mexico Environment Department
QAPP	Quality Assurance Project Plan
STORET	Storage and Retrieval System
SWQB	Surface Water Quality Bureau
EPA	United States Environmental Protection Agency

1.0 EXECUTIVE SUMMARY

During 2004, the Monitoring and Assessment Section of the Surface Water Quality Bureau (SWQB) conducted water quality and biological assessment surveys of the Lower Rio Grande and its perennial tributaries from the international boundary with Mexico to Elephant Butte Reservoir. Tributaries of the Lower Rio Grande sampled during the survey included Alamosa Creek, Las Animas Creek, Palomas Creek, and Percha Creek. Sampling at the tributary stream stations was conducted on a monthly basis from June through October when water was present at the stations. Information on the water quality of the main-stem sites can be found in the *Water Quality Survey Summary for the Lower Rio Grande 2004* (NMED/SWQB 2006a).

The primary purpose of this survey was to collect chemical, physical, and biological data to identify water quality impairments within the watershed. The results of this study are summarized in the Integrated List portion of the biennial *State of New Mexico Integrated Clean Water Act §303(d)/305(b) Report.* Any assessment conclusions presented in this report are based on water quality standards and assessment protocols that existed at the time the survey was conducted. It is important to note that both the assessment protocols and water quality standards are revised periodically to incorporate new information and refinements. The U.S. Environmental Protection Agency (USEPA) uses the most recent state-developed assessment protocols and the most recent USEPA-approved water quality standards when deciding whether or not to approve impairment determinations on the biennial *New Mexico Integrated List of Assessed Surface Waters*. Therefore, the impairment conclusions in the most recent Integrated List supersede assessment conclusions in this survey report if they should differ.

Water quality monitoring at survey stations included total nutrients, total and dissolved metals, major anions and cations, and microbiological collections as determined by proximity to potential sources and/or previous survey findings. Data loggers were deployed at select stations to collect temperature, pH, dissolved oxygen (DO), conductivity, and turbidity data for an extended period of time to monitor diurnal fluctuations. Biological surveys, which included the monitoring of fecal coliform and *E. coli* as well as the collection of macroinvertebrates and physical habitat characteristics, were conducted at select stations.

Water quality in the Lower Rio Grande tributaries was found to be good. Water quality sampling at tributary stream stations found no exceedences of water quality criteria for total nutrients, total and dissolved metals, major anions and cations, bacteria, and field parameters such as dissolved oxygen, pH, and temperature. However, Percha Creek and Alamosa Creek were listed as Partially Supporting on the 1998 §303(d) list with stream bottom deposits as the cause. Additional data were collected in 2007 to confirm the historic sedimentation/siltation listings. These data were assessed according to SWQB's *Appendix D: Sedimentation/Siltation Assessment Protocol for Wadeable, Perennial Streams* (NMED/SWQB 2009). Based on the assessment, it was determined that Alamosa and Percha Creeks were fully supporting their aquatic life uses with respect to sedimentation/siltation. Consequently, NMED/SWQB intends to remove the sedimentation/siltation impairment listings for Alamosa and Percha Creeks in the 2010-2012 State of New Mexico CWA §303(d)/§305(b) Integrated Report.

2.0 INTRODUCTION

The Rio Grande originates in the San Juan Mountains of southern Colorado and follows a 1,885-mile course before flowing into the Gulf of Mexico. Along the way, the river and its tributaries drain 182,200 square miles of land. This drainage encompasses a widely varied landscape in the United States and Mexico, including mountains, forests, and deserts. The basin is home to diverse native plants and wildlife as well as some 10 million people. For approximately two-thirds of its course, the river also serves as the boundary between the United States and Mexico.

The Lower Rio Grande offers a 247-day growing season where temperatures can soar to 111 degrees Fahrenheit (°F) and plummet to –16 °F. Two-thirds of the annual precipitation (7.8 inches) is packed into the late summer and early fall (La Mar 1984). Historic and current land uses in the watershed include agriculture, recreation, and municipal related activities of Las Cruces and El Paso. At present, ranching and irrigated agriculture are major components of the economy in the basin.

Much of the land ownership adjacent to the river is private with the exception of state parks near Elephant Butte Reservoir, Caballo Reservoir, Percha Dam, and Leasburg Dam. The Bureau of Land Management and the State of New Mexico also own and manage sizable tracts of public lands in the upland portions of the watershed. The various state parks and reservoirs located along the river support activities such as hiking, mountain biking, camping, and fishing as well as water skiing and other recreational sports.

The surrounding geology was shaped by the Rio Grande Rift system. The Rio Grande Rift system is a series of grabens (fault-bounded basins) that extend from central Colorado southward through New Mexico and into western Texas and Mexico. Continental rifting was associated with crustal stretching and uplift of the southwestern United States. Grabens dropped down thousands of meters relative to adjacent uplifts, and alluvial sediment accumulated to great thickness in the basins. Intrusions and volcanic eruptions also took place within the rift valleys and throughout the surrounding region.

The Monitoring and Assessment Section (MAS) of the SWQB conducted a water quality survey of the Lower Rio Grande tributaries between June 2004 and October 2004 with additional data collections in 2007. Surface water quality monitoring stations were selected to characterize water quality of the stream reaches and determine impairment. The water quality survey for the Lower Rio Grande and its tributaries included 22 sampling sites encompassing the geographic area from Elephant Butte Reservoir to the International Boundary with Mexico (**Figure 1 and Table 1**). Monitoring these sites enabled an assessment of the cumulative influence of the physical habitat, water sources, and land management activities upstream from the sites. **Table 1** lists the location of sampling stations in each assessment unit (AU) of the Lower Rio Grande tributaries along with the station numbers, STORET identification codes, the current listings on the Integrated Clean Water Act (CWA) §303(d)/§305(b) Report, and the associated water quality segment number. Information on the water quality of the main-stem sites can be found in the *Water Quality Survey Summary for the Lower Rio Grande 2004* (NMED/SWQB 2006a).

Figure 1. Lower Rio Grande Survey Area and 2004 Sampling Stations

Table 1. Lower Rio Grande Tributaries and Associated Sampling Stations

Assessment Unit	Station No.	STORET Code	Sampling Station	Historic Impairment Listing(s)	WQS (August 2007) reference
Percha Creek (Perennial reaches Caballo Res. to M Fork)	16	41Percha025.3	Percha Creek at Percha Box	Sedimentation/ Siltation	20.6.4.103
Las Animas Creek (perennial portion R Grande to headwaters)	17	41LAnima018.6	Las Animas Creek at Rd Crossing	---	20.6.4.103
	18	41LAnima029.3	Las Animas Creek above box		
	19	41LAnima038.3	Las Animas Creek near Dunn		
Palomas Creek (perennial portion R Grande to headwaters)	20	41SPalom019.1	South Fork Palomas Creek near Hermosa	---	20.6.4.103
	21	41Paloma036.7	South Fork Palomas Creek above North Fork		
Alamosa Creek (Perennial reaches abv Monticello diversion)	22	40Alamos058.5	Alamosa Creek below USGS Gage 8360000	Sedimentation/ Siltation	20.6.4.103

3.0 NM WATER QUALITY STANDARDS

United States Environmental Protection Agency (EPA) approved water quality standards were used to determine if waterbodies throughout the watershed are supporting their designated uses. The *State of New Mexico Standards for Interstate and Intrastate Surface Waters*, which include fishable and swimmable goals set forth in the Clean Water Act §102(a), were consulted for this determination. General standards and standards applicable to attainable or designated uses for portions of the Lower Rio Grande tributaries that were surveyed in this study are set forth in sections 20.6.4.13, 20.6.4.97, 20.6.4.98, 20.6.4.99, and 20.6.4.900 of the *State of New Mexico Standards for Interstate and Intrastate Surface Waters* (NMAC 2007). Segment specific standards for the Lower Rio Grande tributaries are set forth in section 20.6.4.103, which reads as follows:

20.6.4.103 RIO GRANDE BASIN - The main stem of the Rio Grande from the headwaters of Caballo reservoir upstream to Elephant Butte dam and perennial reaches of tributaries to the Rio Grande in Sierra and Socorro counties.

A. Designated Uses: fish culture, irrigation, livestock watering, wildlife habitat, marginal coldwater aquatic life, secondary contact and warmwater aquatic life.

B. Criteria:

(1) In any single sample: pH within the range of 6.6 to 9.0 and temperature 25°C (77°F) or less. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 548 cfu/100 mL or less, single sample 2507 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).

C. Remarks: Flow in this reach of the Rio Grande main stem is dependent upon release from Elephant Butte dam. [20.6.4.103 NMAC - Rp 20 NMAC 6.1.2103, 10-12-00; A, 05-23-05]

4.0 METHODS

Water quality sampling methods were in accordance with the approved *Quality Assurance Project Plan (QAPP) for Water Pollution Control Programs* (NMED/SWQB 2004) and the *SWQB Standard Operating Procedures for Data Collection*. These data were assessed in accordance with protocols established in the *Procedures for Assessing Water Quality Standards Attainment for the State of New Mexico CWA §303(d)/§305(b) Integrated Report: Assessment Protocol* (NMED/SWQB 2006b).

5.0 SAMPLING SUMMARY

A map of the study area is provided in **Figure 1**. The station numbers, STORET identification codes, and location descriptions of sampling stations selected for this survey are provided in **Table 1**. The rational for selecting each tributary station is as follows:

Percha Creek at Percha Box was selected because it is a perennial reach of a Rio Grande tributary.
Las Animas Creek at Rd Crossing was selected because it is a perennial reach of a Rio Grande tributary.
Las Animas Creek above box was selected because it is minimally impacted site above ranch headquarters and associated activities and is considered an ecoregional reference site.
Las Animas Creek near Dunn was selected at the request of the US Forest Service because it is located near the USFS boundary.
Alamosa Creek below USGS Gage 8360000 was selected because it is a perennial reach of a Rio Grande tributary and is a possible ecoregional reference station.
South Fork Palomas Creek near Hermosa was selected at the request of the US Forest Service because it is located near the USFS boundary.
South Fork Palomas Creek above North Fork was selected because it is a perennial reach of a Rio Grande tributary and is a possible ecoregional reference station.

Water samples were analyzed for plant nutrients, ions, total and dissolved metals, fecal coliform bacteria, radionuclides, and anthropogenic organic compounds. Variables such as dissolved oxygen (DO), pH, turbidity, and specific conductance were measured in the field. Physical habitat and benthic macroinvertebrate communities were surveyed to determine the impacts of excessive nutrients and settled sediment on aquatic life within a stream. The type of monitoring done at each site is summarized in **Table 2**. The number of times each parameter (or suite of parameters) was sampled for is indicated.

Table 2. SWQB Sampling Summary

Assessment Unit / Stations	**Field Data**[+]	**Ions (full suite)**	**Total Nutrients**	**Total Metals**	**Dissolved Metals**	**Fecal Coliform**	**E. Coli**	**Sonde Deployment**	**Thermograph Deployment**
Percha Creek (Perennial reaches Caballo R to M Fork)									
Percha Creek at Percha Box	5	3	5	5	5	1	1	Yes	**
Las Animas Creek (perennial portion R Grande to headwaters)									
Las Animas Creek at Rd Crossing	5	3	3	3	3	1	1	Yes	Yes
Las Animas Creek above box	5	2	4	2	2	-	-	Yes	-
Las Animas Creek near Dunn	1	-	1	-	-	-	-	Yes	-
Alamosa Creek (Perennial reaches abv Monticello diversion)									
Alamosa Creek below USGS Gage 8360000	6	6	6	5	5	4	4	Yes	**
Palomas Creek (perennial portion R Grande to headwaters)									
South Fork Palomas Creek near Hermosa	3	-	1	1	1	-	-	-	-
South Fork Palomas Creek above North Fork	1	3	3	3	3	1	1	Yes	**

[+] *Field data include dissolved oxygen (DO), pH, temperature, turbidity, specific conductance, and salinity.*
*** Thermographs were deployed but lost due to flood events.*

For many water quality analytes, the State of New Mexico maintains numeric water quality standards, whereas standards for other parameters such as plant nutrients and bottom deposits are narrative. Data are assessed for designated use attainment status for both numeric and narrative water quality standards by application of the *Assessment Protocol* (NMED/SWQB 2009). A complete dataset can be obtained by contacting the SWQB.

6.0 WATER QUALITY CRITERIA EXCEEDENCES

The following discussion includes information pertaining to exceedences of water quality standards found during the SWQB watershed survey. The purpose of this section of the report is to provide the reader with information on where current water quality standards are being exceeded within the watershed. These exceedences are used to determine designated use impairment status. Final assessment determinations as to whether or not a stream reach is considered to be meeting its designated uses depend on the overall amount and type of data available during the assessment process (Refer to SWQB's *Assessment Protocol* for additional information on the assessment process, NMED/SWQB 2009). When available, outside sources of data that meet quality assurance requirements are combined with data collected by SWQB during the watershed survey to determine final impairment status. Final designated use impairment status is housed in the Assessment Database (ADB) and is reported in the biennial *State of New Mexico CWA §303(d)/§305(b) Integrated Report* (NMED/SWQB 2008).

6.1 Water Quality Exceedences For Numeric Criteria

6.1.1 Physicochemical Data

Physicochemical water quality samples and sampling frequencies are provided in **Table 2**. It should be noted that an exceedence of a given criterion may not generate a violation of standards, triggering a listing on the 303(d) list. Details of assessment and listing procedures are available in the *Assessment Protocol* (NMED/SWQB 2006b).

Sampling for major ions, nutrients, total and dissolved metals, bacteria, and field parameters found no exceedences of water quality criteria.

6.1.2 Data from Continuous Monitoring Devices

Temperature data loggers (thermographs) were deployed at selected stations within the study area. **Table 3** summarizes temperature data from thermographs in degrees Celsius (°C). YSI multi-parameter sondes were also deployed at selected stations to examine pH and dissolved oxygen (DO). **Tables 4a and 4b** summarize sonde data collected from the Lower Rio Grande tributaries. The thermographs and sondes were programmed to record temperature, DO, and/or pH once per hour over their respective collection intervals.

Large datasets generated from data loggers (e.g., sondes and thermographs) are assessed according to protocols developed specifically for such datasets (with few exceptions). This is because, unlike grab sample data, it is not reasonable to list as not supporting on the basis of one or a few exceedences out of several hundred or thousand data points.

Temperature (given in °C) and pH assessment criteria are tied to the criteria in the *State of New Mexico Standards for Interstate and Intrastate Surface Waters* (NMAC 2007). Dissolved oxygen assessment criteria are linked to the presence of sensitive, *i.e.* early life stages, aquatic organisms and designated use, *i.e.* marginal coldwater aquatic life use. Details of large dataset assessment procedures are available in the *Assessment Protocol* (NMED/SWQB 2006b).

Table 3. Summary of Thermograph Data

Station	Data Collection Interval	WQS Temperature Criterion (°C)	Maximum Recorded Temperature (°C)	Total # of data points (n)	# / % Exceedences
Las Animas Creek at road crossing	July 8, 2004 – October 19, 2004	25 °C	19.9 °C	2022	0 / 0%

NOTES: Thermographs were deployed but lost due to flood events on Palomas, Alamosa, and Percha Creeks.

Table 4a. Summary of pH Data Collected from Sondes

Station	Data Collection Interval	Designated Use	Criterion SU	Min / Max SU	# / % Exceedences	Magnitude Violation	Frequency Violation
Las Animas Creek at road crossing	July 7-12, 2004	MCWAL	6.6-9.0	6.95/7.09	0 / 0%	No	No
Las Animas Creek above the box	October 18-27, 2006	MCWAL	6.6-9.0	7.30/7.41	0 / 0%	No	No
Las Animas Creek near Dunn	Aug 27-Sep 6, 2004	MCWAL	6.6-9.0	6.18/6.67	0 / 0%	No	No
Alamosa Creek blw USGS Gage 8360000	July 8-12, 2004	MCWAL	6.6-9.0	7.64/8.24	0 / 0%	No	No
South Fork Las Palomas abv North Fork	July 7-12, 2004	MCWAL	6.6-9.0	7.40/8.13	0 / 0%	No	No
Percha Creek at Percha Box	July 7-12, 2004	MCWAL	6.6-9.0	7.43/7.62	0 / 0%	No	No

NOTES: MCWAL = Marginal Coldwater Aquatic Life

Table 4b. Summary of Dissolved Oxygen Data Collected from Sondes

Station	Data Collection Interval	Designated Use	WQS Criterion (mg/L)	Min/Max Conc. (mg/L)	Min Sat. (% local)	Assessment Criterion	Combined Conc./Sat. Exceedences (# / %)	% Sat. Exceedences (# / %)
Las Animas Creek at road crossing*	July 7-12, 2004	MCWAL	6.0	1.69 / 2.43	20.8	OLS	121 / 100%	121 / 100%
Las Animas Creek above the box	Oct 18-27, 2006	MCWAL	6.0	8.21 / 9.64	101.7	OLS	0 / 0%	0 / 0%
Las Animas Creek near Dunn*	Aug 27-Sep 6, 2004	MCWAL	6.0	0.14 / 5.17	1.8	OLS	241 / 100%	241 / 100%
Alamosa Creek blw USGS Gage 8360000	July 8-12, 2004	MCWAL	6.0	5.88 / 7.09	87	OLS	8 / 7.6%	0 / 0%
South Fork Las Palomas abv North Fork^	July 7-12, 2004	MCWAL	6.0	---	---	---	---	---
Percha Creek at Percha Box*	July 7-12, 2004	MCWAL	6.0	4.72 / 7.49	68.1	OLS	77 / 62.6%	54 / 43.9%

NOTES: MCWAL = Marginal Coldwater Aquatic Life
OLS refers to Other Life Stages, as opposed to the more sensitive ELS, Early Life Stages
* Low dissolved oxygen results are likely the result of significant groundwater input.
^ DO probe malfunction.

As noted in **Table 4b** above, several streams have low dissolved oxygen (DO) values below the DO water quality standard. Natural inflows of groundwater often have low concentrations of DO and can therefore result in lower DO concentrations in surface waters. One way to help determine if a stream is dominated by groundwater inflows is to look at the water temperature over a period of time. Groundwater is often colder and does not exhibit the typical diurnal swings of temperature as that observed in surface waters (**Figures 2 and 3**). That is, over a period of 24 hours the temperature of a groundwater-fed stream is relatively stable. The results of this analysis indicated that the low DO values documented in Las Animas and Percha Creeks are likely the result of a significant groundwater input and therefore these sites were determined to be Fully Supporting its aquatic life use with respect to DO.

Figure 2. Example of relatively stable stream temperatures indicative groundwater input

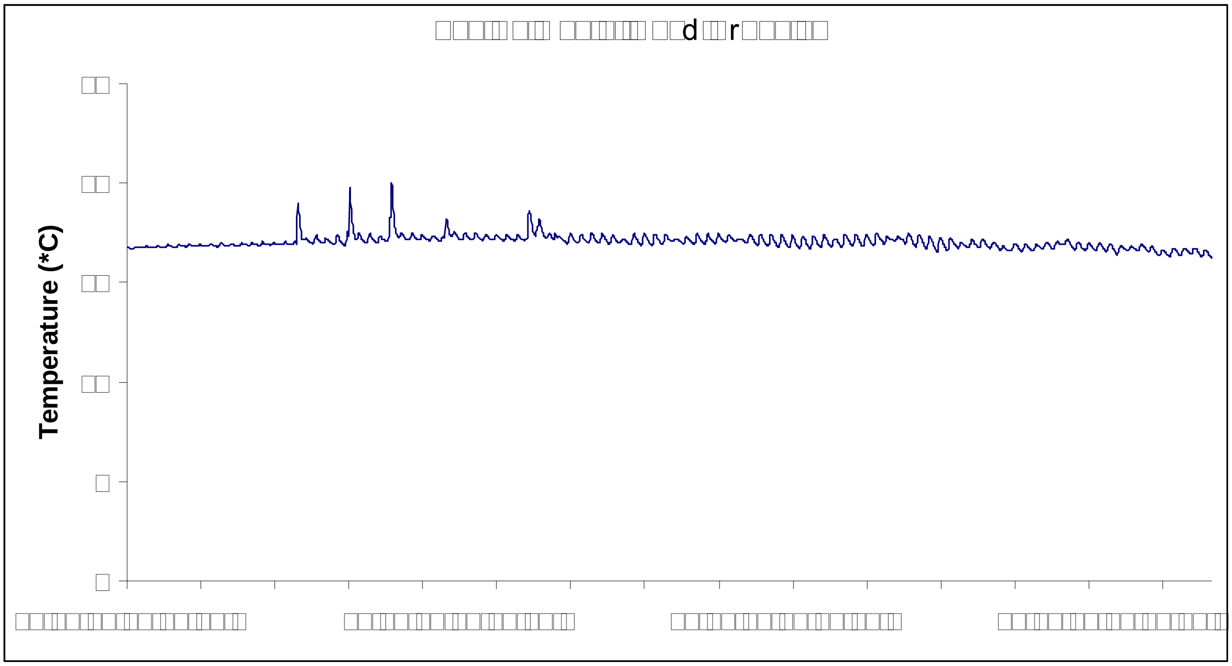
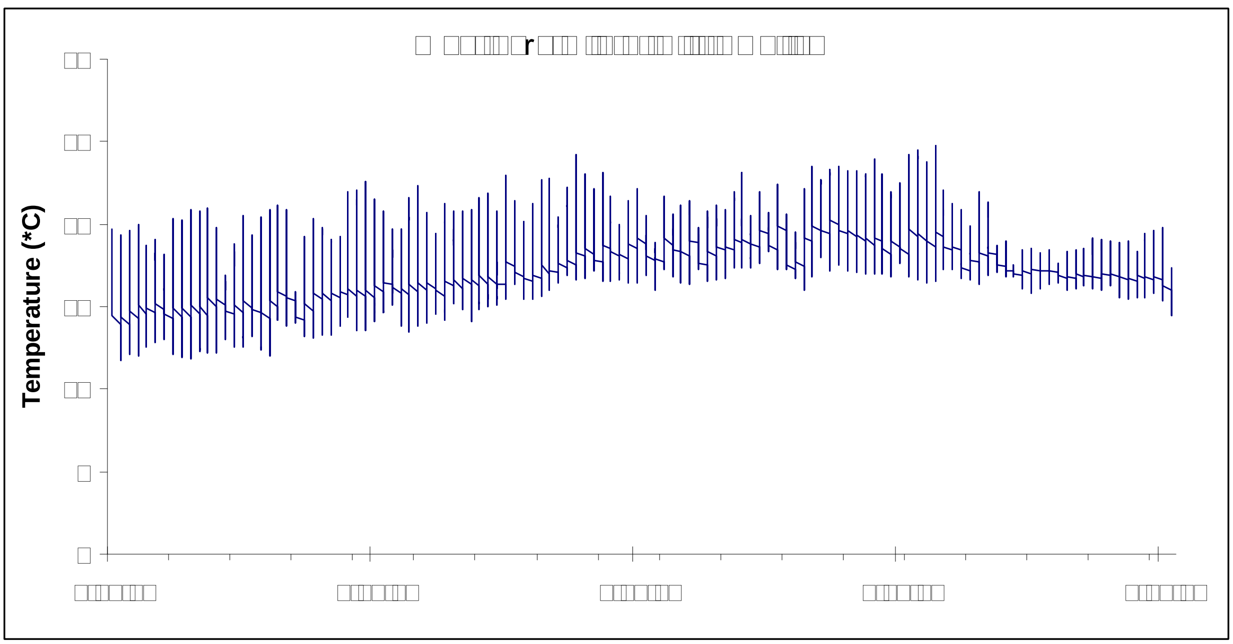


Figure 3. Example of typical diurnal fluctuations of temperature in surface water



6.2 Water Quality Exceedences For Narrative Criteria

6.2.1 Physical Habitat

It is essential to characterize the physical habitat in order to relate stream biological condition to land use impacts and potential anthropogenic disturbances. The physical habitat components most directly impacting biological communities are the stream geomorphology (physical structure), the riparian corridor that supports and protects aquatic life, and the composition of the substrate where the aquatic communities live. Streams existing in similar landscapes express similar compositions of these three attributes and can be compared to a reference site within that group. A reference site is a stream reach that has been exposed to the least amount of human disturbance within a certain landscape. **Table 5** describes the watershed size, ecoregion, and elevation of each station within the biological survey of the Lower Rio Grande Tributaries. These are the minimal data necessary to categorize the sites by landscape, and the reference sites indicated were chosen as the least disturbed by the professional judgment of the Monitoring and Assessment Biology Team.

Percha Creek and Alamosa Creek were previously listed for stream bottom deposits. Environmental Monitoring and Assessment Program (EMAP; Peck *et al.* 2003) surveys were conducted on these streams in 2007 to collect data in order to verify the historic sedimentation/siltation listings.

Table 5. Watershed Characteristics of Reference and Study Sites

Station	Latitude	Longitude	Watershed Area	Elevation	Ecoregion
West Fork Gila abv Cliff Dweller Cyn (reference)	33.2293	108.266	109 mi^2	5709 feet	AZ/NM Mountains
Alamosa Creek below USGS Gage 8360000	33.5687	107.590	401 mi^2	6181 feet	AZ/NM Mountains
Blue Creek 0.5 mile abv Gila River (reference)	32.6627	108.830	138.5 mi^2	3963 feet	Chihuahuan Desert
Percha Creek at Percha Box	32.9179	107.529	85.5 mi^2	5003 feet	Chihuahuan Desert

Substrate Composition

The size of sediment within a stream system is one of the most important physical attributes in determining the health of aquatic communities. There are two components to sediment load that impact aquatic life: suspended load and bed load. Suspended load is quantified through the measurement of turbidity and total suspended solids. Bed load describes the particles that settle to or roll along the bottom (saltation) of the channel. Larger bed load particles provide increased interstitial space between particles, thus allowing for different aquatic communities than those found among small particles with little or no space. The size of sediment within a stream has a natural progression from course, large particles in sections at high elevation with smaller watershed size gradually decreasing to sand in low elevation streams with large watersheds. Therefore, to determine whether a stream exhibits an unnaturally fine bed load, knowledge of the location of the stream segment within the watershed is necessary. Particles smaller than 2mm are considered “fines”, and “percent fines” are considered for assessment purposes (See 20.6.4.13(A) NMAC). The percent fines is calculated by adding the % sand and % silt-clay.

Geomorphology

Quantitatively identifying the current structure of a stream channel allows for a determination of the amount and variation of habitat available for aquatic communities. A natural, undisturbed stream system maintains equilibrium with the amount of water and sediment that it transports, allowing that system to remain stable. Human impacts may alter the equilibrium of a stream, causing the stream to actively attempt to restore this balance. As the stream attempts to restore equilibrium, it may cause damage to the adjacent riparian habitat or the aquatic communities within the channel.

Riparian Health

The riparian area is the corridor of vegetation surrounding the stream that provides many beneficial functions to the stream channel. Although there are many benefits to a diverse and healthy riparian area, the most direct effects are shade, soil stability, and organic inputs providing food for the aquatic communities. Two qualitative assessments were performed to provide general information on the health of the habitat and structure of the stream: the Rapid Geomorphic Assessment (RGA) and the Rapid Habitat Assessment (RHA). These observational assessments provide an indication of riparian health.

Table 6 provides a comparison of the physical habitat parameters collected at the reference reaches and study reaches during the 2007 EMAP surveys. In both cases the geomorphic and measures of riparian health are comparable with reference site conditions.

Table 6. Comparison of Physical Habitat Results between Reference Sites and Study Sites

Results	West Fork Gila (Reference)	Alamosa Creek	Blue Creek (Reference)	Percha Creek
Substrate Composition				
% Fines (< 2 mm)	8%	22%	43%	16%
D50	53 mm	18.5 mm	4.5 mm	24.5 mm
D84	121.5 mm	42.5 mm	119.5 mm	62 mm
Mean % Embeddedness	41.9%	46.6%	60.2%	49.5%
Geomorphic Data				
Slope	1.15%	1.10%	0.95%	0.83%
Width-to-Depth Ratio	47.1	29.3	33.3	26.5
Riparian Health				
Rapid Geomorphic Assessment[1] (0 – 36)	1.0	14.0	11.0	16.5
Rapid Habitat Assessment[2] (0 – 200)	177	151	133	138

NOTES: mm = millimeters

1. The Rapid Geomorphic Assessment is used to identify stable reaches and the destabilizing processes that are active in the reach. A channel stability score is determined by observing a number of channel characteristics and the stage of channel evolution based on the National Sedimentation Lab empirical model (Simon 1989). **Higher scores indicate a more unstable channel**.
2. The Rapid Habitat Assessment (Barbour, *et al.* 1999) provides a qualitative aquatic habitat score that is based primarily on observation of the quality and diversity of in stream habitats. **Higher scores indicate better habitat quality**.

6.2.2 Macroinvertebrate Community and Sedimentation Data

Since the narrative standard for bottom deposits is dependent on biological condition, the assessment of this physically-based narrative sedimentation criteria should be determined using a biological response variable that will link excess settled sediment levels to designated use attainment. The macroinvertebrate community is generally the first to show a response to certain stressors such as the fine sediment that settles to the bottom of the channel. By collecting data on the macroinvertebrate communities that are present in a stream reach SWQB can identify changes that indicate stress on the community. Depending on the ecoregion of the study site, this can be done by utilizing either the Rapid Bioassessment Protocol (RBP) or Mountain Stream Condition Index (M-SCI) as described in SWQB's main assessment protocol. Application of the biological assessment or degree of impairment is a percentage comparison of the sum of selected metric scores at the study site compared to a reference site or condition. For example, a study site in ecoregion 24 (Chihuahuan Desert) achieving a RBP score greater than 83 percent of the reference site would be deemed non-impaired (**Table 7**). Similarly, when the macroinvertebrate community at a study site in ecoregion 23 (AZ/NM Mountains) has an M-SCI score < 56.70% of the reference condition, it can be concluded that there is stress on that community and it would be deemed impaired (i.e. non-support) (**Table 8**).

Table 7. Biological Integrity Attainment Matrix using the Rapid Bioassessment Protocol Index[1] for Chihuahuan Desert Sites

% Comparison to Reference Site(s)	Biological Condition Category[2]	Attributes[1]
> 83%	Non-impaired (Full Support)	Comparable to best situation to be expected within ecoregion (watershed reference site). Balanced trophic structure. Optimum community structure (composition & dominance) for stream size and habitat quality.
79 – 54%	Slightly Impaired (Non-Support)	Community structure less than expected. Composition (species richness) lower than expected due to loss of some intolerant forms. Percent contribution of tolerant forms increases.
50 – 21%	Moderately Impaired (Non-Support)	Fewer species due to loss of most intolerant forms. Reduction in EPT index.
< 17%	Severely Impaired (Non-Support)	Few species present. Densities of organisms dominated by one or two taxa.

1. RBP Index, percentages, and biological attributes are taken from Plafkin *et al.*, 1989. Percentage values obtained that are in between the above ranges will require best professional judgment as to the correct placement.
2. New Mexico has combined all but the "Non-impaired" category into "Non-Support" per USEPA Region 6 suggestion.

Table 8. Biological Integrity Attainment Matrix using M-SCI[1] for AZ/NM Mountain Sites

% Comparison to Reference Condition	Biological Condition Category[2]
> 78.35%	Very Good (Full Support)
78.35 – 56.70%	Good (Full Support)
56.70 – 37.20%	Fair (Non-Support)
37.20 – 18.90%	Poor (Non-Support)
> 18.90%	Very Poor (Non-Support)

1. M-SCI Index and percentages based on Jacobi, *et al.* (2006)
2. New Mexico has combined the “very good” and “good” categories into “Full Support,” while the remaining categories define “Non-Support.”

Sedimentation/Siltation Assessment

In order to assess for excess sedimentation, the biological index score (RBP or M-SCI depending on ecoregion) and the percent fines in the stream reach are assessed independently for their support of the aquatic life use. Reference sites are currently used to determine the amount of fines appropriate for each stream reach. If a low biological index score coincides with a percent fines that is greater than 20% and this value exceeds a 28% increase from the associated reference site, excess fine sediment is indicated as a cause of impairment. If only the biological index score is low, excess fine sediment is not indicated as a cause of impairment.

Alamosa Creek had an M-SCI score in the “good” range indicating the biological community is not impaired or stressed even though the percent fine sediment in Alamosa Creek exhibited a 175% increase over the reference site (**Table 9**) and was slightly above the 20% fine threshold defined in Appendix D of the Assessment Protocol. Therefore, Alamosa Creek was determined to be Fully Supporting its aquatic life use with respect to sedimentation/siltation.

Percha Creek had a RBP score in the “moderately impaired” range indicating the biological community is stressed, however the percent fine sediment in Percha Creek was only 16% almost three times lower than the 43% fines found at its reference site (**Table 9**). According to Appendix D of the Assessment Protocol, raw percent values of ≤ 20% fines at a study site should be evaluated as “Full Support” regardless of the percent attained at the reference site. Therefore Percha Creek was determined to be Fully Supporting its aquatic life use with respect to sedimentation/siltation.

Table 9. Sedimentation Evaluations for the Lower Rio Grande Tributaries

Stations	Biological Index Score	% of Reference	% Fine Sediment	% increase over Reference
Alamosa Creek below USGS Gage 8360000	61.7*	N/A	22	175%
Percha Creek at Percha Box	46^	96%	16+	- 63%

* Mountain – Stream Condition Index (M-SCI) is used to assess AZ/NM Mountain sites.
^ Rapid Bioassessment Protocol (RBP) Index is used to assess Chihuahuan Desert sites.
+ Raw percent values of ≤20% fines at a study site should be evaluated as "Full Support" regardless of the percent attained at the reference site.

6.2.3 Periphyton Community and Nutrient Data

The periphyton community is another biological indicator that can express system stress in ways that the macroinvertebrate or fish community may not reveal. The use of periphyton community data is still in early stages of development and does not provide conclusive information on stream health at this time. Periphyton is collected in biological surveys for a community composition analysis and for the quantification of chlorophyll *a* for the second level of nutrient assessments. A Level 1 nutrient screen is performed at each survey station to determine if excess nutrients may be an issue for the reach. If necessary, a series of data is collected for the nutrient Level 2 survey to determine impairment.

Nutrient Level 2 Assessment

The primary question to be answered during a Nutrient Assessment is: **Is this reach impaired due to nutrient enrichment?** Nutrient impairment occurs where algal and/or macrophyte growth interferes with designated uses, thus preventing the reach from supporting these uses. Algal biomass is the most important indicator of nutrient enrichment, as algae cause most problems related to excessive nutrient enrichment. Algae and macrophytes may be a nuisance when 1) there are large amounts of rotting algae and macrophytes in the stream; 2) the stream substrate is choked with algae; 3) large diurnal fluctuations in DO and pH occur; and/or 4) there is a release of sediment-bound toxins.

The Assessment Protocol uses a two-tiered approach to nutrient assessment. The two levels of assessment are used in sequential order to determine if there is excessive nutrient enrichment. Level 2 nutrient surveys were conducted at the Lower Rio Grande tributary sites that the Level 1 nutrient assessment indicated the possibility of nutrient impairment or that were previously listed as impaired due to plant nutrients. The Level 2 nutrient survey consists of data collection on a number of indicators including total phosphorus, total nitrogen, dissolved oxygen, pH, and periphyton chlorophyll *a* concentration. Chlorophyll *a* is a quantitative measure of algal biomass which is the direct or indirect cause of most problems associated with nutrient impairment. The indicators are compared to the applicable criterion or threshold value to generate an exceedence ratio, or the number of exceedences divided by the total number of times the parameter was measured. For total phosphorus, total nitrogen, and chlorophyll *a*, the threshold values are dependent on the ecoregion and designated aquatic life use.

According to the *Nutrient Assessment Protocol for Wadeable, Perennial Streams* (NMED/SWQB 2009), a stream is determined to be not supporting if **three or more** indicators exceed their respective threshold values. Total phosphorus was the only indicator that exceeded its threshold value for Las Animas Creek (**Table 10**) resulting in a determination of "Full Support" for Las Animas Creek. Total phosphorus and total nitrogen exceeded their respective threshold values in both Alamosa Creek and Percha Creek, however the long term DO and pH datasets from these creeks did not exceed the criteria (**Table 10**), which resulted in a determination of "Full Support" for nutrients in both creeks. Nevertheless, since chlorophyll *a* data were not available for these streams, chlorophyll *a* data should be collected on Alamosa Creek and Percha Creek to verify the "full support" determination.

Table 10. Summary of Nutrient Data

Assessment Unit Station ID	**Ecoregion**	**Designated Aquatic Life Use**	**DO & pH – long term datasets**	**Total Nitrogen** (# and % of exceedences)	**Total Phosphorus** (# and % of exceedences)	**Chlorophyll *a* exceedence?**
Las Animas Creek (perennial portion R Grande to headwaters) Las Animas abv the box	Chihuahuan Desert	MCWAL	support MCWAL	0 / 0%	1 / 25%	N/A
Alamosa Creek (Perennial reaches abv Monticello diversion) Alamosa Creek below USGS Gage 8360000	Chihuahuan Desert	MCWAL	support MCWAL	1 / 17%	2 / 33%	N/A
Percha Creek (Perennial reaches Caballo R to M Fork) Percha Creek at Percha Box	Chihuahuan Desert	MCWAL	support MCWAL	5 / 100%	2 / 40%	N/A

NOTES: MCWAL = Marginal Coldwater Aquatic Life
N/A = not applicable because data not collected

7.0 CONCLUSIONS

Due to the large volume of data collected during this survey, it will not be included in this report. To acquire specific data, contact the SWQB or search USEPA's STORET database. All of the monitoring that was conducting by the SWQB is summarized in **Table 2**.

Sampling for major ions, nutrients, total and dissolved metals, bacteria, and field parameters found no exceedences of water quality criteria. Additionally, according to SWQB's thermograph and sonde data, there were no criteria exceedences for temperature or pH within the Lower Rio Grande's perennial tributaries. There were exceedences of the DO criteria, however these exceedences were determined to be most likely the result of significant groundwater input along the stream reach. Natural inflows of groundwater often have low concentrations of DO and will therefore lower DO concentrations in surface waters. Additional data were collected in 2007 to confirm the historic sedimentation/siltation listings on Percha Creek and Alamosa Creek. These data were assessed according to SWQB's *Appendix D: Sedimentation/Siltation Assessment Protocol For Wadeable, Perennial Streams* (NMED/SWQB 2009). Based on this assessment, it was determined that Alamosa and Percha Creeks were fully supporting their aquatic life uses with respect to sedimentation/siltation. Consequently, the sedimentation/siltation impairment listings for Alamosa and Percha Creeks will be removed in the 2010-2012 State of New Mexico CWA §303(d)/§305(b) Integrated Report.

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F – M3 Foundations Reports

TRIP REPORT No. 001

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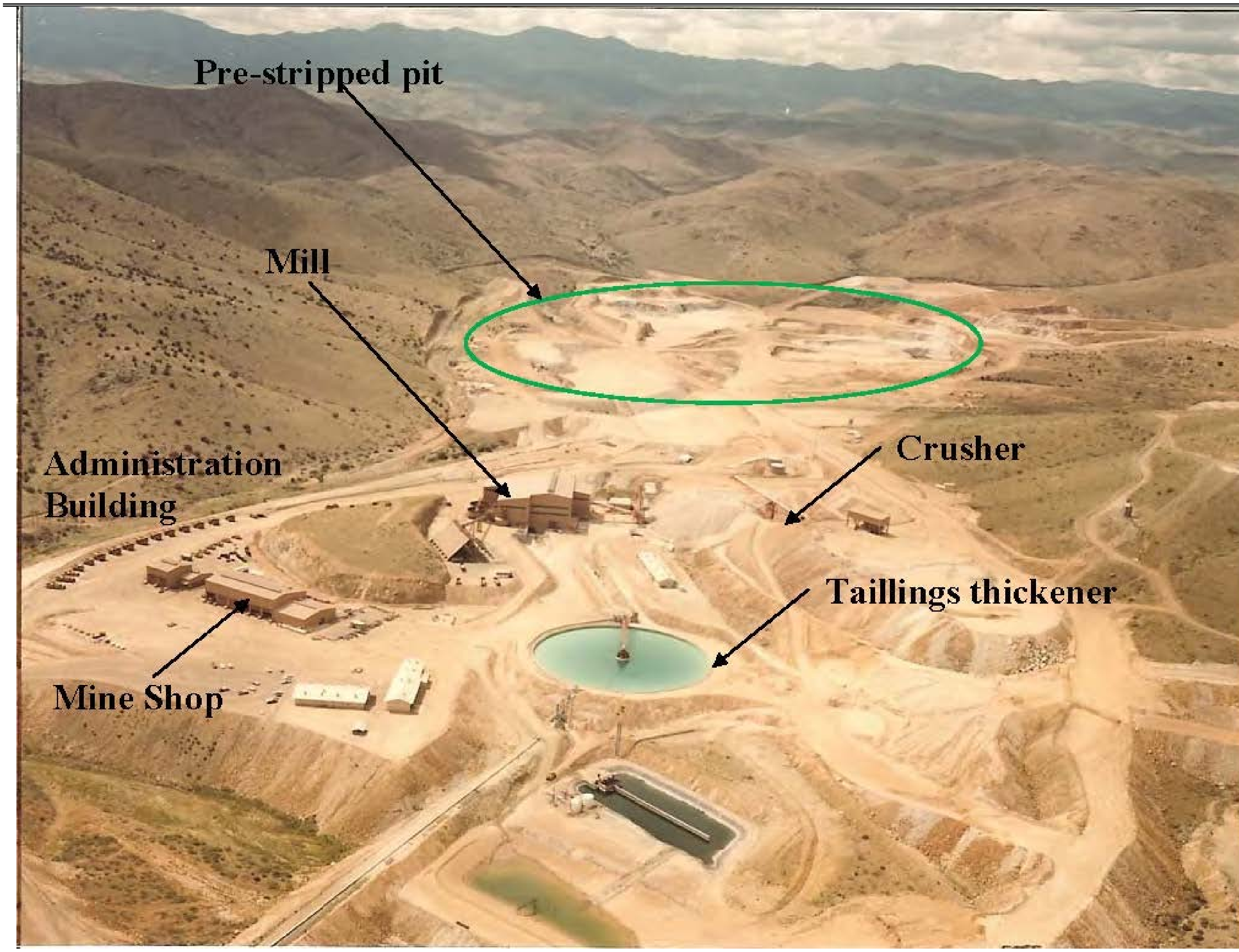
Date: October 25, 2011		**Project No.:**	**M3-PN110087**
To: Hillsboro, New Mexico site		**Project Title:**	**Copper Flat**
Company: New Mexico Copper Corporation (NMCC)		**Contacts:**	**Ann Carpenter** **Ed Fidler** **Rich Hasler**

From: Tucson, AZ. to Truth or Consequences, N.M.

M3 Personnel: Rick Zimmerman, Jim Bogan, Steve Slaby, Roger Rivers, and Justin Meislin

Purpose: Site visit to determine the value of using existing concrete slabs and to evaluate site drainage.



The Copper Flat property near Hillsboro, New Mexico was originally developed in the early 1980's as a copper concentrator by Quintana Minerals Corporation. The property only operated a short while before being shut down. In the late 1980's the equipment was sold and the buildings and all equipment were removed. The underground utilities, all floor slabs, the primary crusher concrete, the reclaim tunnel, and the tailings thickeners were left in place and then covered with a minimum of 2 feet of material with top soil and then revegetated.

New Mexico Copper Corporation (NMCC) has recently had portions of the original concrete foundations excavated so that M3 and NMCC could review the condition of this concrete to evaluate the possibility of reusing portions of these foundations. All foundations discussed in this report will be referred to by their original foundation names for clarity.

Existing Underground Utilities

There is potential to reuse portions of the existing underground utilities (Photo 20). All electrical lines after the substation were in concrete-encased duct banks. The duct banks were not exposed and the utility pull boxes were not available for inspection. One vault was open at the surface, and if emptied of the dirt, might indicate that the duct banks can be reused. The fire water and the process water systems are also buried, so they might also be able to be used, but at this time, we are assuming that they will be replaced. The tailings feed line was removed and needs to be replaced. The decant towers on the tailings pond are still in place and exposed and may be reusable, depending on the tailings placement method chosen.

The plant access road is in good condition and will need only minimal upgrading. The electrical 115 kV power line to the site needs some upgrading, mostly to extend the overhead transmission line from the last existing pole across drainage to the southwest to the new switchyard. Site grading has been done with only minimal future work will be required to uncover the remaining concrete and finalize the plant roads.

The concrete for the substation was not exposed so we did not evaluate that location for the substation. We may want to utilize that location if we find that the duct banks can be reused because that is where the main electrical was originally fed from.

Primary Crusher

(4000 cu. yd. @ $800.00/cu. yd. = $3,200,000)
(10' diameter multiplate tunnel 130 L.F. @ $500.00/l.f. = $65,800).

The concrete that was exposed on the primary crusher indicates that we can assume that it is capable of being reused. No cracking, spalling, or other structural damage was observed. The conveyor discharge tunnel is a multiplate steel tunnel section with a concrete entrance (Photos 1 and 3). The multiplate showed only minimal damage with just a few missing bolts. There was no sign of rusting or deformation in the shape of the tunnel. The poured concrete floor showed no signs of cracking or breaking away from the tunnel. Some damage was encountered above the entrance to the steel tunnel, but this seems to have happened during uncovering of the tunnel (Photo 2). This can easily be repaired and is mainly needed to cover the exposed rebar. This should be able to be reused with no more than casual maintenance.

The main portion of the primary crushing dump station was filled with rock as part of the reclamation. We were not able to go into any of this portion of the crusher, but from the minimal problems we saw on the surface and at the entry to the conveyor tunnel, we are assuming that the crusher concrete should be able to be reused if we install the same type of crusher as it had previously. We are assuming that all the platform steel and stairs were salvaged and will need to be replaced. We are assuming that only the concrete will be reused (Photo 4).

Stockpile Reclaim Tunnel

(3150 cu. yd. @ $800.00/cu. yd. = $2,520,000)
(8' cmp tunnel 120 L.F. @ $300.00/l.f. = $36,000).

The original coarse ore stockpile was an open cone stockpile with 35,000 tons live capacity. It consisted of an inclined concrete vault section (Photos 6 and 7), a short discharge conveyor concrete section, and an eight foot diameter steel corrugated pipe escape section with a concrete manway at the end (Photo 9 and 10). We were able to survey the concrete section and found only incidental concrete cracking. The embedments are rusty, but should be able to be cleaned enough to weld to for replacement of platform steel. Some of the original steel platform members and some of the steel water lines have been left in place and will need to be removed and replaced. The feeders, chute work, reclaim conveyor, electrical, and piping will have to be replaced. The existing concrete should last for this rebuild of the plant.

The draw hole opening steel was observed by flashlight from the floor of the reclaim tunnel and shows damage from rusting and corrosion and will have to be rebuilt and replaced as part of the new feeder installation (Photo 8).

There was no stockpile cover in the original plant, but the addition of a cover for this rebuild will not be affected by the existing concrete.

Concentrator

(4600 cu. yd. @ $800.00/cu. yd. = $3,600,000)

The concentrator concrete shows little sign of problems and should be able to be reused (Photo 11). The main support steel anchor bolts were torched off about three inches above the grout, so a new bed plate will have to be welded to the remaining anchor bolts. Minor column concrete bases have been damaged, and in many cases the anchor bolts have been bent over. These will take some work to renovate and make usable for future supports. Some locations may require drilling and epoxying new anchors in place. Some of the maintenance bay floor may need to be removed and redesigned to allow room for the pebble crusher to be installed inside the building so that the overhead crane can be used for maintenance of the crusher and feed conveyors. The SAG and Ball Mill pedestals have to be removed due to the different mill sizes being used today (Photo 12). The floor will have to be re-poured under the mill, but the majority of the mill and flotation area will remain as is and is in good condition. We may be able to mill mat foundation under the SAG mill and just re-pour the discharge pedestal if the concrete can be removed while leaving the majority of the rebar. The SAG mill is similar enough in length to allow this. The ball mill is bigger and for now we are assuming that it will require new mat foundation, pedestals, and final floor.

Administration Building

(355 cu. yd. @ $800.00/cu. yd. = $284,000)

The exposed administration building floor concrete and anchor bolts are in good condition and we are planning on reusing this slab (Photo 13). Some modifications of the anchor bolts will be necessary similar to the ones needed on the concentrator foundations. Some areas will have to be removed to allow for new under slab plumbing.

Truck Shop/Maintenance/Warehouse building

(1850 cu. yd. @ $800.00/cu. yd. = $1,480,000)

The exposed truck shop slab was in very good shape with no cracking noted on the floor (Photo 14). The existing floor between column line E1 thru E3 was exposed and is in good condition and should be able to be reused as a truck shop, warehouse, and maintenance area (Photo 15). The anchor bolts were also torched off at about 3” high and will take base plate modifications similar to the mill building to allow them to be used for the new truck shop (Photo 16). Some electrical floor trenches were exposed and can possibly be reused (Photo 17).

Concentrate Stockpile Slab

(750 cu. yd. @ $800.00/cu. yd. = $600,000)

The concentrate stockpile slab is in excellent condition and can be used for emergency storage of concentrate (Photo 18). At this time we do not anticipate putting a building over this slab, but it can be used to laydown of mill liners, some outdoor spare parts, or for concentrate if it is covered with tarpaulins. The concentrate would be dumped onto the slab with the intention that it is for short term use and would be reclaimed with a front end loader against the existing concrete push wall (Photo 19). Utilizing this slab necessitates relocation of the existing plan for the concentrate truck haulage road.

Existing Cover Materials

The materials used to cover the aforementioned concrete foundations and other improvements typically consist of two layers. The bottom layer consists of run-of-mine ore, waste rock, or alluvial materials. These materials were placed to cover the improvements to a depth of approximately 2 feet. The second layer consists of a darker, more organic-rich later, typically 1 to 3 feet thick, that was placed over the top to act as a growth medium. It is recommended that these layers be salvaged and stockpiled separately, where practical for reuse during construction or reclamation, as appropriate.

Tailings Thickner

The tailing thickner ring wall was exposed at the surface and in a trench that breached the wall. The floor of the thickner and the tunnel beneath the thickner were not exposed for examination. The ring wall is approximately 10 feet tall and 1 foot wide. It appears to be in good condition, except for the breached area. The thickener has been filled to the top of the ring wall and forms a flat surface with a gently sloping surface toward the center. There are no plans to reuse this thickner because it’s design is out of date.

Tank Pads

Process water and potable/fire water tank pads were observed from a distance on the side of Animas Peak, but were not examined. There were no apparent water lines leading up the the former tank locations. We assume that the tank locations will be reused, but do not assume that any foundation materials for these tanks will be reused. Further, we assume that the existing foundation for these tanks (if present) will need to be removed in preparation for pouring new tank foundations.

Small Vehicle Repair

(560 cu. yds. $800.00/cu. yd. = $448,000)

This building has not been exposed, but should be of sufficient quality to be used as a tire shop and wash area.

Ball Bunkers

It is not anticipated that the existing Ball Bunkers will be used for this Project.

Assay Laborator

It is not anticipated that the Assay Laboratory Floor Slab will be used for this Project.

Reagent Building

It is not anticipated that the Reagent Building Floor Slab will be used for this Project.

Change House

It is not anticipated that the Change House Floor Slab will be used for this Project.

Total estimated value of reused concrete - $12,234,000.

Photo 1 – Entrance to Steel Tunnel

Photo 2 – Damage at Top of Tunnel Entrance

Photo 3 – Multiplate Tunnel

Photo 4 – Primary Crusher Dump Pocket

Photo 5 – Primary Crusher – Maintenance Area

Photo 6 – Stockpile Entrance – Conveyor Gallery

Photo 7 – Vault Area

Photo 8 – Draw Hole in Vault Area

Photo 9 – Escape Tunnel from Vault

Photo 10 – Reclaim Tunnel Escape Manway and Valve Box

Photo 11 – Concentrator – Ball Mill Area

Photo 12 – Concentrator SAG Mill Footings

Photo 13 – Administrative Building

Photo 14 – Typical Column Base at E3

Photo 15 – Truck Shop Floor Slab

Photo 16 – Truck Shop, Typical Column Foundation

Photo 17 – Truck Shop – Floor Trench in Electrical Room

Photo 18 – Concentrator Stockpile Slab from Primary Crusher

Photo 19 – Concentrator Stockpile With Push Wall at Rear

Photo 20 – Underground Utility Floor Penetration

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Date: January 31, 2013 **Project No.: M3-PN120085**

To: Hillsboro, New Mexico site **Project Title: Copper Flat**

Company: New Mexico Copper Corporation (NMCC) **Contacts: Jeffrey Smith**
Andrew Feltman

From: Tucson, AZ to Truth or Consequences, NM

M3 Personnel: Rick Zimmerman, Oscar Avilucea, Shannon Orr, Shelby Madrid, Tim Reiter, and Matthew Murray

Purpose: Evaluate Newly Exposed Foundations

M3 Engineering & Technology Corp. (M3) performed a visual inspection of newly excavated foundations at the Copper Flat Property on January 31, 2013. This inspection is a follow-up to the initial inspection performed by M3 in October 2011. Newly exposed portions of the Primary Crusher, Concentrator and Truck Shop foundations were reviewed during this inspection. General findings for various other existing foundations are documented in the Trip Report 001 (M3-PN110087 Oct. 2011). The purpose of this structural evaluation is to determine the feasibility of reusing these existing foundations and to provide the basis for the capital cost estimate for concrete repairs required to comply with safety and serviceability requirements for the project.

PRIMARY CRUSHER

Observations:

The Primary Crusher had been excavated to the Dump Pocket drawhole at 5551’-0” level (See Photo 1 and Ref. Quintana Dwg. 71-5401). The maintenance side had been excavated to about the 5531’-7” level (See Photo 2). The exposed concrete was visually evaluated for, structural damage, design deficiencies, construction deficiencies, and any structural deterioration occurring during the period of being buried. Concrete surfaces were visually inspected for cracks, spalling, exposed rebar, and signs of any chemical deterioration. Embedded items were also examined for corrosion and signs of deterioration. The concrete surfaces appeared to be in good conditions with some greenish-blue discolorations at the surface (See Photo 3). Embedded items around the openings and Dump Pocket liner plates were observed to have experienced significant corrosion and loss of material (See Photo 4). CMU block walls for the Electrical Room at the 5549’-4 ¾ level had been pushed over exposing wall reinforcing. Also, the elevator framing and structural steel remains were still in place with significant damage (See Photos 5 & 6). No observations were made of the Surge Pocket or levels below, because backfill material had not been excavated to these levels.

Analysis:

The Quintana Minerals Corporation set of drawings and any available reports for the existing foundations were reviewed and compared against field observations. Preliminary structural engineering calculations were performed to check the structural capacity of the concrete basement strip, floors and walls. The Plant Site

Geotechnical Investigation Report (SHB E80-1030, June 1980) could not be obtained and UBC values were assumed for checking the allowable bearing capacity of the soil below. In the absence of the soils report, M3 reviewed the existing civil cut slopes and concrete drawings for this structure and the soil beneath is presumed to be bedrock for this structure (Ref. Qunitana Dwg's. 71-3512, 71-3513 and 71-3515), which is adequate to sustain the anticipated loads. The concrete that was exposed was observed to be in reusable condition.

Recommendations:

The lower levels of the Primary Crusher structure shall be further investigated for signs of distress or deterioration once exposed. Embedded items that are badly deteriorated should be abandoned or replaced. A further investigation should be performed to identify concrete surfaces that will require repairs, such as surface coatings, where applicable.

CONCENTRATOR

Observations:

The existing Flotation, Grinding and Regrind Area foundations were visually inspected using the same criteria defined for the Primary Crusher. The majority of the overburden had been excavated with the exception of the Grinding Area containment slab, but the Mill Piers were able to be inspected (See Photo 7 and Ref. Quintana Dwg. 90-5402). The interior piers in the Flotation Area and building piers had significant signs of distress that occurred during excavation operations (See Photo 8). Anchor bolts and embedded items showed significant signs of corrosion and spalling (See Photos 9 thru 11). Retaining walls and slabs all appeared to be in accordance with the design documents. The floor slabs had signs of distress and may not be water-tight, if needed to provide containment.

Analysis:

The Quintana Minerals Corporation set of drawings and any available reports for the existing foundations were reviewed and compared against field observations. The existing retaining walls, mill foundations and building column piers were preliminarily evaluated for the anticipated loads using the Feasibility Study layout. As with the Primary Crusher, UBC values were assumed for checking the allowable bearing capacity of the soil below due to the absence of a soils report. In general, the state of the concrete that was observed is in a reusable condition with some repairs that would be required. Existing retaining walls, building footings and the SAG Mill Foundation are adequate to sustain the new loads with minimal repairs and modifications.

Recommendations:

The Ball Mill mat foundation shall be increased to encompass the discharge pier extension and to provide a new support for the second pinion drive. The Grinding area containment slab shall be further investigated for signs of distress or deterioration once fully exposed. Embedded items that are badly deteriorated should be abandoned or replaced. Concrete piers that are to be reused should be saw-cut down and a new pier and anchors should be doweled into the pier below where the footings are to be reused. A further investigation should be performed to identify concrete surfaces that will require repairs where excessive deterioration is present in order to allow for any required containment.

TRUCK SHOP:

Observations:

The existing Truck Shop foundations were visually inspected (See Photo 12) using the aforementioned criteria. Building piers had severe damage and edge distances for the anchor bolts were well below the accepted minimums which have added to the extent of spalled concrete (See Photo 13). Flooring embeds in the electrical trench were severely corroded (See Photo 14).

Analysis:

The truck shop foundation was designed for haul trucks of similar size to those planned for the current redevelopment of the project. It is assumed that wheel loads will be similar and the existing floor slab is assumed to have sufficient load bearing capacity for the planned 100-ton haul trucks.

Recommendations:

Concrete piers that are to be reused should be saw-cut down and a new pier and anchors should be doweled into the pier below where footings below are to be reused. A further investigation should be performed to identity concrete surfaces that will require repairs where excessive deterioration is present. The design criteria for the floor slab should further investigated and the existing design should be further evaluated to satisfy all conditions, including future wheel loads and loads from floor jacks. Local strengthening of the floor slab may be considered to preserve the majority of the existing foundations in the case where new loads are in excess of the existing floor slab's load bearing capacity.

Photo 1 – Primary Crusher - Excavation Progress on Crushing Side

Photo 2 – Primary Crusher – Excavation Progress on Maintenance Side

Photo 3 – Primary Crusher – Greenish-blue Discoloration at Wall Surface

Photo 4 – Primary Crusher – Corrosion on Embedded Items

Photo 5 – Primary Crusher – Remains of Structural Steel

Photo 6 – Primary Crusher –Remains of Elevator Structural Steel

Photo 7 – Concentrator – Excavation Progress

Photo 8 – Flotation Area – Existing Interior Concrete Piers

Photo 9 – Flotation Area – Spalled Concrete with Exposed Rebar and Corroded Anchor

Photo 10 – Grinding Area – Corroded Embeds at Sump Box

Photo 11 – Concentrator – Typical Building Pier

Photo 12 – Truck Shop – Excavation Progress

Photo 13 – Truck Shop – Spalled Concrete, Exposed Rebar and Corroded Anchors at Interior Concrete Pier

Photo 14 – Truck Shop – Corroded Electrical Trench Embed Angle