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minefile enforce

State of Utah
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS AND MINING

Michael O. Leavitt
Governor

Ted Stewart
Executive Director

James W. Carter
Division Director

355 West North Temple
3 Triad Center, Suite 350
Salt Lake City, Utah 84180-1203
801-538-5340
801-359-3940 (Fax)
801-538-5319 (TDD)

July 9, 1996

Richard L. Hinckley, Esq.
Nevada Electric Investment Company
6226 West Sahara
P.O. Box 320
Las Vegas Nevada 89151

Re: Division Order 96A Request for Extension of Time, Nevada Electric Investment Company, Wellington Preparation Plant, ACT/007/012, Folder #2, Carbon County, Utah

Dear Mr. Hinckley:

Thank you for taking the opportunity to discuss the referenced Division Order with Lowell and I on June 28, 1996. Your request for an additional 30 days to clarify NEICO's objectives is hereby acknowledged. We look forward to your response by August 15, 1996.

Sincerely,

Joseph C. Helfrich
Permit Supervisor

blb
cc:
Denise Dragoo, Van Cott, Bagley, Cornwall & McCarthy
Pat Collins, NEICO
Steve Demczak, PFO
O:neico.96a

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July 30, 1996

Patrick D. Collins, Ph.D.
Nevada Electric Investment Company
330 East 400 South Suite 6
Springville Utah 84663

Re: Permit Condition Soil Sampling "Area E" Wellington Preparation Plant, ACT/007/012-96B, Nevada Electric Investment Company, Folder #2, Carbon County, Utah

Dear Mr. Collins:

The referenced amendment is hereby approved effective July 23, 1996. A stamped approved incorporated copy is provided for insertion into your mining and reclamation plan. As indicated through the Divisions technical analysis and your previous correspondence, the results from the soil sampling of "Area E" indicate a deficit in the four foot minimum requirement in the amount of approximately 16,069 cubic yards of borrow material. Our staff is looking forward to a visit with you to discuss options regarding the minimum four foot cover requirement. Please contact me or Bob Davidson at your convenience.

Sincerely,

Joseph C. Helfrich
Permit Supervisor

blb
Enclosure
cc: Mark Page, Water Rights-Price (w/o enclosure)
Dave Ariotti, Health-Price (w/o enclosure)
Bill Bates, Wildlife-Price (w/o enclosure)
Bob Davidson
PFO
o:wellsoil

INCORPORATED
EFFECTIVE:
JUL 23 1996
UTAH DIVISION OIL, GAS AND MINING

TRACKING FORM

I. KEY FEATURES OF PERMITTEE'S AMENDMENT APPLICATION

Permittee	Mine Name	Amendment #	Date Received / By Whom
NEICO	Wellington Prep	ACT/007/012-96B	Hand delivered 5-30-96 Pat Collins

Proposal: Results from Soil Sampling Area E
Description: Commitments to conduct a soils survey in this area in April 96 & a final report in May 96. Soil samples different than expected, need to add other proposed areas to borrow areas.

II. AMENDMENT CLASSIFICATION

☐ Major Amendment	Public Notice Required	☐ Yes	☐ No
☐ Minor Amendment	Outside of Permit Area	☐ Yes	☐ No
	Outside of Disturbed Area	☐ Yes	☐ No

III. SUMMARY OF DOGM PROCESSING DATES

		FOLLOWUP REQUIREMENTS		
Reviews Completed				
Approved Effective		MRP "After Const" Documents	☐ Yes	☐ No
Disapproved		TA	☐ Yes	☐ No
Mailed		CHIA	☐ Yes	☐ No
Filed MRP - SLO		Responds Within 15 days of Receipt? ☐ Yes ☐ No If no, explain below.		

IV. COORDINATED REVIEWS

EXTERNAL AGENCIES (Mine Specific) (Adverse Comments, If Any, Include in Item V)			DOGM REVIEWS/DISCIPLINES		
	COPY SENT	CONTACTED			
OSM	☐ Y ☐ N	☐ C ☒ N/A	Generalists ____	☐ Yes	☐ N/A
BLM	☐ Y ☐ N	☐ C ☒ N/A	____ INTERDISCIPLINARY APPROACH		
US Forest Service	☐ Y ☐ N	☐ C ☒ N/A	- Administrative ____	☐ Yes	☒ N/A
US Fish & Wildlife	☐ Y ☐ N	☐ C ☐ N/A	- Biology ____	☐ Yes	☒ N/A
US National Parks	☐ Y ☐ N	☐ C ☐ N/A	- Engineering ____	☐ Yes	☒ N/A
UT Environmental Quality	☐ Y ☐ N	☐ C ☐ N/A	- Geology ____	☐ Yes	☒ N/A
UT Wildlife Resources	☐ Y ☐ N	☐ C ☐ N/A	- Hydrology ____	☐ Yes	☒ N/A
UT State History	☐ Y ☐ N	☐ C ☐ N/A	- Soils ____	☒ Yes	☐ N/A
UT Water Rights	☐ Y ☐ N	☐ C ☐ N/A	- Permitting ____	☐ Yes	☒ N/A
UT SITLA	☐ Y ☐ N	☐ C ☐ N/A	- Other____	☐ Yes	☐ N/A
Other____	☐ Y ☐ N	☐ C ☐ N/A			

V. FOOTNOTES/ADDITIONAL EXPLANATION AS NECESSARY

* ROUTED TO BOB DAVIDSON FOR REVIEW THIS AUGUST 1ST, 1996 OR AS SCHEDULED WITH DARON

MT NEBO SCIENTIFIC, INC.
research & consulting

May 31, 1996

Stephen Demczak
STATE OF UTAH
Division of Oil Gas & Mining
355 West No. Temple
3 Triad Center, Suite 350
Salt Lake City, UT 84180-1203

RE: Results from Soil Sampling ("Area E")
Wellington Preparation Plant (ACT/007/012)

Dear Mr Demczak: 96B

Enclosed please find 3 copies of the results of soil sampling for "Area E" of the borrow areas to be used for final reclamation. Commitments had been made previously by the operator to conduct a soils survey of this area in April 1996, followed by a final report in May 1996.

Because the soil sampling results were somewhat different than what was expected, we may want to get together with members of your technical staff and add other previously proposed areas to the borrow areas.

Please feel free to contact us once you have had time to review and comment on the results.

Sincerely,

Patrick D. Collins, Ph.D.
Resident Agent/Environmental Consultant

Enclosures

cc: R. Hinckley (w/o enclosures)
D. Schwehr (w/ enclosures)

330 East 400 South, Ste. 6, P.O. Box 337, Springville, Utah 84663
(801) 489-6937, (fax) 489-6779

APPLICATION FOR PERMIT CHANGE

Title of Change: RESULTS FROM SOIL SAMPLING "Area E"

Permit Number: ACT / 007 / 012

Mine: Wellington Prep. Plant

Permittee: NEICO

Description, include reason for change and timing required to implement:

☐ Yes	☒ No	1. Change in the size of the Permit Area? _____ acres ☐ increase ☐ decrease.
☐ Yes	☒ No	2. Change in the size of the Disturbed Area? _____ acres ☐ increase ☐ decrease.
☐ Yes	☒ No	3. Will permit change include operations outside the Cumulative Hydrologic Impact Area?
☐ Yes	☒ No	4. Will permit change include operations in hydrologic basins other than currently approved?
☐ Yes	☒ No	5. Does permit change result from cancellation, reduction or increase of insurance or reclamation bond?
☐ Yes	☒ No	6. Does permit change require or include public notice publication?
☐ Yes	☒ No	7. Permit change as a result of a Violation? Violation #
☐ Yes	☒ No	8. Permit change as a result of a Division Order? D.O.#
☐ Yes	☒ No	9. Permit change as a result of other laws or regulations? Explain:
☐ Yes	☒ No	10. Does permit change require or include ownership, control, right-of-entry, or compliance information?
☐ Yes	☒ No	11. Does the permit change affect the surface landowner or change the post mining land use?
☒ Yes	☐ No	12. Does permit change require or include collection and reporting of any baseline information?
☐ Yes	☒ No	13. Could the permit change have any effect on wildlife or vegetation outside the current disturbed area?
☐ Yes	☒ No	14. Does permit change require or include soil removal, storage or placement?
☐ Yes	☒ No	15. Does permit change require or include vegetation monitoring, removal or revegetation activities?
☐ Yes	☒ No	16. Does permit change require or include construction, modification, or removal of surface facilities?
☐ Yes	☒ No	17. Does permit change require or include water monitoring, sediment or drainage control measures?
☐ Yes	☒ No	18. Does permit change require or include certified designs, maps, or calculations?
☐ Yes	☒ No	19. Does permit change require or include underground design or mine sequence and timing?
☐ Yes	☒ No	20. Does permit change require or include subsidence control or monitoring?
☐ Yes	☒ No	21. Have reclamation costs for bonding been provided or revised for any change in the reclamation plan?
☐ Yes	☒ No	22. Is permit change within 100 feet of a public road or perennial stream or 500 feet of an occupied dwelling?
☐ Yes	☒ No	23. Is this permit change coal exploration activity ☐ inside ☐ outside of the permit area?

☑ Attach 3 complete copies of proposed permit change as it would be incorporated into the Mining and Reclamation Plan.

I hereby certify that I am a responsible official of the applicant and that the information contained in this application is true and correct to the best of my information and belief in all respects with the laws of Utah in reference to commitments, undertakings, and obligations herein.

Patricia D Collins Res Agent May 30, 1996

Signed - Name - Position - Date

Subscribed and sworn to before me this 30 day of May, 19 96

Celia Snelson

Notary Public

My Commission Expires: 12-15, 1997

Attest: STATE OF Utah

COUNTY OF Utah

CELIA SNELSON
NOTARY PUBLIC - STATE of UTAH
FIRST SECURITY BANK
119 SOUTH MAIN
SPRINGVILLE, UT 84663

Received by Oil, Gas & Mining

MAY 30 1996

DIVISION OF OIL GAS & MINING PRICE UTAH

ASSIGNED PERMIT CHANGE NUMBER

96B

Form DOGM - C2 (Last Revised 6/93) File Folder # 3

Application for Permit Change
Detailed Schedule of Changes to the Permit

Title of Change: RESULTS FROM SOIL SAMPLING "Area E"	Permit Number: ACT / 007 / 012 Mine: Wellington Prep. Plant Permittee: NEICO

Provide a detailed listing of all changes to the mining and reclamation plan which will be required as a result of this proposed permit change. Individually list all maps and drawings which are to be added, replaced, or removed from the plan. Include changes of the table of contents, section of the plan, pages, or other information as needed to specifically locate, identify and revise the exiting mining and reclamation plan. Include page, section and drawing numbers as part of the description.

			DESCRIPTION OF MAP, TEXT, OR MATERIALS TO BE CHANGED
☐ ADD	☒ REPLACE	☐ REMOVE	Sec. 2.22, p. 33, 6/30/95 of existing MRP with
☐ ADD	☐ REPLACE	☐ REMOVE	Sec 2.22, p. 33, 5/21/96 of this submittal
☐ ADD	☐ REPLACE	☐ REMOVE	
☒ ADD	☐ REPLACE	☐ REMOVE	Sec 2.22, pp. 129- , 5/31/96 of this submittal
☐ ADD	☐ REPLACE	☐ REMOVE	
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Any other specific or special instructions required for insertion of this proposal into the Mining and Reclamation Plan?

SOIL SAMPLING AND ANALYSES

Previous Sampling

Soil sampling and analyses have been conducted at the Wellington site on numerous occasions. A thorough investigation of early files from U.S. STEEL CORP. and KAISER COAL CO. (previous owners of the area) found many references to soil sampling, commitments to sample based on stipulations from the State, and some raw soils data. However, for many of the files, additional pertinent information remains illusive (i.e. sample methods, sample locations, sample depths, laboratory techniques complete results, etc.). Therefore, to avoid further confusion, only the most complete information and data sets have been submitted in this plan.

On seven occasions (referred to as 7 Sample Periods), soils and waste materials were sampled to provide data for potential of reclamation success. Original sampling was accomplished by *U.S. Steel* (prior to 1983), followed by *MT. NEBO SCIENTIFIC* (1983) and James Leatherwood (1989). *MT. NEBO SCIENTIFIC* also recently sampled some of the slurry fines material (1990). Next, to help plan the techniques used for reclamation, additional soil samples were taken and analyzed in 1994. In 1995 and 1996, sampling was conducted to test the feasibility of adding additional topsoil borrow areas to the reclamation plan. Below is a brief history of the better-known sampling information followed by their results.

7. 7th Sample Period

Introduction

A soil borrow material investigation was conducted at "Area E" at the Nevada Electric Investment Corporation (NEICO) Wellington Preparation Plant, Wellington, Utah during April, 1996. The field work was conducted and the following report was prepared by James H. Nyenhuis (Certified Professional Soils Scientist). As part of the borrow area studies and as stated in the MRP (Sec.2.41, pp.5-10, dated 10/13/95), a commitment was made to provide adequate soil survey information for "Area E". The commitment states:

- R645-301.224. Substitute Topsoil. The permittee must provide a commitment which includes timing and methods to provide adequate soil survey information for the proposed Borrow Area "E" to identify the extent of slickspots and soil phases that are high in clay and sodium, as well as other problem areas. This information should be adequate to demonstrate suitability of the material and demonstrate that it is the best material available.

The current study was conducted to determine the quality and quantity of soil materials present on "Area E" that could potentially be salvaged, if necessary, for use as reclamation topsoil on the various coal waste disturbance area components. "Area E" is within the NEICO permit boundary and contains approximately 63.7 acres as delineated on project drawing C9-3511 dated 6-29-95.

The State of Utah Department of Natural Resources, Division of Oil, Gas and Mining (DOGM) has previously recommended issuance of Permit Stipulation N0.1 (Henry Sauer Letter to File dated March 16, 1995) which would require the permittee to submit a plan "which commits to covering all coal mine waste with a minimum of four feet of the best available nontoxic, nonacid forming and noncombustible material". The current reclamation plan envisions salvage of approximately 3.7 feet of soil material across "Area E".

Methods - Scope of Work

Data Review and Evaluation

All existing soils and related discipline information for NEICO's "Area E" was compiled, reviewed, and evaluated prior to initiation of the soils field work. This review included: (1) the existing soils information contained in the NEICO permit application as well as the soils and coal waste data obtained by Mt. Nebo Scientific in 1994, and (2) the Natural Resources Conservation Service (formerly the USDA Soil Conservation Service) soils information for the study area as contained in the Soil Survey of Carbon Area, Utah (Jensen and Borchert, 1988). Project maps and air photos were also reviewed.

Selection of Soil Description/Sample Sites

Five soil description/sample sites (NEICO 8 through 12) were selected for characterization. Three sites (NEICO 8, 9, and 11) were located within the inactive agricultural fields which dominant "Area E". These fields were not previously sampled as a possible soil borrow area in the 1995 Mt. Nebo Scientific soil survey. NEICO 8 was located in the west-central part, and NEICO 9 in the east-central part, of the fields area. NEICO 11 was located in a "slickspot" inclusion within the same fields area. NEICO 10 and 12 were located in a small native area just south of

the fields and north of the ditch on the north side of the slurry ponds area. This small area does not appear to have been part of the agricultural fields when they were actively farmed. Native, halophytic vegetation is present as well as remnants of the small drainage channels that crossed this area before conversion to flood irrigated farmland. NEICO 10 is located in an area most typical of the native vegetation, and NEICO 12 is located in a nearby small "slickspot" inclusion.

Soil Profile Description and Sampling

At each site, a backhoe pit was dug to approximately ten feet, the deepest depth possible with that piece of machinery. This provided the best view and opportunity to deep sample the soil. Once the backhoe pit was dug and the pit walls cleaned off, each soil pedon was described and sampled according to current methods and standards of the National Cooperative Soil Survey as described in: the recently revised Soil Survey Manual (Soil Survey Staff, 1993); the National Soil Survey Handbook, also recently revised (Soil Survey Staff, 1993); and Keys to Soil Taxonomy, sixth edition (Soil Survey Staff, 1994).

The following parameters were described, by natural soil horizon, for each soil pedon description:

- horizon symbol, including depth, thickness, and relative position;

- type and nature of horizon boundaries;
- soil color (Munsell), both moist and dry;
- texture (fine earth fraction - <2mm);
- rock fragment content [type and size - (gravel - 2mm to 3"), (cobble - 3" to 10"), (stone - 10" to 2'), (boulder - >2'), and amount - % by volume;
- soil structure (type, size, and grade);
- soil consistence (dry, moist, and wet);
- roots (number, size, and depth);
- clay films, if present (number, thickness, location);
- effervescence with 0.1N HCl (none, slight, moderate, strong, violent);
- mottles (redoximorphic features), if present (number, size, distinctness, color); and
- soil moisture characteristics at the time of sampling.

In addition, at each sampling site, the following soil and general site features were also described:

- existing dominant vegetation
- parent material
- physiography-landform
- relief, if significant
- elevation (obtainable from topographic maps)
- slope
- aspect
- erosion condition
- permeability
- drainage class

- depth to a saturated zone or ground water if encountered
- salts or alkali if present
- surface stoniness

The description/sampling site number and location were plotted on the topographic base field map.

An adequate amount of representative soil material (about 2 quarts) was collected from each major soil horizon at the sampling locations of the described soil pedons. These soil samples were placed in clean, labeled, polyethylene plastic bags, and kept cool and as dry as possible to limit chemical changes. They were then submitted to the laboratory for the requested soil characterization. Subsequent to soil laboratory analysis, the remaining soil sample material was archived should any future analysis be required.

Soil Laboratory Analysis

Because the current study was a special investigation designed to sample potential soil borrow materials, it was decided to have the laboratory analyze only those parameters that can have unsuitable values according to DOGM soil Table 2 (Overburden Evaluation for Vegetative Root Zone). As such, only pH, EC, SAR, Selenium, and Boron were analyzed in the soil laboratory.

Soil texture, rock fragment content (% by volume), Munsell color, and qualitative calcium carbonate content were determined in the field by James Nyenhuis, Certified Professional Soil Scientist/Soil Classifier. Soil texture was determined by the hand-texture method. Relative calcium carbonate content was based on effervescence in .1N HCl, and reported as none, slight, moderate, strong, and violent. Rock fragment percent was based on the percent gravels (2mm-3"), cobbles (3-10"), and stones and boulders (>10"). Rock fragment content was determined by hand-screening with a #10 2mm screen for gravels and ocular estimates for cobbles, stones, and boulders.

Based on the 1994 Mt. Nebo Scientific study, Acid/Base Potential was previously determined not to be a problem with either the coal waste materials or the native soils (all ABP values were highly positive), and therefore the ABP test was not run on the samples.

Twenty-six soil samples were delivered to Colorado State University's Soil Testing Laboratory in Fort Collins, Colorado for the selected set of analyses listed above. Methods for analysis were taken from Table 1 (Analytical Methods for Baseline Soils Data) and Table 6 (Recommended Laboratory Methods) of the DOGM soils guideline (Leatherwood and Duce, 1988). Specified parameters included:

- pH (standard units based on saturated paste)

- Electrical Conductivity (EC) - mmhos/cm @ 25 degrees C
- Soluble Potassium, Magnesium, Calcium & Sodium (meq/liter)
- Sodium Adsorption Ratio (SAR) - calculated from soluble K, Mg, Ca, and Na (meq/l)
- Selenium - AB-DTPA Extract mg/kg
- Boron - Hot Water mg/kg

Soil Salvage Suitability

Criteria to establish suitability of soil (topsoil) or soil substitute material were those contained in Table 2 of DOGM "Guidelines for Management of Topsoil and Overburden for Underground and Surface Coal Mining" (Leatherwood and Duce 1988). Potential maximum salvage depths were generated for each sampled soil based on an evaluation of all of the field and laboratory data. Potential salvage depths were determined following a detailed evaluation of pH, electrical conductivity (EC), soil texture, sodium adsorption ratio (SAR), calcium carbonate content, rock fragment content, Boron, and Selenium. All poor and unsuitable soil horizons have been noted and the limitations described.

Results and Discussion

Soil profile descriptions for the five soil pedons (NEICO 8 through 12), as recorded on standard NRCS "232" forms, are provided as Appendix A. An accompanying set of footnotes describes the abbreviated terminology used on the field sheets. Soil profile and soil landscape photographs are provided as Appendix B. Soil laboratory data are provided as Appendix C. The locations of the five soil description/sample sites are provided on the Soils Map, which also includes the revised soil map unit delineation lines. The outline of "Area E" is also shown on the map.

Based on the site-specific field and laboratory data, three of the five sampled soils (NEICO 8, 9, and 10) have been classified according to current NRCS soil taxonomy. Slickspots (NEICO 11 and 12) are barren or nearly barren areas and, by convention, are not classified by NRCS. In addition to being important to properly name and classify soils found on a particular area, correlation of site-specific soils with NRCS soil series criteria allows for subsequent reference to and use of established NRCS soil interpretation values for these soils such as hydrologic group number, for runoff modeling; "K" factors, for use in water erosion hazard evaluation; "WEG" group number, for wind erodibility group status for wind erosion hazard evaluation; as well as many other parameter values listed on a

soil series "Form 5" Soil Interpretation Record. The soils at NEICO 8, 9, and 10 were classified to established Utah soil series, with certain differences noted. NEICO 11 and 12 slickspots were not classified.

The results of the current study are summarized and discussed by sample location (NEICO 8 through 12) and Map Unit.

NEICO 8 - Hunting Silt Loam, saline-alkaline, 1 to 2% slopes, Map Unit 55

Soil Classification

NEICO 8 is located in the west-central part of the currently inactive agricultural fields area within "Area E". This very deep soil is representative of Map Unit 55 and is classified as a fine-silty, mixed (calcareous), mesic Oxyaquic Ustifluvent, and meets criteria for the Hunting series with two differences. First, NEICO 8 is saline-alkaline (pH<8.5, EC>4, and SAR>15) between a depth of 14 and 93 inches whereas the established Hunting soil series is commonly not quite as high in salts and alkali. However, NRCS has described a site-specific inclusion in Map Unit 55 as "a soil that is similar to this Hunting soil but is strongly saline and alkali". This inclusion can also have a silt loam surface which is what NEICO 8 has.

Secondly, the NRCS profile description for Hunting in Map Unit 55 says mottles are at a depth of 20 to 40 inches. NEICO 8 is very similar with few, faint, high-chroma mottles between 29 and 50 inches. However, current NRCS soil taxonomy requires Aquic Ustifluvents (the Hunting soil classification in the Soil Survey of Carbon Area, Utah) to have redox depletions with a chroma of 2 or less and aquic conditions for some time in most years within 20 inches of the soil surface (Soil Survey Staff 1994, pg. 139). NEICO 9 does not have such features this high in the profile. It has few, faint, high-chroma mottles between 29 and 50 inches. It has a low chroma matrix (10YR 4/2, moist) with 15% gray (10YR 4/1, moist) depletion spots and a few high-chroma mottles as well. The zone between 70 and 90 inches has a low-chroma matrix with 15% 10YR 4/1 (moist) depletion spots. These characteristics meet criteria for Oxyaquic Ustifluvent classification (Soil Survey Staff 1994, pg. 139), and NEICO 9 has been so classified.

Soil Description and Salvage Suitability

NEICO 8 has a 5-inch surface layer and a 9-inch underlying BC horizon with silt loam texture. This 0 to 14-inch depth does not have high salinity (EC>8 or high alkalinity (SAR>15). It does have a poor rated EC value of 7.6 and an unsuitable rated selenium (Se) value of 0.12 Mg/Kg (ppm) between 5 and 14 inches. The underlying 14 to 50-inch C1 and C2 horizons have fine sandy loam to silt loam texture with <2% rock fragments and high

salinity and alkalinity values. The 14 to 29-inch C1 horizon has a poor rated EC of 12.1, and an unsuitable rated SAR of 16.3. The majority of roots are within this 0 to 29-inch depth. The 29 to 50-inch C2 horizon has a poor rated EC of 14.1, an unsuitable rated SAR of 26.4, and an unsuitable rated Se of 0.21. The 50 to 70-inch C3 horizon is a finer textured lense with silty clay loam texture. It has an unsuitable rated EC value of 15.5, SAR value of 25.8, and an Se of 0.19. The 70 to 93-inch C4 horizon also has silty clay loam texture with an poor rated EC of 14.1, an unsuitable rated SAR of 18, and an unsuitable rated Se of 0.13. The 93 to 122-inch C5 horizon has loam texture and low Ec, SAR, and Se values. Boron values for the entire profile ranged between 0.40 and 2.44 Kg/Mg (ppm), and are rated suitable.

NEICO 8 is moderately well drained based on site-specific data. At the time of sampling (4-11-96), the soil was slightly moist between 14 and 50 inches, moist between 50 and 70 inches, and very moist below 70 inches. Soil mottling was described above. No free water was observed in the pit at the time of sampling or one day later.

NEICO 8 has a fluctuating water table throughout the year but the depth to its upper level is difficult to ascertain. Based on soil morphology, the upper level could be as high as 50 inches but the soil mottling and low chroma matrix could be a result of the flood irrigation practice which was in operation

for some time although it is now inactive rather than groundwater. As stated in DOGM's TA (dated 2-9-96, pg.16), "Data from groundwater well GW-1, in this area (Area E), was measured quarterly and fluctuates between 7.1 feet (March, 1987) and 15.7 feet (March, 1991) from the surface elevation". As stated above, no free water was observed in the pit at the time of sampling nor observed seeping into the ten foot deep pit one day later.

Based on site-specific data, the Hunting soil (NEICO 8, Map Unit 55) is not suitable for salvage. The upper 5 inches are suitable but more than this amount must be left in place to provide a suitable growth medium after salvaging. The depth between 5 and 93 inches has a combination of largely unsuitable rated EC, SAR, and Se values as described above. The upper level of the fluctuating water table is difficult to determine but could be as high as 50 to 86 inches further restricting potential salvage. It is recommended that soil within Map Unit 55 in "Area E" not be salvaged given that it has a largely unsuitable rating based on DOGM topsoil criteria.

NEICO 9 - Ravola Fine Sandy Loam, 1 to 2% slopes, Map Unit 93

Soil Classification

NEICO 9 is located in the east-central part of the currently inactive agricultural fields area within "Area E". This very

deep, well drained soil is representative of the Ravola series within Map Unit 93 (Ravola-Slickspots Complex). NEICO 9 is classified as a fine-silty, mixed (calcareous), mesic Typic Torrifluvent and correlates to the Ravola series. NRCS has characterized Ravola within Map Unit 93 as being strongly alkaline below 20 inches. NEICO 9 is saline between 4 and 123 inches but is not strongly alkaline (as are NEICO 8 and 10).

Soil Description and Salvage Suitability

NEICO 9 has a 4-inch Ap surface layer and a 4 to 19-inch underlying BC horizon with fine sandy loam texture. The surface layer has a low salinity and alkalinity value. The underlying layer has a poor rated EC value of 9.0 and a poor rated SAR value of 12.3. Boron, Se, and pH values are suitable. The major rooting depth is from the surface to the 19-inch depth. The C1 horizon is from 19 to 28 inches and has silt loam texture. It also has a poor rated EC value of 11.9 and a poor rated SAR value of 13.6. Boron, Se, and pH values are suitable. The C1 and C2 horizons are from 28 to 50 inches and 50 to 72 inches, respectively, and have sandy loam texture. Both horizons have suitable pH, EC, SAR, and Boron values, but have unsuitable rated Se values (0.16 and 0.13 Kg/Mg, respectively). The underlying 2C4 and 2C5 layers are coarse textured fluvial lenses. The 2C4 layer is from 72 to 94 inches and has sandy loam texture with 20% gravels and 1% cobbles. It also has some mottling (a high-chroma

10YR 4/3 matrix with 20% low-chroma 10YR 4/1 depletion spots). It has suitable rated pH, EC, SAR, B, and Se values. The underlying 2C5 layer from 94 to 123 inches has a loamy sand texture with 35% gravels and 2% cobbles. It has suitable rated pH, EC, SAR, and B values but an unsuitable rated Se value of 0.11 Kg/Mg.

NEICO 9 was dry to 50 inches, slightly moist from 50 to 72 inches, and moist below 72 at the time of sampling. No free water was observed in the pit during sampling nor one day later. As stated above, NEICO 9 is well drained. Based on soil morphology, it is possible that the upper level of a fluctuating water table exists at approximately 72 inches.

Based on site-specific data, the Ravola soil (NEICO 9, Map Unit 93) is suitable for salvage from the surface to 28 inches in depth although it does have poor rated EC and SAR values between 4 and 28 inches. It should only be salvaged to 10 inches, however, assuming that 18 inches of suitable soil should be left in place to provide a good growth medium for revegetation after salvaging. Below 28 inches, NEICO 9 is rated unsuitable for salvage based on Se values that exceed 0.10 Kg/Mg, except the 72 to 94-inch depth which has a Se value of 0.09 Kg/Mg.

NEICO 11 - Slickspots (15% Inclusion in Map Unit 93)

Soil Classification

NEICO 11 is located in a small "slickspot" area approximately 250 feet northwest of NEICO 9. Slickspots are irregularly shaped barren or nearly barren areas that have a very strongly alkaline, nearly impervious surface layer. By NRCS convention, slickspots are miscellaneous areas and are not classified nor correlated to a soil series name.

Soil Description and Salvage Suitability

Slickspots constitute approximately 15% of Map Unit 93 (the other 85% is the NEICO 9 Ravola soil). NEICO 11 was described and sampled to a depth of 16 inches which included a 3-inch surface layer and a 3 to 16-inch underlying layer. Texture was silty clay loam with about 31% clay. The surface is covered with a white salt efflorescence and all of the soil to the 16-inch depth turns white upon drying. NEICO 11 has unsuitable rated EC values of 38.4 and 30.4 for the surface and underlying layers, respectively, and also unsuitable SAR values of 137.8 and 158.2, respectively. It also has a poor rated pH value of 8.9 for the underlying layer. Boron and Se values, however, are suitable. NEICO 11 is considered highly saline-alkaline.

Based on site-specific data, NEICO 11 slickspots within Map Unit 93 are rated unsuitable for salvage throughout the 0 to 16-inch depth. The underlying soil material was not sampled, and may or may not be suitable for selective depth salvaging.

NEICO 10 - Billings silt loam, saline-alkaline, 1 to 2% slopes, Map Unit 93N (Native)

Soil Classification

NEICO 10 is located in a small native area between Map Unit 93 fields to the north and the slurry ponds area to the south. It appears that the area was never part of the agricultural fields to the north and today supports native vegetation composed of greasewood, saltbush, rabbitbrush, forbs and some weeds. NEICO 10 is representative of the dominant soil in Map Unit 93N. Slickspot areas constitute about 15% of Map Unit 93N and will be discussed in Section 3.5. NEICO 10 is very deep, moderately well to somewhat poorly drained and is classified as a fine-silty , mixed (calcareous), mesic Typic Torrifluvent and is correlated to the Billings series with a saline-alkaline profile.

Soil Description and Salvage Suitability

NEICO 10 has a 4-inch surface layer with silt loam texture.

All parameters are rated suitable for the surface layer. The underlying BC horizon is from 4 to 10 inches in depth and also has silt loam texture. It has, however, an unsuitable rated EC value of 20.8 and SAR value of 46.6, and is considered saline-alkaline. The 10 to 25-inch C1 horizon also has silt loam texture, but again has an unsuitable rated EC value of 24.3, and an SAR value of 34.1, and is considered saline-alkaline. It also has an unsuitable rated Se value of 0.11 Kg/Mg. The major rooting zone extends from the surface to the 25-inch depth. The underlying 2C2 horizon is from 25 to 44 inches and has silty clay texture with about 45% clay. It has an unsuitable rated EC value of 24.2, SAR value of 30.5, a Se value of 0.19 Kg/Mg, and is saline-alkaline. The 2C3 horizon, from 44 to 60 inches, has silt loam texture, a poor/unsuitable rated EC value of 15, poor rated SAR of 14.7, and an unsuitable rated Se value of 0.20 Kg/Mg. The 2C4g horizon, from 60 to 76 inches, has silty clay loam texture, a poor rated EC value of 9.8, and an unsuitable rated Se value of 0.11 Kg/Mg. The 2C5g horizon, in two layers from 76 to 95 and 95 to 120 inches, has silty clay loam to silt loam texture, respectively, and has suitable rated EC and SAR values. It has, however, an unsuitable rated Se value, from 76 to 95 inches in depth, of 0.14 Kg/Mg. The 95 to 120-inch depth has a suitable rated Se value of 0.08 Kg/Mg. The profile below 44 inches is considered saline.

NEICO 10 is mottled with a mix of high-chroma and low-chroma colors from 44 inches to 60 inches. The soil from 60 to 76 inches has a low-chroma matrix (10YR 4/1) with some 10YR 4/4 mottles. Free water was seeping into the pit beginning at about 76 inches at the time of sampling and water filled the pit to the 103-inch depth the next day.

Based on site-specific data, NEICO 10 (Billings silt loam, saline-alkaline) is unsuitable for salvage given the thin surface layer of 4 inches which is suitable but the entire profile between 4 and 95 inches has largely unsuitable rated EC, SAR, and Se values.

NEICO 12 - Slickspots (15% Inclusion in Map Unit 93N)

Soil Classification

NEICO 12 is located in a small "slickspot" area nearby to NEICO 10. As described for NEICO 11, slickspots are irregularly shaped barren or nearly barren areas that have a very strongly alkaline, nearly impervious surface layer. By NRCS convention, slickspots are miscellaneous areas and are not classified nor correlated to a soil series name.

Soil Description and Salvage Suitability

Slickspots constitute approximately 15% of Map Unit 93N (the other 85% is the NEICO 10 Billings, saline-alkaline soil). NEICO 12 was described and sampled to a depth of 17 inches which included a 3-inch surface layer and a 3 to 17-inch underlying layer. Texture was loam in the surface and silty clay loam for the underlying layer. The surface is covered with a white salt efflorescence and all of the soil to the 17-inch depth turns white upon drying. NEICO 12 has an unsuitable rated EC value of 29.7 and SAR value of 107.9 for the surface layer. The underlying layer also has an unsuitable rated EC value of 30.8 and SAR value of 91.5. Both horizons have suitable rated Se and B values.

Based on site-specific data, NEICO 12 slickspots within Map Unit 93N are rated unsuitable for salvage throughout the 0 to 17-inch depth. The underlying material was not sampled, and may or may not be suitable for selective depth salvaging.

Persayo-Chipeta Complex, Map Unit 80

A small portion of "Area E" on the western side contains Map Unit 80 (Persayo-Chipeta Complex). This map unit is on a low shale hill with slopes of 2 to 10%. These soils were observed in the artificial cut on the west end of the ditch separating "Area

E" from the slurry ponds to the south. Both Persayo and Chipeta are shallow, well drained fine-textured soils forming in residuum and some alluvium from shale. Depth to shale ranges from 10 to 20 inches. These soils are too shallow for salvage given that sufficient soil should remain to provide an adequate growth medium after salvaging.

Summary of Suitable Soil Salvage Depths

The following list summarizes the maximum depth of suitable soil that could be salvaged in "Area E":

- Map Unit 55 (NEICO 8, Hunting): 0"
- Map Unit 93 (NEICO 9, Ravola): 10" (over 85% of MU93)
- Map Unit 93 (NEICO 11, Slickspot): 0" (15% of MU93)
- Map Unit 93N (NEICO 10, Billings): 0" (85% of MU93N)
- Map Unit 93N (NEICO 12, Slickspot): 0" (15% of MU93N)
- Map Unit 80 (Persayo-Chipeta): 0"

Based on planimetry of the Soils Map, Map Unit 93 (Ravola) constitutes approximately 57.3% (36.5 acres) of the 63.7 acre "Area E". Unsuitable slickspot inclusions approximate 15% of Map Unit 93 but are highly visible and could be flagged and avoided during salvage operations. As a result, 85% of the 36.5 acres could be salvaged to 10 inches. This equals approximately

41,544.6 cubic yards of suitable, available topsoil that could be salvaged from "Area E", if needed, and still leave a minimum of 18" of suitable topsoil to provide a sufficient growth medium for revegetation of "Area E" after salvaging.

Topsoil required (4 ft Thick)	59113 cy
available soil	1500 cy
required borrow	57613 cy

References

Jensen, Earl H. and James W. Borchert. 1988. Soil Survey of Carbon Area, Utah.

Leatherwood James and Dan Duce. April 1988. Guidelines for Management of Topsoil and Overburden for Underground and Surface Coal Mining. State of Utah Department of Natural Resources Division of Oil, Gas, and Mining. Salt Lake City, Utah.

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Soil Survey Staff. 1993. Soil Survey Manual. Agricultural Handbook 18. USDA-NRCS. Issued October, 1993.

Soil Survey Staff. 1993. National Soil Survey Handbook. Title 430-VI. USDA-NRCS. U.S. Government Printing Office, Washington, D.C.

7th Sample Period

APPENDIX A

FIELD SOIL PROFILE DESCRIPTIONS

Soil Series Hunting, saline-alkaline Map Unit 55 File No. NE CO-8

Classification Fine-silty, mixed (calcareous), mesic Oxyaquic Ustifluvent Date 4-11-96

Location: T. R. Section By: J. Nyenhuis
in Topsoil Borrow Area "E"
Photo yes

Vegetation weeds, forbs; weedy cover = ~30%
Was cleared and plowed in part (not plowed in many years) surface irrigation not active for many years

Range Site

Surface Conditions: no coarse frags on surface

Physiography on gentle alluvial fan-terrace

Salt or Alkali saline-alkaline 14 to 93"

Parent Material mixed alluvium

Stoniness < 2% gravel on surface

Elevation ~ 5380'

Ground Water deep

Slope 1%

Drainage mod well drained

Control Section: Fine-silty

Aspect SW

Permeability slow (from 50 to 70")

% Clay ~ 22%

Erosion some prairie dog burrows & mounds

Profile moisture

% Coarser than VFS

Soil Temperature Regime

Soil Moisture Regime ustic (14-50 sl. moist; 50-70 moist; 70+ very moist)

% Coarse Fragments

* no water in pit next day

Additional Notes:
texture contrast at 14"
70-93 low chroma matrix w 10YR 4/1 (moist) spots (15%)
29-50 has few faint high chroma mottles
50-70 low chroma matrix with 15% gravel, few high chroma mottles
(major rooting depth MRD = 0 to 29")

Horizon	Depth	Color Dry	Color Moist	Texture	Structure	Consistence Dry	Consistence Moist	Consistence Wet	Clay Films	Roots	Coarse Frag.	pH	Eff. Effer.	Bound-ary
A	0-5	10YR 5/2	10YR 4/2	26 Silt Loam	MMPL	SH	FR	S/P	—	Com F,VF Few M	<1% GR	7.6	EM+	GS
S BC	5-14	10YR 6/2	10YR 5/2, 4/2	24 Silt Loam	MM SBK	H	FR	S/P	—	Com F,VF Few M	1GR	7.8	ES	CW
SA C1	14-29	10YR 5/4 6/4	10YR 4/3	Fine 19 Sandy Loam	Massive	H	FR	SS/SP	—	Com F,VF Few M,Co	1GR	7.8	ES	GW
SA C2	29-50	W 10YR 6/4 5/4	10YR 4/3	23 Silt Loam	Massive	H	FI	S/SP	—	Few F,M, F,VF	1GR	7.9	ES	GW
SA C3	50-70	W 10YR 6/2	10YR 3/3	29 Silty Clay Loam	Massive	VH	FI	VS/P	—	Few Fine F,VF	1GR	7.6	ES	GW
SA C4	70-93	10YR 5/3	10YR 3/3	29 Silty Clay Loam	Massive	VH	FI	S/VP	—	Few F,VF	1GR	8.0	ES	GW
S C5	93-122	10YR 5/3	10YR 4/3	21 Loam	Massive	H	FR	SS/P	—	Few F,VF	1GR	7.9	GS	—

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UTAH DIVISION OF OIL, GAS & MINING

94B

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL DESCRIPTION

SCS - SOI - 232 G
Rev. 2 - 81

Soil type RAVOLA — Map Unit 93 — File No. NEICO-9

Area Borrow Area E — Date 4-11-96 — Stop No. .

Classification Fine-silty, mixed (calcareous), mesic Typic Torrifluvent — by: J. Nyenhuis

Location in Typoid Borrow Area "E" — weedy cover = ~30%

N. veg. (or crop) weeds — old field (same as NEICO-8) — Climate mesic, xeric

Parent material mixed alluvium

Physiography alluvial fan-terrace

Relief none — Drainage well — Salt or alkali profile saline

Elevation ~ 5381' — Gr. water deep — Stoniness —

Slope 1 % — Moisture dry to 50" sl. moist 50-72, moist below 72"

Aspect SW — Root distrib. MRD 0-28 — % Clay * 17 to 18 %

Erosion slight (prairie dog burrows) — % Coarse fragments * see below — % Coarser than V.F.S. *

Permeability moderate

Additional notes

observed pit next day — no water in pit

72-94 10YR 4/3 matrix (moist) with 10YR 4/1 spots (20%) texture SL in some Silt Loam bulks

* Control section average

Horizon	Depth	Color Dry	Color Moist	Texture	Structure	Consistence Dry	Consistence Moist	Consistence Wet	Reaction	Boundary	Co. Frags	Roots	pH
A_p	0-4	10YR 4/2, 5/3	10YR 3/2, 3/3	Fine 17 Sandy Loam	MM PL	SH	FR	SS/SP	EM	CW	1 GR	Com F VF, Few M	7.6
S BC	4-19	10YR 5/3	10YR 4/3	Fine 17 Sandy Loam	MM SBK	H	FR	SS/SP	EM+	CW	1 GR	Com to few F VF, few M	8.0
S C1	19-28	10YR 6/3, 5/3	10YR 4/2	Silt 18 Loam	Massive	H	FR	SS/P	EM	GW	1 GR	Few MF, VF	7.8
S C2	28-50	10YR 5/3	10YR 4/3	Sandy 17 Loam	Massive	H	FR	SS/SP	EM+	GW	1 GR	Few F, VF	7.7
S C3	50-72	10YR 5/3	10YR 4/2, 4/3	Sandy 17 Loam	Massive	H	FR	SS/SP	ES	CW	5 GR	Few VF	7.8
S 2C4	72-94	10YR 5/3	10YR 4/3	Gravelly 19 Sandy Loam	Massive	SH	FR	SS/P	ES	GW	20 GR, 1 CB	-	7.6
2C5	94-123	10YR 4/3 dark	10YR 3/3	Very 6 Gravelly LS - 8	Massive/ SG	SH	FR	SS/NP	ES	GW	35 GR, 2 CB	-	7.9

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SOIL DESCRIPTION

SCS - SOI - 232 G
Rev. 2 - 81

NEICO-10
File No.

Soil type Billings saline-alkaline Map Unit 93N

Area in Topsoil Borrow Area E | Date 4-11-96 | Stop No.

Classification Fine-silty, mixed Calcareous, mesic Typic Torrifluvent | By: J. Nyenhuis

Location in undisturbed area (not part of old fields)

N. veg. (or crop) Greasewood, rabbitbrush, forbs, weeds | Climate mesic, natic

Parent material mixed alluvium

Physiography mixed alluvium over fine textured alluvium

Relief none | Drainage mod. well to somewhat poorly | Salt or alkali saline-alkaline from 4 to 44"

Elevation ~ 5379' | Gr. water see * | Stoniness —

Slope 1 to 3% | Moisture dry 0-25, sl. moist 25-60, moist 60-76, free water at 76

Aspect SW | Root distrib. MRD 0-25" | % Clay *

Erosion slight | % Coarse fragments * | % Coarser than V.F.S. *

Permeability very slow at 25 to 44" ← see below

Additional notes

next day salts on wall of pit 10-44"

44-60 mottled (fluctuating zone — high chroma matrix with many colors of high chroma and low chroma

* free water at ~ 76" next day bottom of pit has water at 103"
60-76 mottled low chroma matrix 10YR 4/1 with 10YR 5/4 mottles

* Control section average

Horizon	Depth	Color Dry	Color Moist	Texture	Structure	Consistence Dry	Consistence Moist	Consistence Wet	Reaction	Boundary	Co Frag	pH	Roots
S A	0-4	10YR 5/3	10YR 3/3	Silt Loam 26	M Co Pl	H	FR	S/SP	EM+	CS	1GR	7.7	Few F, VF
SA BC	4-10	W 10YR 5/3	10YR 3/3	Silt Loam 24	M M SBK	H	FR	S/P	EM+	GW	1GR	7.2	Com F, VF Few M
SA C1	10-25	W 10YR 5/4	10YR 4/3	Silt Loam 24	Massive	H	FR	S/P	ES	CW	1GR	8.4	Com F, VF Few M
SA 2C2	25-44	10YR 5/3	10YR 4/2	Silty Clay 45	Massive	VH	FI	VS/VP	ES	GW	-	8.2	Few M, F, VF
S 2C3	44-60	10YR 5/3	10YR 4/2	Silt Loam 26	Massive	H	FR	VS/P	EM+	GW	-	8.2	Few M, F, VF
S 2C4g	60-76	10YR 5/2	10YR 4/1, 4/4	Silty Clay Loam 32	Massive	VH	FI	S/VP	EM+	GW	-	8.1	Few F, VF
S 2C5g	76-95	10YR 5/3	10YR 4/3	Silty Clay Loam 30	Massive	VH	FI	VS/VP	ES	GW	-	7.9	
S 2C5g	95-120	10YR 4/3	10YR 3/3	Silt Loam 24	Massive	H	FI	SS/SP	ES	—	-	7.7	-

96B

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL DESCRIPTION

SCS - SOI - 232 G
Rev. 2 - 81

Soil type Slickspot (inclusion in Map Unit 93) 15%

NEICO-11
File No.

Area in Topsoil Borrow Area "E" | Date 4-11-96 | Stop No.

Classification Not classified | By: J. Nyenhuis

Location ~250' NW of NEICO9

N. veg. (or crop) nearly bareen in slickspot area itself | Climate mesic, xeric

Parent material mixed alluvium

Physiography nearly flat alluvial fan

Relief none	Drainage well	Salt or alkali saline-alkaline
Elevation ~5381	Gr. water deep	Stoniness —
Slope 1%	Moisture slightly moist	
Aspect SW	Root distrib. few F, VF	% Clay * ~31%
Erosion slight	% Coarse fragments * —	% Coarser than V.F.S. *
Permeability slow		

Additional notes

* Control section average

Horizon	Depth	Color Dry	Color Moist	Texture	Structure	Consistence Dry	Consistence Moist	Consistence Wet	Reaction	Boundary	pH
AC	0-3	10YR 6/2	10YR 4/2	30 Silty Clay Loam	MCOPL	H	FI	S/P	EM	CW	8.6
C1	3-16	10YR 5/3	10YR 4/3	32 Silty Clay Loam	Massive	H	FI	VS/SP	ES	G-W	8.9

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SOIL CONSERVATION SERVICE

SOIL DESCRIPTION

SCS - SOI - 232 G
Rev. 2 - 81

NEICO-12
File No.

Soil type Slickspot (15% inclusion in Map Unit 93N)

Area in Topsoil Borrow Area "E" | Date 4-11-96 | Stop No.

Classification not classified | By: J. Nyenhuis

Location nearby to NEICO 10

N. veg. (or crop) nearby - barren | Climate mesic, ustic

Parent material mixed alluvium

Physiography nearly flat alluvial fan

Relief none | Drainage well | Salt or alkali saline-alkaline

Elevation ~ 5379 | Gr. water deep | Stoniness —

Slope 1 % | Moisture slight moist

Aspect SW | Root distrib. few F, VF | % Clay * ~30 %

Erosion slight | % Coarse fragments * — | % Coarser than V.F.S. *

Permeability slow

Additional notes

* Control section average

Horizon	Depth	Color Dry	Color Moist	Texture	Structure	Consistence Dry	Consistence Moist	Consistence Wet	Reaction	Boundary	pH
Ac	0-3	10YR 6/2	10YR 3/2	26 Loam	MCOPL	H	FR	S/P	EM+	CW	8.4
C1	3-17	10YR 5/3	10YR 4/3	32 Silty Clay Loam	Massive	H	FI	VS/SP	EM+	GW	8.5

SOIL PROFILE DESCRIPTION FOOTNOTES LEGEND

Soil type		Date	Step No.
Classification 1			Area
Location			Elev.
N. veg. (or crop)			Climate
Parent material			
Physiography			
Relief	Drainage	Salt or alkali	
Elevation	Gr. water	Stoniness	
Slope	Moisture		
Aspect	Root distrib. 7		
Erosion			
Permeability			
Additional notes			

SCS-232A-Soil Description—Rev.

2 Horizon	Depth	4 Color Dry	Color Moist	8 Co. Frag. Texture 3	5 Structure	6 Consistence d'Dry	Consistence Moist	Consistence Wet	9 Reaction	10 Boundary

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SOIL PROFILE DESCRIPTIONS FOOTNOTES

[1] Soil Series, and Soil Classification according to current SCS information. Soil classification based on Keys to Soil Taxonomy, fifth edition (Soil Survey Staff 1992).

[2] Horizon and Depth based on site-specific conditions at the sample location.

[3] Texture and texture modifier abbreviations:

S	Sand	SCL	Sandy Clay Loam	CB	Cobbly	GR	Gravely
LS	Loamy Sand	CL	Clay Loam	CBV	Very Cobbly	GRV	Very Gravely
SL	Sandy Loam	SICL	Silty Clay Loam	CBX	Extremely Cobbly	GRX	Extremely Gravely
L	Loam	SIC	Silty Clay	CN	Channery	SH	Shaley
SIL	Silt Loam	C	Clay	CNV	Very Channery	SR	Stratified
SI	Silt			CNX	Extremely Channery		

[4] Color, Dry and Moist: Munsell Soil Color Chart, 1975 Edition.

[5] Structure:

Grade	Size	Type
W Weak	VF Very Fine	PL Platy
M Moderate	F Fine	GR Granular
S Strong	M Medium	SBK Subangular Blocky
	CO Coarse	ABK Angular Blocky
	VCO Very Coarse	PR Prismatic
		W Massive Weak Massive
		Massive
		S Massive Strong Massive
		SG Single Grained
		Cloddy

[6] Consistency:

Dry		Moist		Wet	
LO	Loose	LO	Loose	NS	Non Sticky
SO	Soft	VFR	Very Friable	SS	Slightly Sticky
SH	Slightly Hard	FR	Friable	S	Sticky
H	Hard	FI	Firm	VS	Very Sticky
VH	Very Hard	VFI	Very Firm	NP	Non Plastic
EH	Extremely Hard	EFI	Extremely Firm	SP	Slightly Plastic
				P	Plastic
				VP	Very Plastic

[7] Roots:

Number	Type	
Very Few	VF	Very Fine
Few	F	Fine
Com (Common)	M	Medium
Many	CO	Coarse

Roots are described in terms of a specified size (type) and quantity (number). The size classes are:

Very Fine: Less than 1 mm in diameter
Fine: 1 to 2 mm in diameter
Medium: 2 to 5 mm in diameter
Coarse: 5 mm or larger in diameter
Roots larger than 10 mm in diameter may be described separately.

Quantity classes or roots are defined in terms of numbers of each size per unit area--1 square centimeter for very fine and fine roots, and 1 square decimeter for medium and coarse roots. All roots smaller than 10 mm in diameter are described in terms of the following quantity classes:

Few: Less than 1 per unit area of the specified size
Common: 1 to 5 per unit area of the specified size
Many: More than 5 per unit area of the specified size
Roots are described as to number first, and type second.

[9] Coarse Fragments: All coarse fragment percentages (% by volume) are taken from the field soil profile descriptions. Lithologic modifier types (gravelly, channery, etc.) are also taken from the field soil profile description forms for each sampled profile.

[9] Reaction:

Effervescence	
EO	Non-Effervescent
SE	Slightly Effervescent
EM	Moderately Effervescent
ES	Strongly Effervescent
EV	Violently Effervescent

Reaction		pH
Str. Acid	Strongly Acid	5.1 - 5.5
Mod. Acid	Moderately Acid	5.6 - 6.0
Sl. Acid	Slightly Acid	6.1 - 6.5
Neutral	Neutral	6.6 - 7.3
Mild. Alk.	Mildly Alkaline	7.4 - 7.8
Mod. Alk.	Moderately Alkaline	7.9 - 8.4
Strong Alk.	Strongly Alkaline	8.5 - 9.0
Very Strong Alk.	Very Strongly Alkaline	>9.0

[10] Horizon Boundaries:

Distinctness

A	Abrupt (<2 cm thick)
C	Clear (2 to 5 cm thick)
G	Gradual (5 to 15 cm thick)
D	Diffuse (>15 cm thick)

Topography

S	Smooth (the boundary is a plane with few or no irregularities)
W	Wavy (the boundary has undulations in which depressions are wider than they are deep)
I	Irregular (the boundary has pockets that are deeper than they are wide)
B	Broken (at least one of the horizons or layers separated by the boundary is discontinuous and the boundary is interrupted).

7th Sample Period

APPENDIX B

SOIL PROFILE/SOIL LANDSCAPE PHOTOGRAPHS

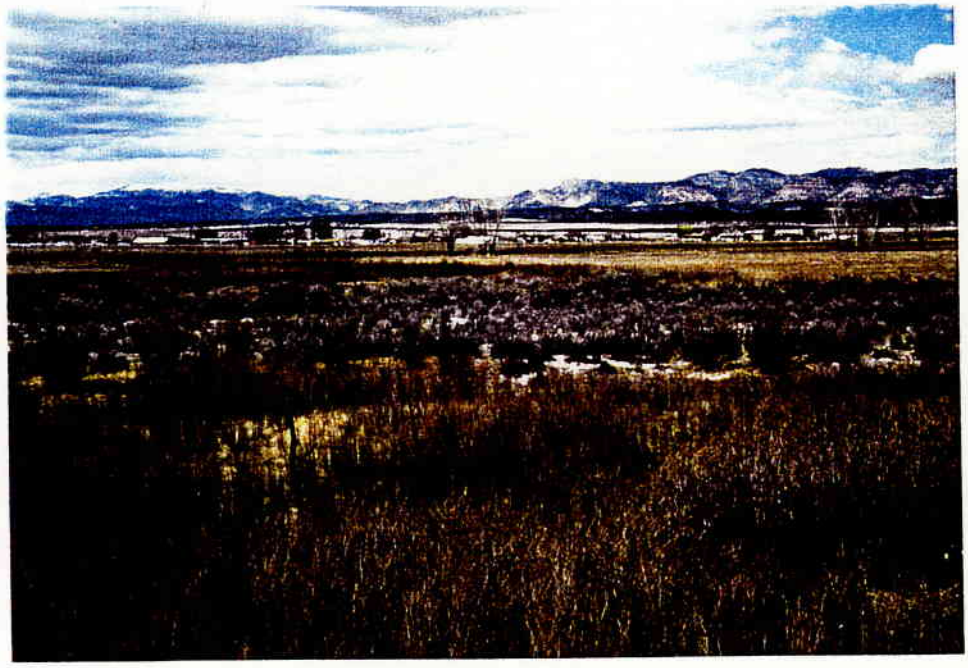


Figure 1. View of Area E. Picture taken from south border of Area E looking north. NEICO-10 located in greasewood-saltbush area in middle. NEICO-9 located in weedy field in right background.

Figure 2. View of Area E. Picture taken west of previous view, also from south border looking north. Greasewood-saltbush area in middleground shows slickspots. Immediate foreground shows salty disturbed area associated with ditch north of slurry ponds.

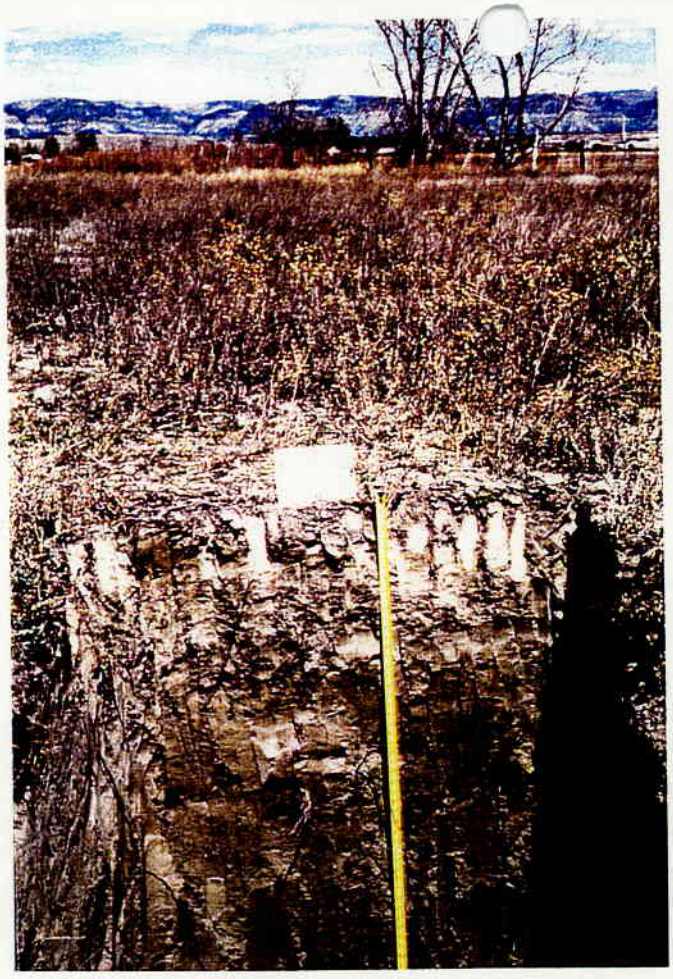


Figure 3. NEICO-8. Soil/Landscape of Hunting silt loam, saline-alkaline, 1 to 2% slopes, Map Unit 55.

Figure 4. NEICO-8. Closeup of Hunting silt loam soil profile.

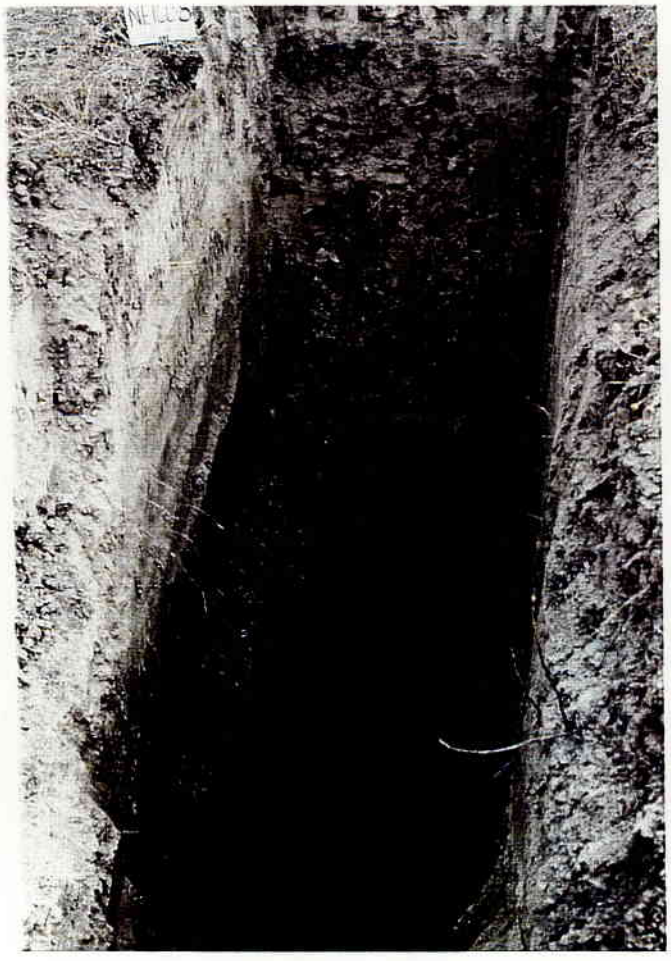


Figure 5. NEICO-8, Hunting silt loam. View of backhoe pit dug to 10+ feet. Lower soil material is slightly darker in color but not as dark as as indicated due to darkness of pit when photographed (no flash). No free water was present in the pit more than a day after the pit was dug.

WEB

Figure 6. NEICO-9. Soil/Landscape of Ravola fine sandy loam, 1 to 2% slopes, Map Unit 93.

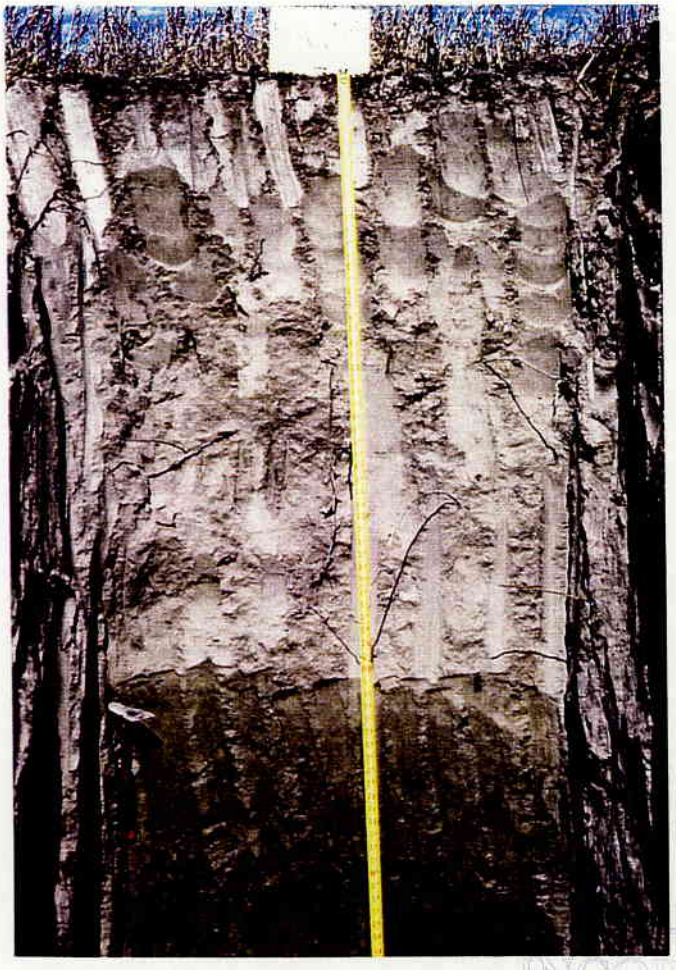


Figure 7. NEICO-9. Closeup of Ravola fine sandy loam soil profile.

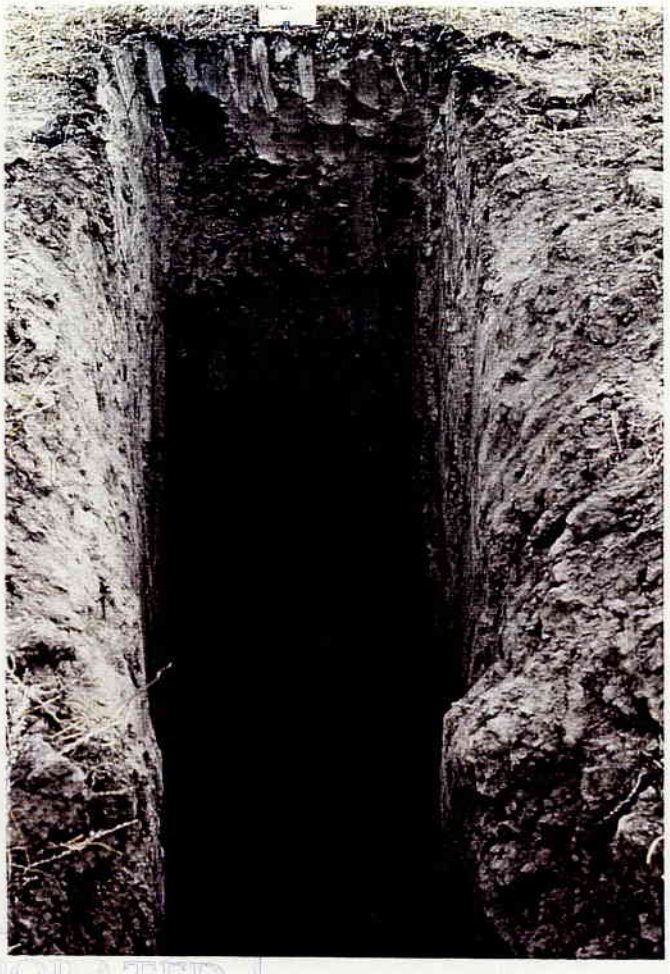


Figure 8. NEICO-9. View of Ravola backhoe pit dug 10+ feet. As in Figure 5 lower soil material is not as dark as indicated due to no flash on the camera. No free water was present in the pit the next day.

WEB

Figure 9. NEICO-10. Soil/Landscape of Billings silty clay loam, saline-alkaline 1 to 2% slopes, Map Unit 93N.

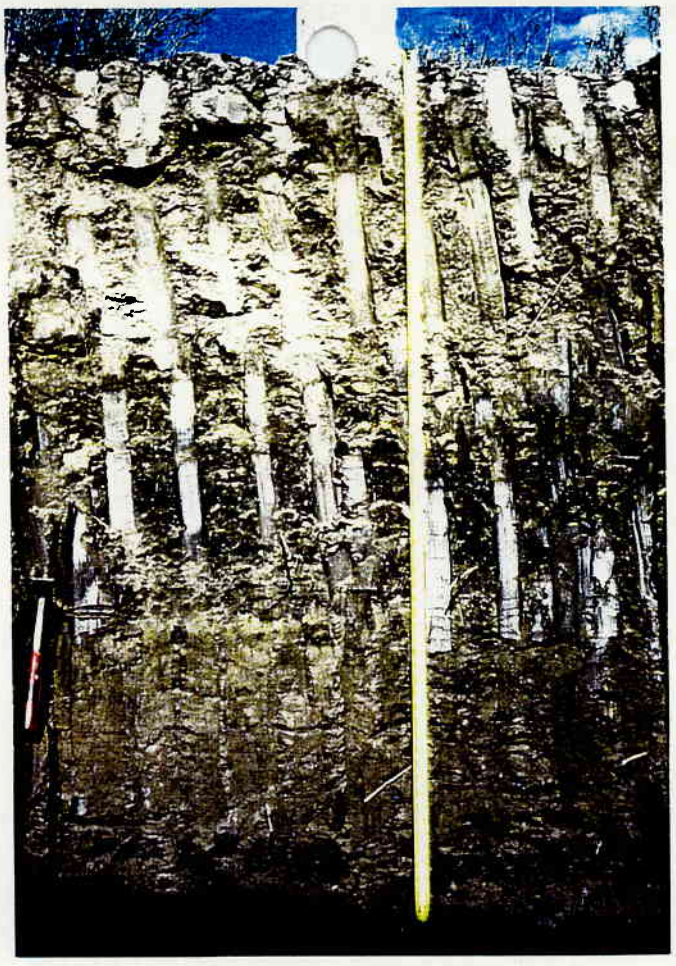


Figure 10. NEICO-10. Closeup of Billings silty clay loam, saline-alkaline.

Figure 11. NEICO-10. View of Billings backhoe pit dug to 10+ feet. Lower soil material is darker due in part to wetness. Free water was at 76" at the time the pit was dug.

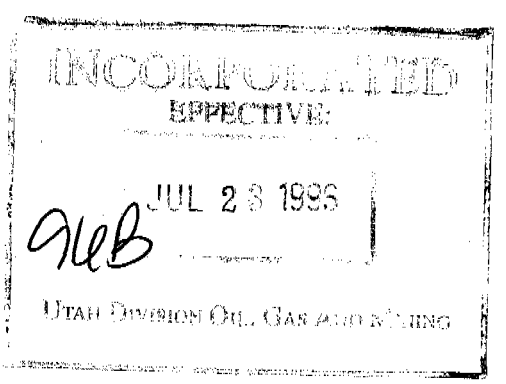
Figure 12. NEICO-11. Slickspot inclusion in Map Unit 93, about 250 feet northwest of NEICO-9.

Figure 13. Slickspot inclusion in Map Unit 93N, nearby to NEICO-10.

7th Sample Period

APPENDIX C

SOIL LABORATORY DATA



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For: Patrick Collins
Mt. Nebo Scien[illegible]
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Colorado State University
Soil, Water and Plant Testing Laboratory
Natural & Environmental Sciences Bldg - A319
Fort Collins, CO 80523

(970) 491-5061 FAX: 491-2930

DATE RECEIVED: 04-17-96
DATE REPORTED: 04-23-96

BILLING:

RESEARCH SOIL ANALYSIS

Lab #	Sample ID #		Paste pH	mmhos/cm EC	meq/l Ca	meq/l Mg	meq/l Na	meq/l K	SAR	mg/kg AB-DTPA EXTRACT Se	mg/kg Hot Water B
R7586	NEICO-8	0-6"	7.6	1.6	6.5	4.9	4.1	2.0	1.7	0.09	1.84
7587	NEICO-8	5-14"	7.8	1.6	25.4	42.8	41.7	0.2	7.1	0.12	0.40
7588	NEICO-8	14-29"	7.8	12.1	25.9	60.0	106.6	0.4	16.3	0.08	0.50
7589	NEICO-8	29-50"	7.9	14.9	19.0	58.4	164.3	0.6	26.4	0.21	2.23
7590	NEICO-8	50-70"	7.6	15.5	36.9	60.0	180.0	0.7	25.8	0.19	2.33
7591	NEICO-8	70-93"	8.0	14.1	31.4	90.5	140.6	0.8	18.0	0.13	2.44
7592	NEICO-8	93-122"	7.9	5.4	27.9	38.7	20.1	0.4	3.5	0.03	1.11
7593	NEICO-9	0-4"	7.6	1.7	7.5	5.1	6.0	2.0	2.4	0.04	1.64
7594	NEICO-9	4-19"	8.0	9.0	24.0	39.5	69.5	2.8	12.3	0.09	1.55
7595	NEICO-9	19-28"	7.8	11.9	30.9	58.4	90.7	1.7	13.6	0.09	2.27
7596	NEICO-9	28-50"	7.7	7.4	29.9	44.4	42.0	0.5	6.9	0.16	1.11
7597	NEICO-9	50-72"	7.8	7.2	11.5	17.3	20.5	0.3	5.4	0.13	0.82
7598	NEICO-9	72-94"	7.6	6.0	23.0	20.6	32.6	0.4	7.0	0.09	0.49
7599	NEICO-9	94-123"	7.9	2.4	10.0	9.0	10.6	0.2	3.4	0.11	0.33
7600	NEICO-10	0-4"	7.7	6.1	30.9	14.8	38.1	3.1	8.0	0.09	2.27
7601	NEICO-10	4-10"	7.2	20.8	31.9	72.4	336.4	3.1	46.6	0.03	1.48
7602	NEICO-10	10-25"	8.4	24.3	24.5	98.7	267.9	1.8	34.1	0.11	0.86
7603	NEICO-10	25-44"	8.2	24.2	29.4	139.8	280.3	0.9	30.5	0.19	2.73
7604	NEICO-10	44-60"	8.2	15.0	29.9	106.9	122.0	0.9	14.7	0.20	1.62
7605	NEICO-10	60-76"	8.1	9.8	26.9	73.2	61.1	0.6	8.6	0.11	1.57
7606	NEICO-10	76-95"	7.9	5.3	28.9	41.9	19.0	0.4	3.2	0.14	1.37
7607	NEICO-10	95-120"	7.7	4.4	33.9	27.1	13.8	0.4	2.5	0.08	0.80
7608	NEICO-11	0-3"	8.6	38.4	13.0	16.4	528.4	11.0	137.8	0.09	1.20
7609	NEICO-11	3-16"	8.9	30.4	2.3	13.2	439.9	6.4	158.2	0.05	2.09
7610	NEICO-12	0-3"	8.4	29.7	20.5	31.3	548.9	6.9	107.9	0.08	2.20

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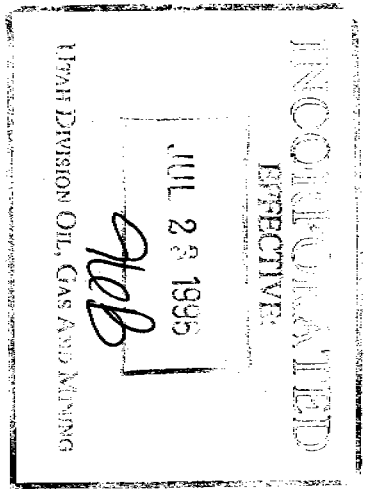
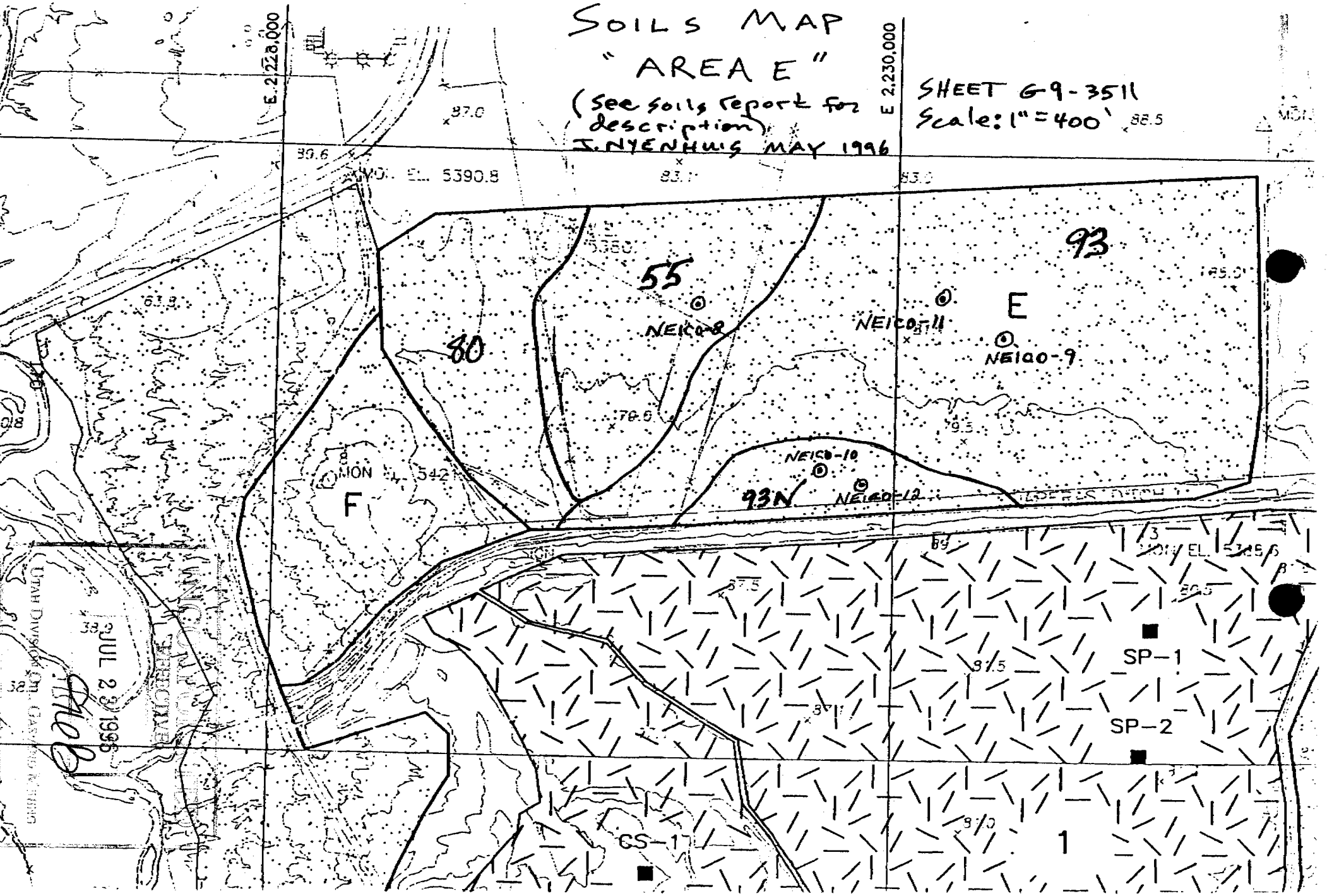
R7611	NEICO-12 3-17"	8.5	30.8	4.7	82.2	603.7	7.4	91.5	0.09	1.96

Certified By

James R. Self, PH. D.
Director
Colorado State University Soil, Water, and Plant Testing Laboratory

169




SOILS MAP
"AREA E"
(See soils report for description)
J. NYENHUIS MAY 1996
SHEET G-9-3511
Scale: 1" = 400'
E 2,220,000
E 2,230,000
55
93
80
E
F
NEI00-8
NEI00-11
NEI00-9
NEI00-10
NEI00-12
93N
SP-1
SP-2
GS-1
1
JUL 23 1996