MOUNTAIN COAL COMPANY

APPLICATION
FOR
PHASE II BOND RELEASE

HUNTINGTON CANYON NO. 4 MINE

INA/015/004

Mountain Coal Company
West Elk Mine
Post Office Box 591
Somerset, Colorado 81434
Telephone 303 929-5015
Fax 303 929-5595

December 6, 1993

Mr. Lowell Braxton, Administrator
Division of Oil, Gas and Mining
355 West North Temple
3 Triad Center, Suite 350
Salt Lake City, Utah 84180-1203

Re: Application for Partial Bond Release
Huntington Canyon No. 4 Mine
INA/015/004, UT-004
Emery County, Utah

Dear Mr. Braxton,

Mountain Coal Company has completed Phase II of the approved reclamation plan for the Huntington Canyon No. 4 Mine. This is based upon the establishment of revegetation and sediment control in accordance with the approved reclamation plan, as verified in the attached 1993 Vegetation Monitoring Report and Sediment Production Evaluation.

In accordance with the provisions of R645-301-880, Mountain Coal Company is hereby applying for partial release of the performance bond. The original bond posted for this property was $216,062.40, (60%) was released on November 10, 1986 upon approval of Phase I Bond Release. The present bond posted for this site is $144,041.60. Mountain Coal Company is hereby applying for release of an additional 30% of the original bond, or $108,031.20. This will leave an amount of $36,010.40 to be held until final bond release. The disturbed area for this site was 12.29 acres, with an affected area of approximately 37 acres. The remaining bond would provide for approximately $2,930.06/acre of disturbed area or $973.25/acre of affected area.

Copies of letters for notification to land owners, agencies, and water companies in the area are enclosed. A copy of the newspaper advertisement placed prior to submittal of this application is enclosed. This advertisement ran for four consecutive weeks in the local area papers. Proof of publication is also enclosed.

It is our hope this application will meet with your approval. If you have any questions, or need any further information, please let me know.

Respectfully,

Dan W. Guy

Dan W. Guy, P.E.
for Kathleen G. Welt

Encl.

cc: Scot Anderson
Kathy Welt
File

Mountain Coal Company
West Elk Mine
Post Office Box 591
Somerset, Colorado 81434
Telephone 303 929-5015
Fax 303 929-5595

December 6, 1993

Mr. Reed C. Christensen
Forest Supervisor
U.S. Forest Service
599 West Price River Drive
Price, Utah 84501

Re: Notification of Application for Partial Bond Release
Huntington Canyon No. 4 Mine
INA/015/004, UT-004
Emery County, Utah

Dear Mr. Christensen,

Mountain Coal Company has completed Phase II of its approved reclamation plan for the Huntington Canyon No. 4 Mine. This is based upon the establishment of revegetation in accordance with the approved reclamation plan.

In accordance with the provisions of R645-301-880 of the Utah Coal Mining Reclamation Act, this letter will serve as notification that Mountain Coal Company intends to file an application with the Utah Division of Oil, Gas and Mining for partial release of the performance bond.

The original bond posted for this property was $360,104.00, of which $216,062.40 (60%) was released on November 10, 1986 upon approval of Phase I Bond Release. The present bond posted for this site is $144,041.60. Mountain Coal Company is seeking release of an additional 30% of the original bond, or $108,031.20.

If you have any questions, or need any further information, please let me know.

Respectfully,

Dan W. Guy, P.E.
for Kathleen G. Welt

cc: Kathy Welt
File

Mountain Coal Company
West Elk Mine
Post Office Box 591
Somerset, Colorado 81434
Telephone 303 929-5015
Fax 303 929-5595

December 6 1993

Emery County Commission
95 East Main Street
Castle Dale, Utah 84513

Re: Notification of Application for Partial Bond Release
Huntington Canyon No. 4 Mine
INA/015/004, UT-004
Emery County, Utah

Gentlemen:

Mountain Coal Company has completed Phase II of its approved reclamation plan for the Huntington Canyon No. 4 Mine. This is based upon the establishment of revegetation in accordance with the approved reclamation plan.

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cc: Kathy Welt
File

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West Elk Mine
Post Office Box 591
Somerset, Colorado 81434
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December 6, 1993

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Division of Oil, Gas and Mining
355 West North Temple
3 Triad Center, Suite 350
Salt Lake City, Utah 84180-1203

Re: Notification of Application for Partial Bond Release
Huntington Canyon No. 4 Mine
INA/015/004, UT-004
Emery County, Utah

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Dan W. Guy

Dan W. Guy, P.E.
for Kathleen G. Welt

cc: Kathy Welt
File

Mountain Coal Company
West Elk Mine
Post Office Box 591
Somerset, Colorado 81434
Telephone 303 929-5015
Fax 303 929-5595

December 6, 1993

Mr. Darrell Leamaster
Castle Valley Special Service Dept.
P.O. Box 553
Castle Dale, UT 84513

Re: Notification of Application for Partial Bond Release
Huntington Canyon No. 4 Mine
INA/015/004, UT-004
Emery County, Utah

Dear Mr. Leamaster,

Mountain Coal Company has completed Phase II of its approved reclamation plan for the Huntington Canyon No. 4 Mine. This is based upon the establishment of revegetation in accordance with the approved reclamation plan.

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Dan W. Guy

Dan W. Guy, P.E.
for Kathleen G. Welt

cc: Kathy Welt
File

PUBLIC NOTICE

Huntington Canyon No. 4 Mine
Permit #INA/015/004

Mountain Coal Company
P.O. Box 591
Somerset, Colorado 81434

Application for Partial Release of Performance Bond

Mountain Coal Company completed reclamation Phase I at its Huntington Canyon No. 4 Mine during the period of August 15, 1985 through September 30, 1985. Phase I Bond Release was granted on November 10, 1986. The company has now completed reclamation Phase II, which is based on establishment of revegetation in accordance with the approved reclamation plan.

In accordance with the provisions of R645-301-880, of the Utah Coal Mining Rules, notice is hereby given to the general public that Mountain Coal Company is applying for partial release of the performance bond posted for this operation.

The original bond posted for this property was $360,104.00, of which $216,062.40 (60%) was release on November 10, 1986 upon approval of Phase I Bond Release. The present bond posted for this site is $144,041.60. Mountain Coal Company is seeking release of an additional 30% of the original bond, or $108,301.20.

The Huntington Canyon No. 4 Mine is located in Mill Fork Canyon, approximately 35 road miles southwest of Price, Utah. The following are the legal descriptions of the permit area:

Township 16 South, Range 7 East, SLBM, Utah
Sec. 8: SE 1/4, S 1/2, SE 1/4
Sec. 9: S 1/2 SW 1/4, SW 1/4 SE 1/4
Sec. 16: All of Section
Sec. 17: EW 1/2

The permit area is located on the Rilda Canyon, Utah, U.S. Geological Survey 15 minute quadrangle map.

Federal Coal Leases were #U-33454 and #SL-064903.

The reclamation work was performed on approximately 37 acres of disturbed and affected area located on the following described lands:

Township 16 South, Range 7 East, SLBM, Utah
Sec. 16: SW 1/4 SE 1/4
Sec. 16: S 1/2 SW 1/4
Sec. 17: SE 1/4 SE 1/4

The Division will now evaluate the proposal to determine whether it meets all the criteria of the Permanent Program Performance Standards according to the requirements of the Utah Coal Mining Rules.

Upon completion of the evaluation for said reclamation, a decision will be made as to approval or disapproval of the application. The reclamation plan is available for public review at: Division of Oil, Gas and Mining, 355 West North Temple, 3 Triad Center, Suite 350, Salt Lake City, Utah 84180-1203, and at the Emery County Courthouse, Castle Dale, Utah 84513.

Written comments, objections, and requests for public hearing or informal conference on this proposal may be addressed to the Director of the Division: Mr. Jim Carter, Director, Division of Oil, Gas and Mining, 355 West North Temple, 3 Triad Center, Suite 350, Salt Lake City, Utah 84180-1203, Attention: Mr. Lowell Braxton.

AFFIDAVIT OF PUBLICATION

STATE OF UTAH)
ss.
County of Carbon,)

I, Kevin Ashby, on oath, say that I am the Publisher of the Sun Advocate, a twice-weekly newspaper of general circulation, published at Price, State and County aforesaid, and that a certain notice, a true copy of which is hereto attached, was published in the full issue of such newspaper for Four (4) consecutive issues, and that the first publication was on the

21st day of September, 19 93

and that the last publication of such notice was in the issue of such newspaper dated the

12th day of October, 19 93

Kevin Ashby

Subscribed and sworn to before me this

12th day of October, 19 93

Linda Thayn
Notary Public

My Commission expires January 10, 1995

Residing at Price, Utah

Publication fee, $ 176.00

NOTARY PUBLIC
LINDA THAYN
811 NORTH 10TH EAST
PRICE, UT 84501
My Commission Expires Jan. 10, 1995
State of Utah

PUBLIC NOTICE
Huntington Canyon No. 4 Mine
Permit #INA/015/004
Mountain Coal Company
P.O. Box 591
Somerset, Colorado 81434

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Published in the Sun Advocate September 21, 28, October 5 and 12, 1993.

AFFIDAVIT OF PUBLICATION

.TATE OF UTAH)
ss.
County of Emery,)

I, Kevin Ashby, on oath, say that I am the Publisher of the Emery County Progress, a weekly newspaper of general circulation, published at Castle Dale, State and County aforesaid, and that a certain notice, a true copy of which is hereto attached, was published in the full issue of such newspaper for Four (4) consecutive issues, and that the first publication was on the

21st day of September, 19 93

and that the last publication of such notice was in the issue of ıch newspaper dated the

12th day of October, 19 93

Kevin Ashby

Subscribed and sworn to before me this

12th day of October, 19 93

Linda Thayn
Notary Public

My Commission expires January 10, 1995

Residing at Price, Utah

Publication fee, $ 176.00

NOTARY PUBLIC
LINDA THAYN
811 NORTH 10TH EAST
PRICE, UT 84501
My Commission Expires Jan. 10, 1995
State of Utah

PUBLIC NOTICE
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Permit #IN/015/004
Mountain Coal Company
P.O. Box 591
Somerset, Colorado 81434

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Published in the Emery County Progress September 21, 28, October 5 and 12, 1993.

VEGETATION SAMPLING: RECLAIMED AREAS OF THE HUNTINGTON NO. 4 MINE

1993

Prepared by

MT. NEBO SCIENTIFIC, INC.
330 East 400 South, Suite 6
P.O. Box 337
Springville, Utah 84663
(801) 489-6937

for

BLACKHAWK ENGINEERING
Route 1, Box 146-H5
Helper, Utah 84526

November 1993

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VEGETATION SAMPLING:

RECLAIMED AREAS OF THE HUNTINGTON NO. 4 MINE

1993

SCOPE

The following report has been prepared to assess the current condition of the vegetation of reclaimed areas at the Huntington No. 4 Mine. The reclaimed areas were compared with an undisturbed reference area that was used as a standard for revegetation success.

INTRODUCTION

General Site Description

The Huntington Canyon No. 4 Mine is located in Huntington Canyon, Emery County, Utah. The elevation of the area lies between 7,300 ft and 8,000 ft above sea level. Vegetation types adjacent to the mine area vary from pinyon-juniper and mountain brushland on the drier sites, to associated conifers and riparian areas in the more moist regions. The reclaimed areas of the mine

site are on the relatively drier sites with primarily south and southwestern exposures.

The reclaimed areas consisted principally of access roads, portal areas, pads and regraded slopes. The largest surface areas that were reclaimed were the access roads of the mine site.

Quantitative sampling was also conducted by *MT. NEBO SCIENTIFIC, INC.* in the area in 1989 and 1990. Qualitative information was assessed in 1991. No vegetation sampling was conducted in 1992.

METHODS

Methodologies used herein were performed in accordance with the guidelines supplied by the State of Utah, Division of Oil, Gas and Mining (DOGM).

Quantitative and qualitative data were taken on the vegetation of the reclaimed and reference areas. Sampling was conducted July 29-31, 1993. For the purpose of simplicity, the reclaimed areas were divided into two (2) major areas -- the *Lower Reclaimed Areas* and the *Upper Reclaimed Access Road Areas*. Each of those areas consisted of several disturbance types (i.e. roads, pads, portals, regraded slopes, etc.).

Transect and Quadrat Placement

Transect lines for sampling were placed randomly throughout the reclaimed areas resulting in several sample sites in the *Lower Reclaimed Areas* and the *Upper Reclaimed Access Road Areas* (see Sample Map).

Random/regular placement of sampling quadrats were designed to provide unbiased accuracy of the data compiled. Once the transect lines were placed, regular points were then marked on them. From these marks, a random number dictated the direction and distance to place the quadrats at right angles from the transect lines.

All reclaimed areas were seeded with the same seed mix on a variety of slopes, exposures, soil conditions and water relationships, etc. Data summaries are presented separately and combined in the *Lower Reclaimed Areas* due to heterogeneity of this area. Since all the *Upper Reclaimed Access Road Areas* were so similar in basic physiognomy, the data were combined for the summary tables. Reporting the data in this manner was an attempt to provide information of small, localized areas, yet also provide the average success of the entire mine site. The reference area was also sampled using the same methodologies, but simply reports combined data.

Cover and Composition

Cover estimates were made using ocular methods with meter square quadrats. Species composition and relative frequencies were also assessed from the quadrats. Additional information recorded on the raw data sheets were: estimated precipitation, slope, exposure, grazing use, animal disturbance and other appropriate notes. Plant nomenclature follows Welsh et al. (1987).

Woody Species Density

Density of woody plant species of the reclaimed areas were made using belt transects. These 5 ft by 50 ft belts were placed randomly throughout the study areas. Total number of individuals by species were counted in each of the belt transects. The average number was then calculated followed by the number of individuals per acre.

Density of woody plant species of the *Reference Area* were recorded using the point quarter distance method (Cottom and Curtis 1956). In this method, random points were placed on the sample sites and measured into four quarters. The distances to the nearest woody plant species were then recorded in each quarter. The average point-to-individual distance was equal to the square root of the mean area per individual.

Production

Total annual biomass production was estimated by clipping, drying and weighing current annual growth. "Double sampling" using four quadrats estimated around the clipped and weighed plot was implemented.

Sample Adequacy & Statistical Comparisons

Sampling adequacy for cover and woody species density was achieved using formulas from Snedocor and Cochran (1980), insuring that 80% of the samples were within 10% of the true mean for the shrub communities of the area. The formula used is given below.

$$nmin = \left[\frac{1.28\ (s)}{x\ (.1)}\right]^2$$

where,

nmin = minimum adequate sample
s = standard deviation
x = sample mean
.1 = confidence interval

Student's t-tests were also employed to compare the reclaimed disturbance and reference areas of all sites for cover and productivity. All sample means, standard deviations, and sample sizes were included in this report to enable the reviewers to apply further statistical tests if desired.

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Photographs

Color photographs of the sample areas were taken at the time of sampling and have been submitted with this report (see Appendix A).

Raw Data

The raw data have been summarized on a spreadsheet and are included in this report.

RESULTS

The Lower Reclaimed Areas (Areas A-E, separately)

Vegetation sample areas A-E (see Sample Map) were first summarized separately. Tables 1-20 summarize the results of the sampling for these areas.

Each area showed nonsignificant differences for total living cover when compared to the *Reference Area*, with the exception of "Area E" (which was significantly greater). One should note that when using the *Reference Area's* cover estimate, the value used included both understory and overstory combined. The reclaimed areas, of course, had no appreciable overstory cover yet.

Density of woody plant species varied in each of the reclaimed areas ranging from 1,176 to 4,443 individuals per acre. All of these estimates (Areas A-E, separately), however, were greater than the *Reference Area* (Table 33).

Total annual production did not change much between *Reclaimed Areas* A-E. All were also significantly greater than the *Reference Area* (Table 33). The *Reference Area* data are shown on Tables 29-32.

<u>The Lower Reclaimed Areas</u> (Areas A-E, combined)

The data of *Lower Reclaimed Areas* A-E were also combined to show the overall values for each of the parameters and general success of the revegetated areas as a whole. The combined data summaries area shown on Tables 21-24. The *Reference Area* data for comparisons are shown on Tables 29-32. To review the results of statistical comparisons between the *Lower Reclaimed Areas* (A-E combined), refer to Table 33. In short, the reclaimed areas were not statistically different for cover. The reclaimed areas were, however, statistically different from the *Reference Area* for woody plant species density and productivity. The reclaimed areas were higher for both of these parameters (Table 33).

Upper Reclaimed Access Road Areas

Regular sample points were placed along the entire length of the *Upper Reclaimed Access Road Areas* (see Sample Map). At each regular point, a random number was used to place the quadrats and transects. For sample results refer to Tables 25-28.

All parameters including cover, density and productivity were significantly higher in the *Upper Reclaimed Access Road Areas* when compared to the *Reference Area* (Table 33).

TABLE 1: Total cover and composition summary for the reclaimed areas of the Huntington No. 4 Mine (Area "A", see Sample Map).

TOTAL COVER	% MEAN COVER	STANDARD DEVIATION	SAMPLE SIZE
Living Cover	35.00	7.75	20
Litter	15.50	9.07	20
Bareground	29.50	10.36	20
Rock	20.00	9.87	20
COMPOSITION			
Shrubs	7.13	12.77	20
Forbs	34.54	28.91	20
Grasses	58.34	29.41	20

TABLE 2: Species cover and frequency summary for the reclaimed areas of the Huntington No. 4 Mine (Area "A", see Sample Map).

SPECIES	% MEAN COVER	STANDARD DEVIATION	SAMPLE SIZE	RELATIVE FREQUENCY
TREES & SHRUBS				
Chrysothamnus nauseosus	1.75	3.96	20	20.00
Ceratoides lanata	0.35	1.53	20	5.00
Purshia tridentata	0.25	1.09	20	5.00
FORBS				
Penstemon palmeri	1.75	2.86	20	30.00
Astragalus cicer	9.75	9.86	20	60.00
Melilotus officinalis	0.40	1.74	20	5.00
Artemisia ludoviciana	0.25	1.09	20	5.00
Machaeranthera canescens	0.25	1.09	20	5.00
GRASSES				
Stipa hymenoides	1.00	1.00	20	20.00
Elymus spicatus	4.25	7.63	20	35.00
Agropyron cristatum	3.50	5.94	20	40.00
Bromus carinatus	4.00	3.39	20	65.00
Elymus lanceolatus	4.25	7.79	20	35.00
Dacytylis glomeratus	2.00	3.67	20	25.00
Elymus salinus	1.25	4.44	20	10.00

TABLE 3: Woody species densities of the reclaimed areas of the Huntington No. 4 Mine (Area "A", see Sample Map).

	NUMBER/ACRE
Brickelia microphylla	23.52
Ceratoides lanata	129.37
Chrysothamnus nauseosus	870.33
Pinus ponderosa	82.33
Purshia tridentata	70.57
TOTAL	1176.12

TABLE 4: Dry weight annual production for the reclaimed areas of the Huntington No. 4 Mine (Area "A", see Sample Map).

LIFEFORM	LBS/ ACRE	STANDARD DEVIATION	SAMPLE* SIZE
Herbaceous	529.88	268.25	10
Woody Spp.	9.74	23.18	10
TOTAL PRODUCTION	539.62	263.60	10

TABLE 5: Total cover and composition summary for the reclaimed areas of the Huntington No. 4 Mine (Area "B", see Sample Map).

TOTAL COVER	% MEAN COVER	STANDARD DEVIATION	SAMPLE SIZE
Living Cover	34.50	10.59	20.00
Litter	10.75	3.63	20.00
Bareground	37.25	13.46	20.00
Rock	17.50	8.87	20.00
COMPOSITION			
Shrubs	24.07	14.23	20.00
Forbs	33.50	23.32	20.00
Grasses	42.42	23.72	20.00

TABLE 6: Species cover and frequency summary for the reclaimed areas of the Huntington No. 4 Mine (Area "B", see Sample Map).

SPECIES	% MEAN COVER	STANDARD DEVIATION	SAMPLE SIZE	RELATIVE FREQUENCY
TREES & SHRUBS				
Chrysothamnus nauseosus	5.00	4.18	20	70.00
Eriogonum corymbosum	2.35	2.90	20	45.00
Gutierrezia sarothrae	0.50	1.50	20	10.00
Purshia tridentata	0.25	1.09	20	5.00
FORBS				
Penstemon palmeri	2.50	3.35	20	40.00
Astragalus cicer	8.10	10.95	20	70.00
Aster chilensis	0.25	1.09	20	5.00
Machaeranthera canescens	0.50	1.50	20	10.00
Salsola iberica	0.05	0.22	20	5.00
GRASSES				
Hordeum jubatum	0.25	1.09	20	5.00
Stipa hymenoides	2.25	3.34	20	35.00
Agropyron critatum	6.50	8.53	20	45.00
Elymus spicatus	4.25	6.57	20	40.00
Elymus lanceolatus	1.50	2.78	20	25.00
Bromus carinatus	0.25	1.09	20	5.00

TABLE 7: Woody species densities of the reclaimed areas of the Huntington No. 4 Mine (Area "B", see Sample Map).

	NUMBER/ACRE
Brickelia microphylla	3637.26
Chrysothamnus viscidiflorus	43.56
Eriogonum corymbosum	531.62
Gutierrezia sarothrae	87.12
Pinus ponderosa	43.56
TOTAL	4443.12

TABLE 8: Dry weight annual production for the reclaimed areas of the Huntington No. 4 Mine (Area "B", see Sample Map).

LIFEFORM	LBS/ ACRE	STANDARD DEVIATION	SAMPLE* SIZE
Herbaceous	411.39	333.48	5
Woody Spp.	157.35	134.53	5
TOTAL PRODUCTION	583.63	424.68	5

TABLE 9: Total cover and composition summary for the reclaimed areas of the Huntington No. 4 Mine (Area "C", see Sample Map).

TOTAL COVER	% MEAN COVER	STANDARD DEVIATION	SAMPLE SIZE
Living Cover	35.83	7.86	6
Litter	7.50	3.82	6
Bareground	33.33	16.24	6
Rock	23.33	12.13	6
COMPOSITION			
Shrubs	24.23	25.24	6
Forbs	41.94	30.73	6
Grasses	33.83	16.54	6

TABLE 10: Species cover and frequency summary for the reclaimed areas of the Huntington No. 4 Mine (Area "C", see Sample Map).

SPECIES	% MEAN COVER	STANDARD DEVIATION	SAMPLE SIZE	RELATIVE FREQUENCY
TREES & SHRUBS				
Chrysothamnus nauseosus	5.00	7.07	6	33.33
Eriogonum corymbosum	3.33	4.71	6	33.33
FORBS				
Erigonus sp.	4.17	9.32	6	16.67
Iva axillaris	0.83	1.86	6	16.67
Penstemon palmeri	0.83	1.86	6	16.67
Astragalus cicer	8.33	10.27	6	50.00
Melilotus officinalis	1.67	3.37	6	16.67
GRASSES				
Stipa hymenoides	5.00	5.77	6	50.00
Elymus spicatus	2.50	3.82	6	33.33
Agropyron cristatum	2.50	2.50	6	50.00
Bromus carinatus	0.83	1.86	6	16.67
Elymus lanceolatus	0.83	1.86	6	16.67

TABLE 11: Woody species densities of the reclaimed areas of the Huntington No. 4 Mine (Area "C", see Sample Map).

	NUMBER/ACRE
Ceratoides lanata	147.24
Chrysothamnus nauseosus	2178.00
Eriogonum corymbosum	261.36
Purshia tridentata	87.12
TOTAL	2700.72

TABLE 12: Dry weight annual production for the reclaimed areas of the Huntington No. 4 Mine (Area "C", see Sample Map).

LIFEFORM	LBS/ ACRE	STANDARD DEVIATION	SAMPLE* SIZE
Herbaceous	--	--	--
Woody Spp.	--	--	--
TOTAL PRODUCTION	*(no production taken here)*		

TABLE 13: Total cover and composition summary for the reclaimed areas of the Huntington No. 4 Mine (Area "D", see Sample Map).

TOTAL COVER	% MEAN COVER	STANDARD DEVIATION	SAMPLE SIZE
Living Cover	35.36	6.11	14
Litter	14.64	4.80	14
Bareground	24.29	11.00	14
Rock	25.71	11.63	14
COMPOSITION			
Shrubs	19.73	22.96	14
Forbs	24.48	15.92	14
Grasses	55.79	14.09	14

TABLE 14: Species cover and frequency summary for the reclaimed areas of the Huntington No. 4 Mine (Area "D", see Sample Map).

SPECIES	% MEAN COVER	STANDARD DEVIATION	SAMPLE SIZE	RELATIVE FREQUENCY
TREES & SHRUBS				
Chrysothamnus nauseosus	5.57	6.32	14	57.14
Ceratoides lanata	0.36	1.29	14	7.14
Rosa woodsii	0.71	2.58	14	7.14
FORBS				
Penstemon palmeri	1.07	2.05	14	21.43
Astragalus cicer	5.00	4.23	14	71.43
Melilotus officinalis	2.64	3.06	14	50.00
Haplopappus parryi	0.36	1.29	14	7.14
GRASSES				
Stipa hymenoides	4.64	7.19	14	42.86
Elymus spicatus	9.64	5.81	14	85.71
Agropyron cristatum	0.71	1.75	14	14.29
Bromus carinatus	1.43	5.15	14	7.14
Elymus lanceolatus	3.21	6.44	14	35.71

TABLE 15: Woody species densities of the reclaimed areas of the Huntington No. 4 Mine (Area "D", see Sample Map).

	NUMBER/ACRE
Ceratoides lanata	116.16
Chrysothamnus nauseosus	3049.20
Eriogonum corymbosum	29.04
Pinus ponderosa	29.04
Rosa woodsii	58.08
TOTAL	3281.52

TABLE 16: Dry weight annual production for the reclaimed areas of the Huntington No. 4 Mine (Area "D", see Sample Map).

LIFEFORM	LBS/ ACRE	STANDARD DEVIATION	SAMPLE* SIZE
Herbaceous	510.35	313.93	2
Woody Spp.	106.00	149.90	2
TOTAL PRODUCTION	616.34	463.83	2

TABLE 17: Total cover and composition summary for the reclaimed areas of the Huntington No. 4 Mine (Area "E", see Sample Map).

TOTAL COVER	% MEAN COVER	STANDARD DEVIATION	SAMPLE SIZE
Living Cover	47.00	4.40	15
Litter	15.67	4.78	15
Bareground	22.00	8.72	15
Rock	15.33	7.63	15
COMPOSITION			
Shrubs	6.67	17.38	15
Forbs	15.38	15.33	15
Grasses	77.95	24.47	15

TABLE 18: Species cover and frequency summary for the reclaimed areas of the Huntington No. 4 Mine (Area "E", see Sample Map).

SPECIES	% MEAN COVER	STANDARD DEVIATION	SAMPLE SIZE	RELATIVE FREQUENCY
TREES & SHRUBS				
Chrysothamnus nauseosus	3.33	8.69	15	13.33
FORBS				
Penstemon palmeri	0.67	2.49	15	6.67
Astragalus cicer	3.00	5.72	15	26.67
Melilotus officinalis	0.67	1.70	15	13.33
Artemisia ludoviciana	0.33	1.25	15	6.67
Iva axillaris	2.00	3.56	15	26.67
Haplopappua palmeri	0.33	1.25	15	6.67
GRASSES				
Elymus spicatus	6.67	10.11	15	53.33
Agropyron cristatum	11.33	13.35	15	60.00
Bromus carinatus	15.67	16.21	15	73.33
Elymus lanceolatus	0.67	2.49	15	6.67
Dactylis glomeratus	0.67	2.49	15	6.67
Poa secunda	1.67	5.06	15	13.33

TABLE 19: Woody species densities of the reclaimed areas of the Huntington No. 4 Mine (Area "E", see Sample Map).

	NUMBER/ACRE
Ceratoides lanata	145.20
Chrysothamnus nauseosus	1277.76
Rosa woodsii	29.04
TOTAL	1452.00

TABLE 20: Dry weight annual production for the reclaimed areas of the Huntington No. 4 Mine (Area "E", see Sample Map).

LIFEFORM	LBS/ ACRE	STANDARD DEVIATION	SAMPLE* SIZE
Herbaceous	359.03	--	1
Woody Spp.	0.00	--	1
TOTAL PRODUCTION	359.03	--	1

TABLE 21: Total cover and composition summary for the combined reclaimed areas of the Huntington No. 4 Mine (Areas A-E, see Sample Map).

TOTAL COVER	% MEAN COVER	STANDARD DEVIATION	SAMPLE SIZE
Living Cover	37.40	9.21	75
Litter	13.47	6.53	75
Bareground	29.40	13.01	75
Rock	19.73	10.42	75
COMPOSITION			
Shrubs	15.27	19.25	75
Forbs	29.15	24.61	75
Grasses	55.58	37.30	75

TABLE 22: Species cover and frequency summary for the combined reclaimed areas of the Huntington No. 4 Mine (Areas A-E, see Sample Map).

SPECIES	% MEAN COVER	STANDARD DEVIATION	SAMPLE SIZE	RELATIVE FREQUENCY
TREES & SHRUBS				
Chrysothamnus nauseosus	3.91	6.14	75	38.67
Ceratoides lanata	0.16	0.98	75	2.67
Purshia tridentata	0.13	0.81	75	2.67
Eriogonum corymbosum	0.89	2.36	75	14.67
Gutierrezia sarothrae	0.13	0.81	75	2.67
Rosa woodsii	0.13	0.81	75	2.67
FORBS				
Penstemon palmeri	1.53	2.83	75	25.33
Astragalus cicer	6.96	9.04	75	56.00
Melilotus officinalis	0.87	2.27	75	14.67
Artemisia ludoviciana	0.13	0.81	75	2.67
Machaeranthera canescens	0.20	0.98	75	4.00
Aster chilensis	0.07	0.57	75	2.67
Salsola iberica	0.01	0.11	75	2.67
Eriogonum sp.	0.33	2.87	75	2.67
Iva axillaris	0.47	1.86	75	6.67
Haplopappus parryi	0.70	0.57	75	2.67
GRASSES				
Stipa hymenoides	2.13	4.41	75	26.67
Elymus spicatus	5.60	7.74	75	48.00
Agropyron cristatum	5.27	8.87	75	41.33
Bromus carinatus	4.60	9.69	75	36.00
Elymus lanceolatus	2.33	5.44	75	25.33
Dactylis glomeratus	0.67	2.36	75	8.00
Elymus salinus	0.33	2.36	75	2.67
Hordeum jubatum	0.07	0.57	75	2.67
Poa secunda	0.33	2.36	75	2.67

TABLE 23: Woody species densities of the combined reclaimed areas of the Huntington No. 4 Mine (Areas A-E, see Sample Map).

	NUMBER/ACRE
Brickelia microphylla	5.81
Ceratoides lanata	98.74
Chrysothamnus nauseosus	2212.85
Chrysothamnus viscidiflorus	11.62
Eriogonum corymbosum	191.66
Gutierrezia sarothrae	23.23
Pinus ponderosa	40.66
Purshia tridentata	23.23
Rosa woodsii	17.42
TOTAL	2625.22

TABLE 24: Dry weight annual production for the combined reclaimed areas of the Huntington No. 4 Mine (Areas A-E, see Sample Map).

LIFEFORM	LBS/ ACRE	STANDARD DEVIATION	SAMPLE* SIZE
Herbaceous	488.55	274.23	18
Woody Spp.	59.96	103.36	18
TOTAL PRODUCTION	550.06	308.09	18

TABLE 25: Total cover and composition summary for the reclaimed areas of the Huntington No. 4 Mine (Revegetated Road Areas, see Sample Map).

TOTAL COVER	% MEAN COVER	STANDARD DEVIATION	SAMPLE SIZE
Living Cover	44.71	14.09	34
Litter	11.03	7.55	34
Bareground	15.88	12.28	34
Rock	28.38	16.75	34
COMPOSITION			
Shrubs	20.50	22.66	34
Forbs	45.50	30.17	34
Grasses	34.00	27.14	34

TABLE 26: Species cover and frequency summary for the reclaimed areas of the Huntington No. 4 Mine (Revegetated Road Areas, see Sample Map).

SPECIES	% MEAN COVER	STANDARD DEVIATION	SAMPLE SIZE	RELATIVE FREQUENCY
TREES & SHRUBS				
Chrysothamnus nauseosus	9.03	11.54	34	58.82
Ceratoides lanata	0.50	2.03	34	5.88
FORBS				
Penstemon palmeri	3.12	3.63	34	47.06
Astragalus cicer	17.21	15.59	34	73.53
GRASSES				
Stipa hymenoides	1.47	4.29	34	14.71
Elymus spicatus	5.15	7.72	34	41.18
Agropyron cristatum	4.56	7.01	34	44.12
Bromus carinatus	1.03	4.16	34	5.88
Elymus lanceolatus	2.35	5.03	34	29.41
Elymus salinus	0.29	1.69	34	2.94

TABLE 27: Woody species densities of the reclaimed areas of the Huntington No. 4 Mine (Revegetated Road Areas, see Sample Map).

	NUMBER/ACRE
Amalanchier utahensis	3.11
Ceratoides lanata	127.57
Chrysothamnus nauseosus	2430.03
Chrysothamnus viscidiflorus	6.22
Gutierrezia sarothrae	9.33
Purshia tridentata	24.89
Symphoricarpos oreophilus	3.11
TOTAL	2604.27

TABLE 28: Dry weight annual production for the reclaimed areas of the Huntington No. 4 Mine (Revegetated Road Areas, see Sample Map).

LIFEFORM	LBS/ ACRE	STANDARD DEVIATION	SAMPLE* SIZE
Herbaceous	442.24	50.58	10
Woody Spp.	50.48	69.19	10
TOTAL PRODUCTION	495.56	260.91	10

TABLE 29: Total cover and composition summary for the Reference Area of Huntington No. 4 Mine (see Sample Map).

TOTAL COVER	% MEAN COVER	STANDARD DEVIATION	SAMPLE SIZE
Living Cover	34.67	14.54	30
Litter	21.83	16.46	30
Bareground	18.87	19.73	30
Rock	24.63	20.85	30
COMPOSITION			
Shrubs	43.21	36.04	30
Forbs	0.00	0.00	30
Grasses	56.79	36.04	30

TABLE 30: Species cover and frequency summary for the Reference Area of Huntington No. 4 Mine (see Sample Map).

SPECIES	% MEAN COVER	STANDARD DEVIATION	SAMPLE SIZE	RELATIVE FREQUENCY
TREES & SHRUBS				
Pinus edulis	15.50	18.50	30	50.00
Ceratoides lanta	2.97	8.20	30	20.00
FORBS				
GRASSES				
Elymus salinus	16.20	9.42	30	87.67

TABLE 31: Woody species densities for the Reference Area of Huntington No. 4 Mine (see Sample Map).

	NUMBER/ACRE
Ceratoides lanata	130.56
Gutierrezia sarothrae	4.21
Juniperus osteosperma	46.33
Pinus edulis	223.21
TOTAL	404.30

TABLE 32: Dry weight annual production for the Reference Area of Huntington No. 4 Mine (see Sample Map).

LIFEFORM	LBS/ ACRE	STANDARD DEVIATION	SAMPLE* SIZE
Herbaceous	109.61	72.43	10
Woody Spp.	100.48	136.50	10
TOTAL PRODUCTION	210.19	144.57	10

TABLE 33: Statistical summary sheet for the Reclaimed Areas and Reference Areas at the Huntington No. 4 Mine.

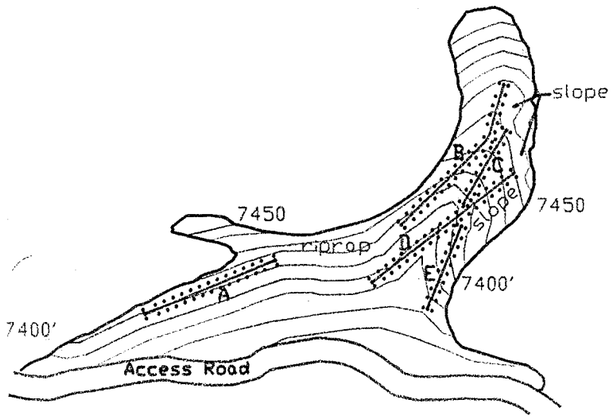
LOWER RECLAIMED AREAS (A-E Combined)			
Living Cover*	x=37.40	s=9.21	n=75
Density	x=2625.22	s= --	n=30
Production	x=550.06	s=308.09	n=18
REFERENCE AREA			
Living Cover*	x=34.67	s=14.54	n=30
Density	x=404.30	s= --	n=24
Production	x=109.61	s=72.43	n=10
STATISTICAL ANALYSES			
Living Cover	t=1.151	df=103	SL=NS
Density	t=**	df= --	SL= --
Production	t=4.419	df=26	SL=p<.001

UPPER RECLAIMED ACCESS ROAD AREAS			
Living Cover*	x=41.71	s=14.09	n=34
Density	x=2604.27	s= --	n=56
Production	x=495.56	s=260.91	n=10
REFERENCE AREA			
Living Cover*	x=34.67	s=14.54	n=30
Density	x=404.30	s= --	n=24
Production	x=109.61	s=72.43	n=10
STATISTICAL ANALYSES			
Living Cover	t=1.965	df=62	SL=p<.05
Density	t=**	df= --	SL= --
Production	t=4.507	df=18	SL=p<.001

2805 75
1418 34
4223 109
n=

x = sample mean, s = sample standard deviation,
n = sample size, NS = nonsignificant,
* represents understory and overstory cover combined.
** not calculated (differences obvious)

Lower Reclaimed Areas



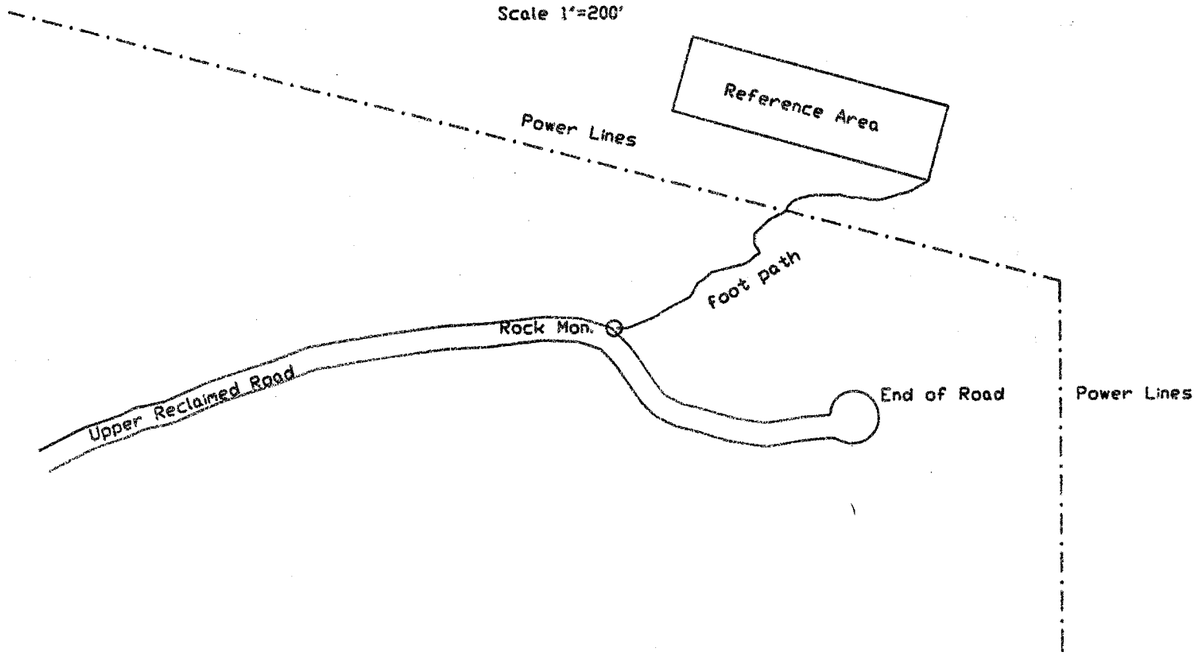
Scale 1"=200'

Sample Area	Parameter	Sample No.	Sample Size(n)
A	Cover	1-20	(20)
	Density	1-8	(8)
	Production	1-10	(10)
B	Cover	21-40	(20)
	Density	9-16	(8)
	Production	11-15	(5)
C	Cover	41-46	(6)
	Density	17-18	(2)
D	Cover	47-60	(14)
	Density	19-24	(6)
	Production	16-17	(2)
E	Cover	61-75	(15)
	Density	25-30	(6)
	Production	18	(1)

: Transect Lines

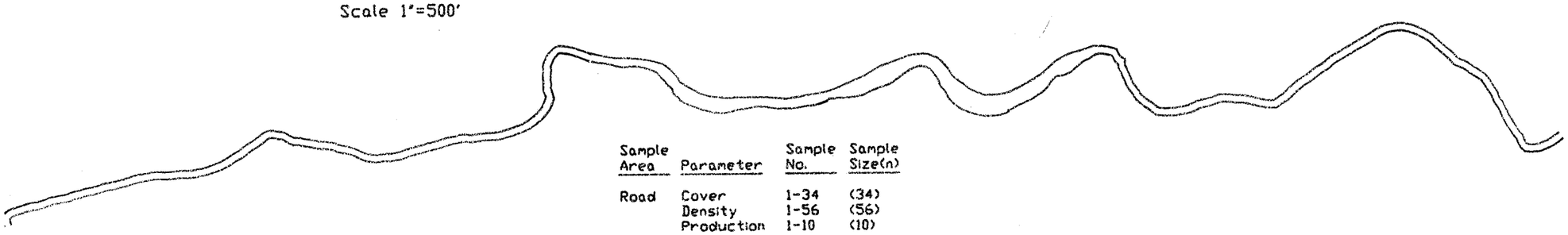
Reference Area Location Map

Scale 1"=200'



Upper Reclaimed Access Road Areas

Scale 1"=500'



Sample Area	Parameter	Sample No.	Sample Size(n)
Road	Cover	1-34	(34)
	Density	1-56	(56)
	Production	1-10	(10)

HUNTINGTON NO.4 MINE
SAMPLE LOCATION MAP
1993

MT. NEBO SCIENTIFIC, INC.
RESEARCH AND CONSULTING

DRAWN	JON MAGENO
CHECKED	P. COLLINS
DATE	11-19-93
SCALE	VARIES

HUNT4.DWG

APPENDIX A:

COLOR PHOTOGRAPHS

HUNTINGTON NO. 4 MINE

Lower Reclaimed Area "A"

Lower Reclaimed Area "B"

Lower Reclaimed Area "C"

Lower Reclaimed Area "D"

Lower Reclaimed Area "E"

Upper Reclaimed Access Road Area

Upper Reclaimed Access Road Area

Reference Area

APPENDIX B:

RAW DATA

BEAVERCREEK/BLACKHAWK
Huntington #4
Reveg Lower Pads, Slopes etc.
A - Lower Area South
Exposure: Variable
Slope:

Sample Date: 29 July 1993	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00	11.00
TREES & SHRUBS											
Chrysothamnus nauseosus	0.00	0.00	0.00	0.00	0.00	15.00	0.00	0.00	5.00	0.00	0.00
Ceratoides lanata	0.00	7.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Purshia tridentata	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FORBS											
Penstemon palmeri	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Astragalus cicer	0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	25.00	25.00
Melilotus officinalis	0.00	8.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Artemisia ludoviciana	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Machaeranthera canescens	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GRASSES											
Stipa hymenoides	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Elymus spicatus	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	5.00
Agropyron cristatum	0.00	0.00	0.00	5.00	10.00	10.00	25.00	0.00	5.00	5.00	0.00
Bromus carinatus	10.00	5.00	10.00	5.00	5.00	5.00	5.00	5.00	10.00	5.00	5.00
Elymus lanceolatus	30.00	5.00	5.00	20.00	10.00	0.00	0.00	10.00	0.00	5.00	0.00
Dacytylis glomeratus	0.00	5.00	10.00	0.00	0.00	0.00	10.00	10.00	0.00	0.00	0.00
Elymus salinus	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	20.00	0.00	0.00
COVER											
Total Living Cover	40.00	30.00	25.00	35.00	30.00	30.00	40.00	25.00	40.00	45.00	35.00
Litter	5.00	10.00	15.00	20.00	35.00	10.00	30.00	10.00	40.00	10.00	15.00
Bareground	30.00	25.00	30.00	20.00	25.00	25.00	20.00	50.00	15.00	35.00	40.00
Rock	25.00	35.00	30.00	25.00	10.00	35.00	10.00	15.00	5.00	10.00	10.00
% COMPOSITION											
Shrubs	0.00	23.33	0.00	0.00	0.00	50.00	0.00	0.00	12.50	0.00	0.00
Forbs	0.00	26.67	0.00	14.29	16.67	0.00	0.00	0.00	0.00	55.56	71.43
Grasses	100.00	50.00	100.00	85.71	83.33	50.00	100.00	100.00	87.50	44.44	28.57

12.00	13.00	14.00	15.00	16.00	17.00	18.00	19.00	20.00	Mean	SDev	Freq
0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	10.00	1.75	3.96	20.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.35	1.53	5.00
0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.25	1.09	5.00
5.00	0.00	5.00	0.00	5.00	5.00	0.00	10.00	5.00	1.75	2.86	30.00
10.00	15.00	5.00	15.00	20.00	10.00	20.00	20.00	25.00	9.75	9.68	60.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.40	1.74	5.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	1.09	5.00
0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.25	1.09	5.00
0.00	0.00	0.00	0.00	0.00	5.00	5.00	5.00	5.00	1.00	2.00	20.00
15.00	30.00	5.00	15.00	10.00	0.00	0.00	0.00	0.00	4.25	7.63	35.00
0.00	0.00	5.00	0.00	0.00	0.00	0.00	5.00	0.00	3.50	5.94	40.00
0.00	5.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00	3.39	65.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.25	7.79	35.00
5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	3.67	25.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	1.25	4.44	10.00
35.00	50.00	30.00	30.00	40.00	25.00	25.00	40.00	50.00	35.00	7.75	
15.00	20.00	10.00	10.00	10.00	10.00	10.00	15.00	10.00	15.50	9.07	
30.00	20.00	35.00	40.00	25.00	25.00	55.00	30.00	15.00	29.50	10.36	
20.00	10.00	25.00	20.00	25.00	40.00	10.00	15.00	25.00	20.00	9.87	
0.00	0.00	16.67	0.00	0.00	20.00	0.00	0.00	20.00	7.13	12.77	
42.86	30.00	33.33	50.00	75.00	60.00	80.00	75.00	60.00	34.54	28.91	
57.14	70.00	50.00	50.00	25.00	20.00	20.00	25.00	20.00	58.34	29.41	

BEAVERCREEK/BLACKHAWK
Huntington #4
Reveg Lower Pads, Slopes etc.
A - Lower Area South
Exposure: Variable
Slope:
Sample Date: 29 July 1993

TREES & SHRUBS
Chrysothamnus nauseosus
Ceratoides lanata
Purshia tridentata

FORBS
Penstemon palmeri
Astragalus cicer
Melilotus officinalis
Artemisia ludoviciana
Machaeranthera canescens

GRASSES
Stipa hymenoides
Elymus spicatus
Agropyron cristatum
Bromus carinatus
Elymus lanceolatus
Dacytylis glomeratus
Elymus salinus

COVER
Total Living Cover
Litter
Bareground
Rock

% COMPOSITION
Shrubs
Forbs
Grasses

BEAVERCREEK/BLACKHAWK
Huntington #4
Reveg Lower Pads, Slopes etc.
B - Lower Area North
Exposure: Variable
Slope:

Sample Date: 29 July 1993	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00	11.00
TREES & SHRUBS											
Chrysothamus nauseosus	10.00	5.00	5.00	5.00	10.00	0.00	0.00	10.00	0.00	0.00	5.00
Eriogonum corymbosum	10.00	0.00	5.00	5.00	0.00	5.00	5.00	2.00	5.00	5.00	0.00
Gutierrezia sarothrae	0.00	0.00	0.00	0.00	5.00	0.00	0.00	5.00	0.00	0.00	0.00
Purshia tridentata	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FORBS											
Penstemon palmeri	0.00	5.00	0.00	5.00	0.00	5.00	5.00	0.00	10.00	0.00	0.00
Astragalus cicer	5.00	10.00	0.00	5.00	10.00	5.00	20.00	8.00	0.00	0.00	10.00
Aster chilensis	0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00
Machaeranthera canescens	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00
Salsola iberica	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GRASSES											
Hordeum jubatum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Stipa hymenoides	0.00	10.00	5.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	5.00
Agropyron critatum	5.00	0.00	20.00	5.00	20.00	0.00	0.00	0.00	20.00	20.00	0.00
Elymus spicatus	15.00	0.00	0.00	0.00	0.00	10.00	5.00	5.00	0.00	10.00	0.00
Elymus lanceolatus	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00
Bromus carinatus	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
COVER											
Total Living Cover	45.00	35.00	35.00	25.00	50.00	30.00	35.00	35.00	40.00	35.00	20.00
Litter	15.00	10.00	10.00	10.00	10.00	10.00	5.00	10.00	5.00	20.00	10.00
Bareground	20.00	30.00	20.00	25.00	30.00	50.00	50.00	30.00	45.00	35.00	55.00
Rock	20.00	25.00	35.00	40.00	10.00	10.00	10.00	25.00	10.00	10.00	15.00
% COMPOSITION											
Shrubs	44.44	14.29	28.57	40.00	30.00	16.67	14.29	48.57	12.50	14.29	25.00
Forbs	11.11	42.86	0.00	40.00	30.00	33.33	71.43	37.14	25.00	0.00	50.00
Grasses	44.44	42.86	71.43	20.00	40.00	50.00	14.29	14.29	62.50	85.71	25.00

12.00	13.00	14.00	15.00	16.00	17.00	18.00	19.00	20.00	Mean	SDev	Freq
5.00	5.00	10.00	5.00	0.00	15.00	5.00	5.00	0.00	5.00	4.18	70.00
0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	2.35	2.90	45.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	1.50	10.00
0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.25	1.09	5.00
0.00	5.00	5.00	0.00	0.00	0.00	0.00	0.00	10.00	2.50	3.35	40.00
5.00	5.00	10.00	0.00	14.00	0.00	50.00	5.00	0.00	8.10	10.95	70.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	1.09	5.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.50	1.50	10.00
0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.05	0.22	5.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.25	1.09	5.00
5.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00	10.00	2.25	3.34	35.00
0.00	0.00	0.00	0.00	15.00	5.00	0.00	20.00	0.00	6.50	8.53	45.00
0.00	0.00	5.00	25.00	0.00	0.00	0.00	0.00	10.00	4.25	6.57	40.00
0.00	0.00	5.00	0.00	0.00	10.00	5.00	0.00	0.00	1.50	2.78	25.00
0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.25	1.09	5.00
15.00	15.00	40.00	40.00	30.00	35.00	60.00	40.00	30.00	34.50	10.59	
10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	20.00	10.75	3.63	
65.00	60.00	40.00	35.00	50.00	30.00	20.00	25.00	30.00	37.25	13.46	
10.00	15.00	10.00	15.00	10.00	25.00	10.00	25.00	20.00	17.50	8.87	
33.33	33.33	37.50	25.00	0.00	42.86	8.33	12.50	0.00	24.07	14.23	
33.33	66.67	37.50	0.00	50.00	0.00	83.33	25.00	33.33	33.50	23.32	
33.33	0.00	25.00	75.00	50.00	57.14	8.33	62.50	66.67	42.42	23.72	

BEAVERCREEK/BLACKHAWK
Huntington #4
Reveg Lower Pads, Slopes etc.
B - Lower Area North
Exposure: Variable
Slope:
Sample Date: 29 July 1993

TREES & SHRUBS
Chrysothamus nauseosus
Eriogonum corymbosum
Gutierrezia sarothrae
Purshia tridentata

FORBS
Penstemon palmeri
Astragalus cicer
Aster chilensis
Machaeranthera canescens
Salsola iberica

GRASSES
Hordeum jubatum
Stipa hymenoides
Agropyron critatum
Elymus spicatus
Elymus lanceolatus
Bromus carinatus

COVER
Total Living Cover
Litter
Bareground
Rock

% COMPOSITION
Shrubs
Forbs
Grasses

BEAVERCREEK/BLACKHAWK
Huntington #4
Reveg Lower Pads, Slopes etc.
C - Lower Area Slopes
Exposure: Variable
Slope:

Sample Date: 29 July 1993	1.00	2.00	3.00	4.00	5.00	6.00	Mean	SDev	Freq
TREES & SHRUBS									
Chrysothamnus nauseosus	0.00	15.00	15.00	0.00	0.00	0.00	5.00	7.07	33.33
Eriogonum corymbosum	10.00	0.00	10.00	0.00	0.00	0.00	3.33	4.71	33.33
FORBS									
Eriogonus sp.	0.00	0.00	0.00	25.00	0.00	0.00	4.17	9.32	16.67
Iva axillaris	0.00	0.00	0.00	5.00	0.00	0.00	0.83	1.86	16.67
Penstemon palmeri	0.00	0.00	0.00	0.00	5.00	0.00	0.83	1.86	16.67
Astragalus cicer	0.00	5.00	0.00	0.00	25.00	20.00	8.33	10.27	50.00
Melilotus officinalis	0.00	0.00	10.00	0.00	0.00	0.00	1.67	3.73	16.67
GRASSES									
Stipa hymenoides	10.00	15.00	0.00	0.00	0.00	5.00	5.00	5.77	50.00
Elymus spicatus	0.00	0.00	0.00	5.00	10.00	0.00	2.50	3.82	33.33
Agropyron cristatum	0.00	0.00	5.00	0.00	5.00	5.00	2.50	2.50	50.00
Bromus carinatus	0.00	0.00	0.00	0.00	5.00	0.00	0.83	1.86	16.67
Elymus lanceolatus	5.00	0.00	0.00	0.00	0.00	0.00	0.83	1.86	16.67
COVER									
Total Living Cover	25.00	35.00	40.00	35.00	50.00	30.00	35.83	7.86	
Litter	10.00	5.00	5.00	15.00	5.00	5.00	7.50	3.82	
Bareground	60.00	50.00	30.00	20.00	15.00	25.00	33.33	16.24	
Rock	5.00	10.00	25.00	30.00	30.00	40.00	23.33	12.13	
% COMPOSITION									
Shrubs	40.00	42.86	62.50	0.00	0.00	0.00	24.23	25.24	
Forbs	0.00	14.29	25.00	85.71	60.00	66.67	41.94	30.73	
Grasses	60.00	42.86	12.50	14.29	40.00	33.33	33.83	16.54	

BEAVERCREEK/BLACKHAWK
Huntington #4
Reveg Lower Pads, Slopes etc.
D - Below Slopes
Exposure: Variable
Slope:

Sample Date: 29 July 1993	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00	11.00
TREES & SHRUBS											
Chrysothamnus nauseosus	15.00	13.00	5.00	10.00	5.00	0.00	0.00	0.00	0.00	0.00	5.00
Ceratoides lanata	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rosa woodsii	0.00	0.00	0.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FORBS											
Penstemon palmeri	0.00	5.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	5.00	0.00
Astragalus cicer	0.00	0.00	0.00	5.00	10.00	10.00	5.00	5.00	5.00	5.00	5.00
Melilotus officinalis	0.00	2.00	5.00	0.00	10.00	5.00	0.00	0.00	5.00	5.00	5.00
Haplopappus parryi	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00
GRASSES											
Stipa hymenoides	0.00	0.00	0.00	0.00	5.00	0.00	5.00	25.00	10.00	5.00	0.00
Elymus spicatus	10.00	15.00	0.00	10.00	5.00	15.00	10.00	0.00	15.00	5.00	15.00
Agropyron cristatum	0.00	5.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00
Bromus carinatus	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	20.00	0.00
Elymus lanceolatus	0.00	0.00	25.00	5.00	5.00	0.00	5.00	0.00	0.00	0.00	5.00
COVER											
Total Living Cover	25.00	40.00	40.00	40.00	45.00	35.00	25.00	35.00	35.00	45.00	35.00
Litter	10.00	10.00	20.00	20.00	15.00	15.00	10.00	5.00	20.00	20.00	15.00
Bareground	25.00	20.00	20.00	20.00	10.00	40.00	15.00	55.00	15.00	25.00	20.00
Rock	40.00	30.00	20.00	20.00	30.00	10.00	50.00	5.00	30.00	10.00	30.00
% COMPOSITION											
Shrubs	60.00	32.50	25.00	50.00	11.11	0.00	0.00	0.00	0.00	0.00	14.29
Forbs	0.00	17.50	12.50	12.50	44.44	57.14	20.00	28.57	28.57	33.33	28.57
Grasses	40.00	50.00	62.50	37.50	44.44	42.86	80.00	71.43	71.43	66.67	57.14

BEAVERCREEK/BLACKHAWK
Huntington #4
Reveg Lower Pads, Slopes et
D - Below Slopes
Exposure: Variable
Slope:
Sample Date: 29 July 1993

12.00	13.00	14.00	Mean	SDev	Freq	
						TREES & SHRUBS
5.00	0.00	20.00	5.57	6.32	57.14	Chrysothamnus nauseosus
0.00	0.00	0.00	0.36	1.29	7.14	Ceratoides lanata
0.00	0.00	0.00	0.71	2.58	7.14	Rosa woodsii
						FORBS
0.00	0.00	0.00	1.07	2.05	21.43	Penstemon palmeri
5.00	15.00	0.00	5.00	4.23	71.43	Astragalus cicer
0.00	0.00	0.00	2.64	3.06	50.00	Melilotus officinalis
0.00	0.00	0.00	0.36	1.29	7.14	Haplopappus parryi
						GRASSES
15.00	0.00	0.00	4.64	7.19	42.86	Stipa hymenoides
5.00	20.00	10.00	9.64	5.81	85.71	Elymus spicatus
0.00	0.00	0.00	0.71	1.75	14.29	Agropyron cristatum
0.00	0.00	0.00	1.43	5.15	7.14	Bromus carinatus
0.00	0.00	0.00	3.21	6.44	35.71	Elymus lanceolatus
						COVER
30.00	35.00	30.00	35.36	6.11		Total Living Cover
10.00	20.00	15.00	14.64	4.80		Litter
30.00	20.00	25.00	24.29	11.00		Bareground
30.00	25.00	30.00	25.71	11.63		Rock
						% COMPOSITION
16.67	0.00	66.67	19.73	22.96		Shrubs
16.67	42.86	0.00	24.48	15.92		Forbs
66.67	57.14	33.33	55.79	14.09		Grasses

BEAVERCREEK/BLACKHAWK
Huntington #4
Reveg Lower Pads, Slopes etc.
E - Lowest Area
Exposure: Variable
Slope:

Sample Date: 29 July 1993	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00	11.00
TREES & SHRUBS											
Chrysothamus nauseosus	0.00	0.00	0.00	0.00	0.00	0.00	30.00	20.00	0.00	0.00	0.00
FORBS											
Penstemon palmeri	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	0.00	0.00
Astragalus cicer	0.00	0.00	0.00	5.00	0.00	0.00	0.00	10.00	10.00	0.00	0.00
Melilotus officinalis	0.00	0.00	0.00	0.00	0.00	5.00	5.00	0.00	0.00	0.00	0.00
Artemisia ludoviciana	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Iva axillaris	0.00	10.00	0.00	0.00	10.00	5.00	5.00	0.00	0.00	0.00	0.00
Haplopappus palmeri	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GRASSES											
Elymus spicatus	0.00	0.00	40.00	0.00	15.00	0.00	0.00	5.00	10.00	10.00	0.00
Agropyron cristatum	0.00	30.00	0.00	25.00	0.00	0.00	10.00	0.00	5.00	20.00	30.00
Bromus carinatus	45.00	0.00	10.00	0.00	20.00	35.00	0.00	5.00	5.00	10.00	10.00
Elymus lanceolatus	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	0.00	0.00	0.00
Dactylis glomeratus	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00
Poa secunda	0.00	0.00	0.00	20.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00
COVER											
Total Living Cover	45.00	40.00	50.00	50.00	50.00	45.00	50.00	50.00	40.00	40.00	50.00
Litter	20.00	10.00	20.00	20.00	20.00	20.00	20.00	15.00	15.00	20.00	15.00
Bareground	20.00	20.00	10.00	10.00	15.00	25.00	25.00	10.00	25.00	25.00	25.00
Rock	15.00	30.00	20.00	20.00	15.00	10.00	5.00	25.00	20.00	15.00	10.00
% COMPOSITION											
Shrubs	0.00	0.00	0.00	0.00	0.00	0.00	60.00	40.00	0.00	0.00	0.00
Forbs	0.00	25.00	0.00	10.00	20.00	22.22	20.00	20.00	50.00	0.00	0.00
Grasses	100.00	75.00	100.00	90.00	80.00	77.78	20.00	40.00	50.00	100.00	100.00

BEAVERCREEK/BLACKHAWK
Huntington #4
Reveg Lower Pads, Slopes etc.
E - Lowest Area
Exposure: Variable
Slope:
Sample Date: 29 July 1993

12.00	13.00	14.00	15.00	Mean	SDev	Freq	
							TREES & SHRUBS
0.00	0.00	0.00	0.00	3.33	8.69	13.33	Chrysothamus nauseosus
							FORBS
0.00	0.00	0.00	0.00	0.67	2.49	6.67	Penstemon palmeri
20.00	0.00	0.00	0.00	3.00	5.72	26.67	Astragalus cicer
0.00	0.00	0.00	0.00	0.67	1.70	13.33	Melilotus officinalis
0.00	0.00	5.00	0.00	0.33	1.25	6.67	Artemisia ludoviciana
0.00	0.00	0.00	0.00	2.00	3.56	26.67	Iva axillaris
0.00	0.00	0.00	5.00	0.33	1.25	6.67	Haplopappus palmeri
							GRASSES
5.00	10.00	0.00	5.00	6.67	10.11	53.33	Elymus spicatus
5.00	5.00	0.00	40.00	11.33	13.35	60.00	Agropyron cristatum
15.00	30.00	50.00	0.00	15.67	16.21	73.33	Bromus carinatus
0.00	0.00	0.00	0.00	0.67	2.49	6.67	Elymus lanceolatus
0.00	0.00	0.00	0.00	0.67	2.49	6.67	Dactylis glomeratus
0.00	0.00	0.00	0.00	1.67	5.06	13.33	Poa secunda
							COVER
45.00	45.00	55.00	50.00	47.00	4.40		Total Living Cover
15.00	10.00	10.00	5.00	15.67	4.78		Litter
15.00	35.00	30.00	40.00	22.00	8.72		Bareground
25.00	10.00	5.00	5.00	15.33	7.63		Rock
							% COMPOSITION
0.00	0.00	0.00	0.00	6.67	17.38		Shrubs
44.44	0.00	9.09	10.00	15.38	15.33		Forbs
55.56	100.00	90.91	90.00	77.95	24.47		Grasses

BEAVERCREEK/BLACKHAWK
Huntington #4
Sites A thru E Combined
Exposure: Variable
Slope:

Site A = 1 thru 20

Sample Date: 29 July 1993	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00	11.00
TREES & SHRUBS											
Chrysothamnus nauseosus	0.00	0.00	0.00	0.00	0.00	15.00	0.00	0.00	5.00	0.00	0.00
Ceratoides lanata	0.00	7.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Purshia tridentata	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Eriogonum corymbosum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gutierrezia sarothrae	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rosa woodsii	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FORBS											
Penstemon palmeri	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Astragalus cicer	0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	25.00	25.00
Melilotus officinalis	0.00	8.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Artemisia ludoviciana	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Machaeranthera canescens	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Aster chilensis	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Salsola iberica	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Eriogonus sp.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Iva axillaris	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Haplopappus parryi	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Haplopappus palmeri	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GRASSES											
Stipa hymenoides	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Elymus spicatus	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	5.00
Agropyron cristatum	0.00	0.00	0.00	5.00	10.00	10.00	25.00	0.00	5.00	5.00	0.00
Bromus carinatus	10.00	5.00	10.00	5.00	5.00	5.00	5.00	5.00	10.00	5.00	5.00
Elymus lanceolatus	30.00	5.00	5.00	20.00	10.00	0.00	0.00	10.00	0.00	5.00	0.00
Dacytylis glomeratus	0.00	5.00	10.00	0.00	0.00	0.00	10.00	10.00	0.00	0.00	0.00
Elymus salinus	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	20.00	0.00	0.00
Hordeum jubatum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Poa secunda	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
COVER											
Total Living Cover	40.00	30.00	25.00	35.00	30.00	30.00	40.00	25.00	40.00	45.00	35.00
Litter	5.00	10.00	15.00	20.00	35.00	10.00	30.00	10.00	40.00	10.00	15.00
Bareground	30.00	25.00	30.00	20.00	25.00	25.00	20.00	50.00	15.00	35.00	40.00
Rock	25.00	35.00	30.00	25.00	10.00	35.00	10.00	15.00	5.00	10.00	10.00
% COMPOSITION											
Shrubs	0.00	23.33	0.00	0.00	0.00	50.00	0.00	0.00	12.50	0.00	0.00
Forbs	0.00	26.67	0.00	14.29	16.67	0.00	0.00	0.00	0.00	55.56	71.43
Grasses	100.00	50.00	100.00	85.71	83.33	50.00	100.00	100.00	87.50	44.44	28.57

12.00	13.00	14.00	15.00	16.00	17.00	18.00	19.00	20.00	21.00	22.00	23.00	24.00
0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	10.00	10.00	5.00	5.00	5.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	0.00	5.00	5.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00	0.00	5.00	0.00	5.00	5.00	0.00	10.00	5.00	0.00	5.00	0.00	5.00
10.00	15.00	5.00	15.00	20.00	10.00	20.00	20.00	25.00	5.00	10.00	0.00	5.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	5.00	5.00	5.00	5.00	0.00	10.00	5.00	0.00
15.00	30.00	5.00	15.00	10.00	0.00	0.00	0.00	0.00	15.00	0.00	0.00	0.00
0.00	0.00	5.00	0.00	0.00	0.00	0.00	5.00	0.00	5.00	0.00	20.00	5.00
0.00	5.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00
5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
35.00	50.00	30.00	30.00	40.00	25.00	25.00	40.00	50.00	45.00	35.00	35.00	25.00
15.00	20.00	10.00	10.00	10.00	10.00	10.00	15.00	10.00	15.00	10.00	10.00	10.00
30.00	20.00	35.00	40.00	25.00	25.00	55.00	30.00	15.00	20.00	30.00	20.00	25.00
20.00	10.00	25.00	20.00	25.00	40.00	10.00	15.00	25.00	20.00	25.00	35.00	40.00
0.00	0.00	16.67	0.00	0.00	20.00	0.00	0.00	20.00	44.44	14.29	28.57	40.00
42.86	30.00	33.33	50.00	75.00	60.00	80.00	75.00	60.00	11.11	42.86	0.00	40.00
57.14	70.00	50.00	50.00	25.00	20.00	20.00	25.00	20.00	44.44	42.86	71.43	20.00

Site B = 21 thru 40

25.00	26.00	27.00	28.00	29.00	30.00	31.00	32.00	33.00	34.00	35.00	36.00	37.00
10.00	0.00	0.00	10.00	0.00	0.00	5.00	5.00	5.00	10.00	5.00	0.00	15.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00
0.00	5.00	5.00	2.00	5.00	5.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00
5.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	5.00	5.00	0.00	10.00	0.00	0.00	0.00	5.00	5.00	0.00	0.00	0.00
10.00	5.00	20.00	8.00	0.00	0.00	10.00	5.00	5.00	10.00	0.00	14.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	5.00	0.00	0.00	0.00	0.00	5.00	5.00	0.00	0.00	0.00	0.00	5.00
0.00	10.00	5.00	5.00	0.00	10.00	0.00	0.00	0.00	5.00	25.00	0.00	0.00
20.00	0.00	0.00	0.00	20.00	20.00	0.00	0.00	0.00	0.00	0.00	15.00	5.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00
0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00	10.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
50.00	30.00	35.00	35.00	40.00	35.00	20.00	15.00	15.00	40.00	40.00	30.00	35.00
10.00	10.00	5.00	10.00	5.00	20.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
30.00	50.00	50.00	30.00	45.00	35.00	55.00	65.00	60.00	40.00	35.00	50.00	30.00
10.00	10.00	10.00	25.00	10.00	10.00	15.00	10.00	15.00	10.00	15.00	10.00	25.00
30.00	16.67	14.29	48.57	12.50	14.29	25.00	33.33	33.33	37.50	25.00	0.00	42.86
30.00	33.33	71.43	37.14	25.00	0.00	50.00	33.33	66.67	37.50	0.00	50.00	0.00
40.00	50.00	14.29	14.29	62.50	85.71	25.00	33.33	0.00	25.00	75.00	50.00	57.14

Site C = 41 thru 46

38.00	39.00	40.00	41.00	42.00	43.00	44.00	45.00	46.00	47.00	48.00	49.00	50.00
5.00	5.00	0.00	0.00	15.00	15.00	0.00	0.00	0.00	15.00	13.00	5.00	10.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	10.00	0.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00
0.00	0.00	10.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00	5.00	0.00	0.00
50.00	5.00	0.00	0.00	5.00	0.00	0.00	25.00	20.00	0.00	0.00	0.00	5.00
0.00	0.00	0.00	0.00	0.00	10.00	0.00	0.00	0.00	0.00	2.00	5.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	25.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	10.00	10.00	15.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00
0.00	0.00	10.00	0.00	0.00	0.00	5.00	10.00	0.00	10.00	15.00	0.00	10.00
0.00	20.00	0.00	0.00	0.00	5.00	0.00	5.00	5.00	0.00	5.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00
5.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25.00	5.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
60.00	40.00	30.00	25.00	35.00	40.00	35.00	50.00	30.00	25.00	40.00	40.00	40.00
10.00	10.00	20.00	10.00	5.00	5.00	15.00	5.00	5.00	10.00	10.00	20.00	20.00
20.00	25.00	30.00	60.00	50.00	30.00	20.00	15.00	25.00	25.00	20.00	20.00	20.00
10.00	25.00	20.00	5.00	10.00	25.00	30.00	30.00	40.00	40.00	30.00	20.00	20.00
8.33	12.50	0.00	40.00	42.86	62.50	0.00	0.00	0.00	60.00	32.50	25.00	50.00
83.33	25.00	33.33	0.00	14.29	25.00	85.71	60.00	66.67	0.00	17.50	12.50	12.50
8.33	62.50	66.67	60.00	42.86	12.50	14.29	40.00	33.33	40.00	50.00	62.50	37.50

Site D = 47 thru 60

51.00	52.00	53.00	54.00	55.00	56.00	57.00	58.00	59.00	60.00	61.00	62.00	63.00
5.00	0.00	0.00	0.00	0.00	0.00	5.00	5.00	0.00	20.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	5.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.00	10.00	5.00	5.00	5.00	5.00	5.00	5.00	15.00	0.00	0.00	0.00	0.00
10.00	5.00	0.00	0.00	5.00	5.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	0.00
0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00	0.00	5.00	25.00	10.00	5.00	0.00	15.00	0.00	0.00	0.00	0.00	0.00
5.00	15.00	10.00	0.00	15.00	5.00	15.00	5.00	20.00	10.00	0.00	0.00	40.00
5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	30.00	0.00
0.00	0.00	0.00	0.00	0.00	20.00	0.00	0.00	0.00	0.00	45.00	0.00	10.00
5.00	0.00	5.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
45.00	35.00	25.00	35.00	35.00	45.00	35.00	30.00	35.00	30.00	45.00	40.00	50.00
15.00	15.00	10.00	5.00	20.00	20.00	15.00	10.00	20.00	15.00	20.00	10.00	20.00
10.00	40.00	15.00	55.00	15.00	25.00	20.00	30.00	20.00	25.00	20.00	20.00	10.00
30.00	10.00	50.00	5.00	30.00	10.00	30.00	30.00	25.00	30.00	15.00	30.00	20.00
11.11	0.00	0.00	0.00	0.00	0.00	14.29	16.67	0.00	66.67	0.00	0.00	0.00
44.44	57.14	20.00	28.57	28.57	33.33	28.57	16.67	42.86	0.00	0.00	25.00	0.00
44.44	42.86	80.00	71.43	71.43	66.67	57.14	66.67	57.14	33.33	100.00	75.00	100.00

Site E = 60 thru 75

64.00	65.00	66.00	67.00	68.00	69.00	70.00	71.00	72.00	73.00	74.00	75.00
0.00	0.00	0.00	30.00	20.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00	0.00	0.00	0.00	10.00	10.00	0.00	0.00	20.00	0.00	0.00	0.00
0.00	0.00	5.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	10.00	5.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	15.00	0.00	0.00	5.00	10.00	10.00	0.00	5.00	10.00	0.00	5.00
25.00	0.00	0.00	10.00	0.00	5.00	20.00	30.00	5.00	5.00	0.00	40.00
0.00	20.00	35.00	0.00	5.00	5.00	10.00	10.00	15.00	30.00	50.00	0.00
0.00	0.00	0.00	0.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
50.00	50.00	45.00	50.00	50.00	40.00	40.00	50.00	45.00	45.00	55.00	50.00
20.00	20.00	20.00	20.00	15.00	15.00	20.00	15.00	15.00	10.00	10.00	5.00
10.00	15.00	25.00	25.00	10.00	25.00	25.00	25.00	15.00	35.00	30.00	40.00
20.00	15.00	10.00	5.00	25.00	20.00	15.00	10.00	25.00	10.00	5.00	5.00
0.00	0.00	0.00	60.00	40.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.00	20.00	22.22	20.00	20.00	50.00	0.00	0.00	44.44	0.00	9.09	10.00
90.00	80.00	77.78	20.00	40.00	50.00	100.00	100.00	55.56	100.00	90.91	90.00

BEAVERCREEK/BLACKHAWK
Huntington #4
A thru E Combined
Exposure: Variable
Slope:
Sample Date: 29 July 1993

Mean	SDev	Freq	
			TREES & SHRUBS
3.91	6.14	38.67	Chrysothamnus nauseosus
0.16	0.98	2.67	Ceratoides lanata
0.13	0.81	2.67	Purshia tridentata
0.89	2.36	14.67	Eriogonum corymbosum
0.13	0.81	2.67	Gutierrezia sarothrae
0.13	1.15	1.33	Rosa woodsii
			FORBS
1.53	2.83	25.33	Penstemon palmeri
6.96	9.04	56.00	Astragalus cicer
0.87	2.27	14.67	Melilotus officinalis
0.13	0.81	2.67	Artemisia ludoviciana
0.20	0.98	4.00	Machaeranthera canescens
0.07	0.57	2.67	Aster chilensis
0.01	0.11	2.67	Salsola iberica
0.33	2.87	2.67	Eriogonus sp.
0.47	1.86	6.67	Iva axillaris
0.07	0.57	2.67	Haplopappus parryi
0.07	0.57	2.67	Haplopappus palmeri
			GRASSES
2.13	4.41	26.67	Stipa hymenoides
5.60	7.74	48.00	Elymus spicatus
5.27	8.87	41.33	Agropyron cristatum
4.60	9.69	36.00	Bromus carinatus
2.33	5.44	25.33	Elymus lanceolatus
0.67	2.36	8.00	Dacytylis glomeratus
0.33	2.36	2.67	Elymus salinus
0.07	0.57	2.67	Hordeum jubatum
0.33	2.36	2.67	Poa secunda

		COVER
37.40	9.21	Total Living Cover
13.47	6.53	Litter
29.40	13.01	Bareground
19.73	10.42	Rock
		% COMPOSITION
15.27	19.25	Shrubs
29.15	24.61	Forbs
55.58	27.30	Grasses

BEAVERCREEK/BLACKHAWK
Huntington #4
Revegetated Road
Exposure: Variable
Slope: Variable

Sample Date: 30 July 1993	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00
TREES & SHRUBS										
Chrysothamnus nauseosus	0.00	0.00	5.00	0.00	25.00	10.00	7.00	10.00	0.00	0.00
Ceratoides lanata	0.00	0.00	7.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00
FORBS										
Penstemon palmeri	0.00	10.00	8.00	5.00	0.00	0.00	8.00	0.00	5.00	10.00
Astragalus cicer	0.00	5.00	0.00	5.00	0.00	0.00	0.00	15.00	40.00	25.00
GRASSES										
Stipa hymenoides	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Elymus spicatus	0.00	10.00	0.00	0.00	0.00	25.00	0.00	0.00	0.00	0.00
Agropyron cristatum	20.00	0.00	0.00	0.00	25.00	0.00	25.00	5.00	5.00	5.00
Bromus carinatus	0.00	0.00	0.00	15.00	0.00	0.00	0.00	0.00	0.00	0.00
Elymus lanceolatus	25.00	0.00	0.00	0.00	10.00	0.00	10.00	5.00	0.00	0.00
Elymus salinus	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
COVER										
Total Living Cover	45.00	25.00	20.00	35.00	60.00	35.00	50.00	35.00	50.00	40.00
Litter	25.00	5.00	5.00	10.00	25.00	25.00	25.00	20.00	5.00	5.00
Bareground	15.00	10.00	25.00	15.00	10.00	25.00	10.00	20.00	10.00	15.00
Rock	15.00	60.00	50.00	40.00	5.00	15.00	15.00	25.00	35.00	40.00
% COMPOSITION										
Shrubs	0.00	0.00	60.00	28.57	41.67	28.57	14.00	28.57	0.00	0.00
Forbs	0.00	60.00	40.00	28.57	0.00	0.00	16.00	42.86	90.00	87.50
Grasses	100.00	40.00	0.00	42.86	58.33	71.43	70.00	28.57	10.00	12.50

11.00	12.00	13.00	14.00	15.00	16.00	17.00	18.00	19.00	20.00	21.00	22.00	23.00
0.00	0.00	20.00	20.00	45.00	25.00	0.00	0.00	0.00	20.00	5.00	5.00	10.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	10.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	5.00	5.00	0.00	5.00
0.00	10.00	30.00	35.00	10.00	0.00	15.00	50.00	20.00	0.00	0.00	40.00	15.00
0.00	0.00	0.00	5.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30.00	5.00	0.00	0.00	0.00	0.00	5.00	15.00	0.00	15.00	15.00	15.00	0.00
10.00	0.00	5.00	5.00	5.00	10.00	5.00	0.00	15.00	0.00	10.00	0.00	5.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00	0.00	0.00	5.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	5.00
0.00	0.00	0.00	0.00	0.00	0.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00
45.00	25.00	55.00	70.00	70.00	35.00	35.00	70.00	35.00	40.00	35.00	60.00	40.00
5.00	10.00	15.00	10.00	15.00	15.00	10.00	10.00	5.00	10.00	20.00	5.00	10.00
5.00	35.00	25.00	15.00	5.00	5.00	5.00	5.00	10.00	25.00	5.00	15.00	5.00
45.00	30.00	5.00	5.00	10.00	45.00	50.00	15.00	50.00	25.00	40.00	20.00	45.00
0.00	0.00	36.36	28.57	64.29	71.43	0.00	0.00	0.00	50.00	14.29	8.33	25.00
0.00	80.00	54.55	50.00	21.43	0.00	42.86	71.43	57.14	12.50	14.29	66.67	50.00
100.00	20.00	9.09	21.43	14.29	28.57	57.14	28.57	42.86	37.50	71.43	25.00	25.00

24.00	25.00	26.00	27.00	28.00	29.00	30.00	31.00	32.00	33.00	34.00	Mean	SDev	Freq
40.00	10.00	20.00	0.00	15.00	0.00	5.00	5.00	0.00	5.00	0.00	9.03	11.54	58.82
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	2.03	5.88
0.00	5.00	0.00	5.00	0.00	5.00	10.00	0.00	5.00	0.00	0.00	3.12	3.63	47.06
10.00	15.00	30.00	30.00	50.00	25.00	15.00	5.00	45.00	25.00	20.00	17.21	15.59	73.53
0.00	0.00	0.00	0.00	0.00	5.00	0.00	20.00	0.00	15.00	0.00	1.47	4.29	14.71
0.00	5.00	0.00	5.00	10.00	0.00	0.00	10.00	0.00	0.00	10.00	5.15	7.72	41.18
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.56	7.01	44.12
0.00	0.00	20.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.03	4.16	5.88
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	2.35	5.03	29.41
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.29	1.69	2.94
50.00	35.00	70.00	40.00	75.00	35.00	30.00	40.00	50.00	45.00	40.00	44.71	14.09	
5.00	5.00	10.00	5.00	5.00	5.00	5.00	30.00	5.00	5.00	5.00	11.03	7.55	
35.00	55.00	15.00	30.00	5.00	45.00	10.00	5.00	5.00	10.00	10.00	15.88	12.28	
10.00	5.00	5.00	25.00	15.00	15.00	55.00	25.00	40.00	40.00	45.00	28.38	16.75	
80.00	28.57	28.57	0.00	20.00	0.00	16.67	12.50	0.00	11.11	0.00	20.50	22.66	
20.00	57.14	42.86	87.50	66.67	85.71	83.33	12.50	100.00	55.56	50.00	45.50	30.17	
0.00	14.29	28.57	12.50	13.33	14.29	0.00	75.00	0.00	33.33	50.00	34.00	27.14	

BEAVERCREEK/BLACKHAWK
Huntington #4
Revegetated Road
Exposure: Variable
Slope: Variable
Sample Date: 30 July 1993

TREES & SHRUBS
Chrysothamnus nauseosus
Ceratoides lanata

FORBS
Penstemon palmeri
Astragalus cicer

GRASSES
Stipa hymenoides
Elymus spicatus
Agropyron cristatum
Bromus carinatus
Elymus lanceolatus
Elymus salinus

COVER
Total Living Cover
Litter
Bareground
Rock

% COMPOSITION
Shrubs
Forbs
Grasses

BEAVERCREEK/BLACKHAWK
Huntington #4
Reference Area
Exposure: SSW
Slope: 34 deg.

Sample Date: 30 July 1993	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00
TREES & SHRUBS										
Pinus edulis	0.00	40.00	30.00	25.00	15.00	0.00	40.00	70.00	0.00	0.00
Ceratoides lanata	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35.00	0.00
FORBS										
GRASSES										
Elymus salinus	35.00	0.00	20.00	25.00	15.00	20.00	5.00	0.00	0.00	15.00
COVER										
Total Living Cover	35.00	40.00	50.00	50.00	30.00	20.00	45.00	70.00	35.00	15.00
Litter	5.00	45.00	20.00	45.00	35.00	20.00	5.00	15.00	25.00	5.00
Bareground	45.00	10.00	5.00	3.00	5.00	45.00	5.00	5.00	35.00	60.00
Rock	15.00	5.00	25.00	2.00	30.00	15.00	45.00	10.00	5.00	20.00
% COMPOSITION										
Shrubs	0.00	100.00	60.00	50.00	50.00	0.00	88.89	100.00	100.00	0.00
Forbs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Grasses	100.00	0.00	40.00	50.00	50.00	100.00	11.11	0.00	0.00	100.00

11.00	12.00	13.00	14.00	15.00	16.00	17.00	18.00	19.00	20.00	21.00	22.00	23.00
0.00	0.00	0.00	25.00	0.00	10.00	0.00	50.00	0.00	45.00	10.00	25.00	20.00
0.00	2.00	0.00	0.00	0.00	25.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20.00	18.00	25.00	25.00	25.00	20.00	30.00	0.00	15.00	15.00	25.00	25.00	15.00
20.00	20.00	25.00	50.00	25.00	55.00	30.00	50.00	15.00	60.00	35.00	50.00	35.00
10.00	10.00	5.00	45.00	10.00	40.00	60.00	25.00	20.00	30.00	25.00	40.00	55.00
45.00	45.00	5.00	3.00	55.00	3.00	2.00	10.00	5.00	5.00	15.00	5.00	5.00
25.00	25.00	65.00	2.00	10.00	2.00	8.00	15.00	60.00	5.00	25.00	5.00	5.00
0.00	10.00	0.00	50.00	0.00	63.64	0.00	100.00	0.00	75.00	28.57	50.00	57.14
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
100.00	90.00	100.00	50.00	100.00	36.36	100.00	0.00	100.00	25.00	71.43	50.00	42.86

BEAVERCREEK/BLACKHAWK
Huntington #4
Reference Area
Exposure: SSW
Slope: 34 deg.
Sample Date: 30 July 1993

24.00	25.00	26.00	27.00	28.00	29.00	30.00	Mean	SDev	Freq	
										TREES & SHRUBS
0.00	0.00	30.00	10.00	5.00	15.00	0.00	15.50	18.50	50.00	Pinus edulis
0.00	5.00	0.00	0.00	2.00	0.00	20.00	2.97	8.20	20.00	Ceratoides lanata
										FORBS
										GRASSES
15.00	20.00	5.00	25.00	8.00	5.00	15.00	16.20	9.42	86.67	Elymus salinus
										COVER
15.00	25.00	35.00	35.00	15.00	20.00	35.00	34.67	14.54		Total Living Cover
20.00	5.00	5.00	10.00	5.00	10.00	5.00	21.83	16.46		Litter
40.00	15.00	5.00	5.00	15.00	60.00	5.00	18.87	19.73		Bareground
25.00	55.00	55.00	50.00	65.00	10.00	55.00	24.63	20.85		Rock
										% COMPOSITION
0.00	20.00	85.71	28.57	46.67	75.00	57.14	43.21	36.04		Shrubs
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		Forbs
100.00	80.00	14.29	71.43	53.33	25.00	42.86	56.79	36.04		Grasses

SEDIMENT PRODUCTION EVALUATION OF THE RECLAIMED AREA FOR THE HUNTINGTON NO. 4 MINE

MOUNTAIN COAL COMPANY
Somerset, Colorado

Prepared by

EARTHFAX ENGINEERING, INC.
Midvale, Utah

December 7, 1993

REGISTERED PROFESSIONAL ENGINEER
No. 8435
CAROL A.
BJORK
STATE OF UTAH

Carol A. Bjork
12/7/93

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SEDIMENT PRODUCTION EVALUATION OF THE RECLAIMED AREA FOR THE HUNTINGTON NO. 4 MINE

CHAPTER 1

INTRODUCTION

This report presents an evaluation of the sediment production from the Huntington No. 4 Mine, located between Mill Fork Canyon and Crandall Canyon, southwest of Price, Utah. The sediment production is evaluated under both pre-mining and post-mining topographic and vegetative conditions. The result of these analyses will be a determination of the effectiveness of the reclaimed surface in controlling sediment production compared with that produced from undisturbed areas.

The report is divided into four chapters, including this introduction. Chapter 2 presents a discussion of the methods used to develop runoff and sediment hydrographs. Chapter 3 presents and discusses the results of the evaluation, while the references used in the report are contained in Chapter 4. The appendices follow the references.

CHAPTER 2
METHODS

2.1 DETERMINATION OF PRECIPITATION DEPTH

Precipitation depth was determined for the 10-year, 24-hour storm. The depth values for this storm were determined from National Oceanographic and Atmospheric Administration (NOAA) (1973).

2.2 DETERMINATION OF RUNOFF

The Civil Software Design SEDCAD+ Program, Version 3 (1992) was used to determine the runoff volume and peak flow and the sediment concentration. Within the SEDCAD+ model, the SCS curve number method was used to determine the runoff volume and peak flow.

2.2.1 Runoff Volume

According to the U.S. Soil Conservation Service (SCS) (1972), the algebraic and hydrologic relations between storm rainfall, soil moisture storage, and runoff can be expressed by the equations:

$$Q = \frac{(P - 0.2S)^2}{P + 0.8S} \qquad (1)$$

and

$$S = \frac{1000}{CN} - 10 \qquad (2)$$

where:

Q	=	Direct runoff volume (inches)
S	=	Watershed storage factor (inches)
P	=	Rainfall depth (inches)
CN	=	Runoff the curve number (dimensionless)

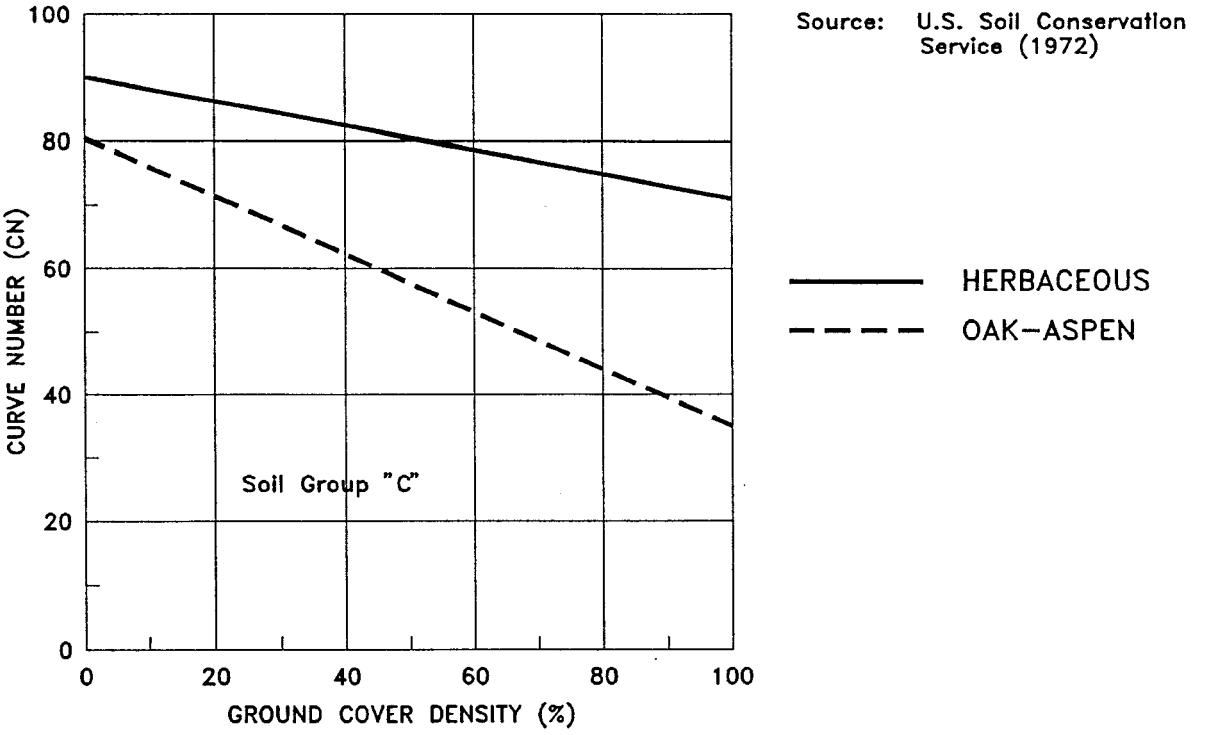
It should be noted that (a) Equation (1) is valid only for P > = 0.2S (otherwise Q = 0), (b) Equation (2), as stated, is in inches, with the values of 1000 and 10 carrying the dimensions of inches, although metric conversions are possible, and (c) CN is only a convenient transformation of S to establish a scale of 0 to 100 and has no intrinsic meaning.

Curve numbers for the watersheds of concern were obtained by evaluating the watershed surface characteristics based on soils and vegetative type. This determination was based on site maps, soil sample results, vegetative studies, and field reconnaissance of the site. The curve numbers for the pre-mining and post-mining watersheds were determined using the estimated cover density of the various vegetative communities, and by reading the value from Figure 2-1, assuming a hydrologic soil group of C (as is typical of much of the region).

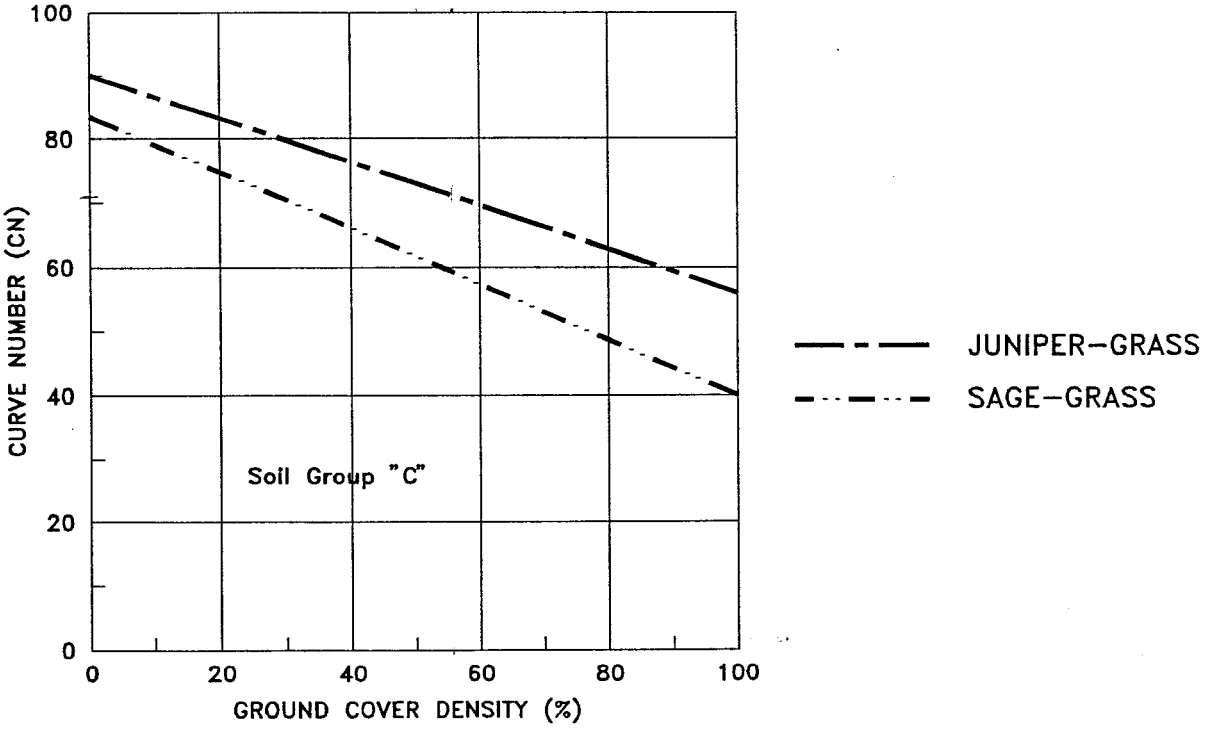
2.2.2 Hydrograph Synthesis

Runoff hydrographs were developed for the 10-year, 24-hour storm event using the SEDCAD+ computer program developed by Civil Software Design (1992). The SEDCAD+ program uses the SCS triangular hydrograph method to simulate the surface runoff response of a drainage to precipitation.

The SCS method yields a total rainfall excess, the difference between rainfall depth and precipitation loss. For a given storm, the incremental excess for a given period of a storm can be computed as the difference between the accumulated excess at the end of the current time



HERBACEOUS AND OAK-ASPEN COMPLEXES



JUNIPER-GRASS AND SAGE-GRASS COMPLEXES

FIGURE 2-1. GRAPHS FOR ESTIMATING RUNOFF CURVE NUMBERS OF FOREST-RANGE COMPLEXES IN THE WESTERN UNITED STATES.

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period and the accumulated excess at the end of the previous period (SCS, 1972). The computer program calculates the incremental volume using:

$$\Delta Q = \left[\frac{(P(t + \Delta t) - 0.2S)^2}{P(t + \Delta t) + 0.8S}\right] - \left[\frac{(P(t) - 0.2S)^2}{P(t) + 0.8S}\right] \quad (3)$$

where S is as previously defined using the curve number and values for $P(t+\Delta t)$ and $P(t)$ are determined from the rainfall mass curve.

This rainfall excess is then translated to an outflow hydrograph using the SCS triangular dimensionless unit hydrograph (SCS, 1972). Figure 2-2 shows a typical curvilinear unit hydrograph. It is characterized by its time to peak (T_p), recession time (T_r), time of base (T_b), and the relations between these parameters (i.e., $T_r = 1.67T_p$; $T_b = 2.67T_p$). Thus, from the geometry of a triangle and the incremental runoff (ΔQ) the peak flow can be defined by the equation:

$$q_p = \frac{0.75\ \Delta Q}{T_p} \quad (4)$$

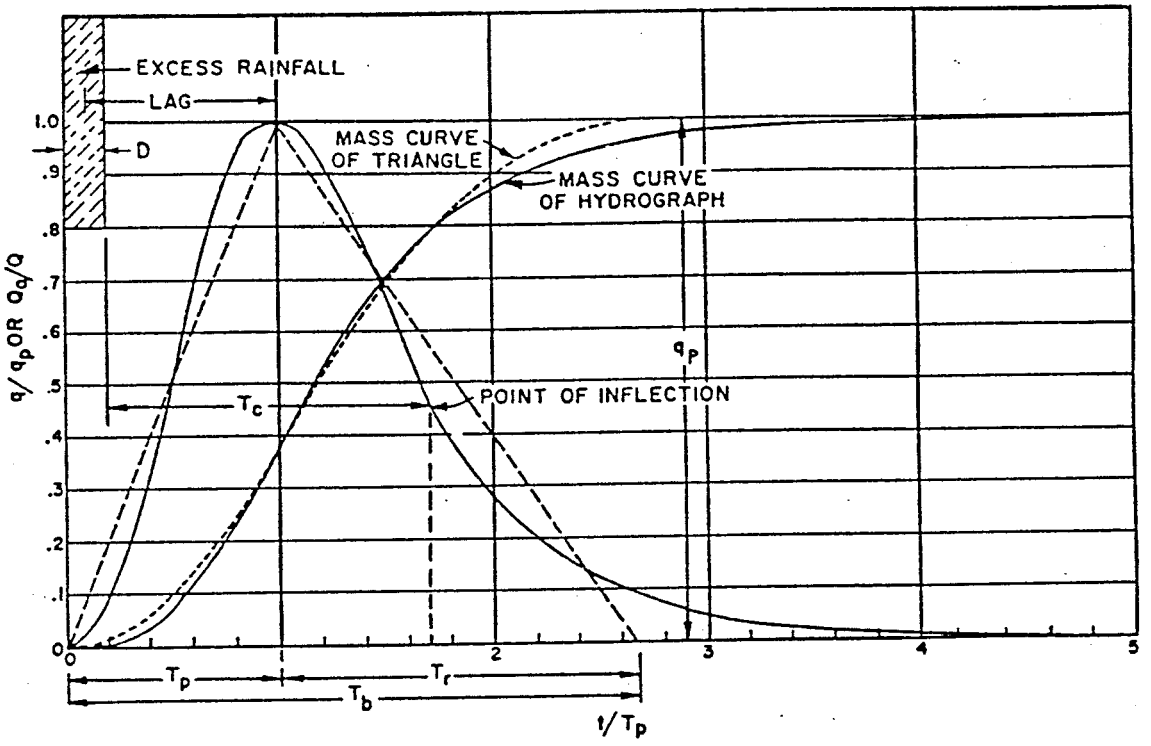
where:

q_p = Peak flow rate (in/hr, if Q is in inches and T_p in hours), and other parameters are previously defined.

The flow at any time $0 < t < T_r$ may be determined by simple linear proportioning of the triangular unit hydrograph. The time to peak is related to the familiar expression "time of concentration" (T_c) by the equation:

$$T_c + \Delta t = 1.7\ T_p \quad (5)$$

in which the factor 1.7 is an empirical finding cited by the U.S. Soil Conservation Service (1972).



Source: U.S. Soil Conservation Service (1972)

FIGURE 2-2. DIMENSIONLESS UNIT HYDROGRAPH AND MASS-CURVE.

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The time of concentration may be estimated by several formulas. For this report, T_c was determined from the following equations (SCS, 1972):

$$L = \frac{\lambda^{0.8}\,(S+1)^{0.7}}{1900\,Y^{0.5}} \tag{6}$$

and

$$T_c = 1.67\,L \tag{7}$$

where:

L	=	Watershed lag time (hours)
λ	=	Hydraulic length of the watershed, or distance along the main channel to the watershed divide (feet)
S	=	Watershed storage factor defined in Equation (2)
Y	=	Average watershed slope (percent)
T_c	=	Time of concentration (hours)

The U.S. Soil Conservation Service (1972) shows that Δt must equal $0.2T_p$. Therefore, the computer code uses only T_c, and from this value computes Δt, T_p, T_r, and interim unit hydrograph ordinates. To convert the unit hydrograph ordinates to cubic feet per second, the following relation is used:

$$q_{cfs} = q_{\frac{inch}{hr}} * 645.33 * \text{Area} \tag{8}$$

where:

Area	=	Drainage area (square miles)
q	=	Discharge (cubic feet per second)

2.3 SEDIMENT VOLUME AND CONCENTRATION DETERMINATION

The anticipated sediment production from the pre-mine and reclaimed areas was determined using the Revised Universal Soil Loss Equation (RUSLE) developed by Williams (1975) and implemented in the SEDCAD+ computer program:

$$A = 95\ (Q * q)^{0.56} * K * LS * CP \tag{9}$$

where:

A	=	Sediment production (tons)
Q	=	Runoff volume (ac-ft)
q	=	Peak flow (cfs)
K	=	Erodibility factor
LS	=	Length slope factor
CP	=	Control practice factor

The LS factor has been modified to account for steep slopes. The revised slope factor is now a piece-wise linear equation rather than a logarithmic equation. The new LS factor is determined from the following equation and Figure 2-3:

$$LS = \left(\frac{\lambda}{72.6}\right)^{m} * (SF)$$

where:

LS	=	Length slope factor
λ	=	Representative slope length (ft)
m	=	0.6 for slopes greater than 10%
		0.5 for slopes less than or equal to 10% and greater than 4%
		0.4 for slopes equal to 4%
		0.3 for slopes less than 4%
SF	=	Slope Factor, determined from Figure 2-3.

The RUSLE provides an estimate of the total sediment eroded and transported from the watershed. Using the sediment volume, the particle size distribution of the site soils, and the

Source: Civil Software Design (1992)

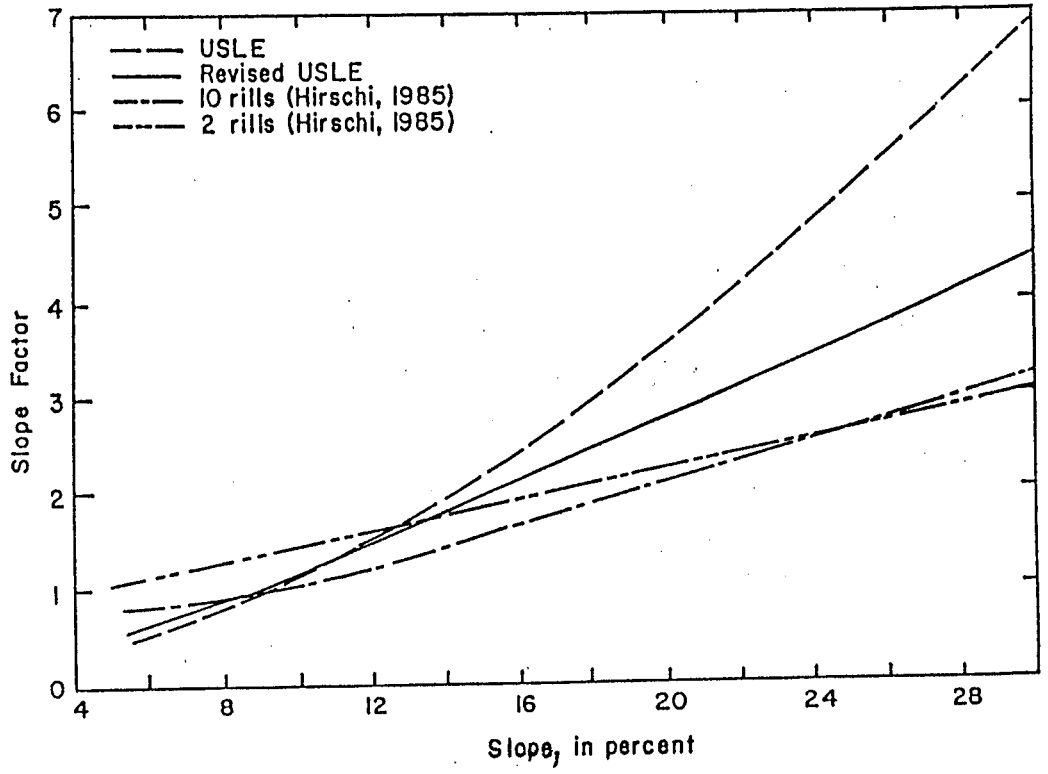

FIGURE 2-3. SLOPE FACTOR VS. SLOPE FOR RUSLE

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peak flow from the watershed, SEDCAD+ can determine the estimated sediment concentration in the runoff from the site.

The soil particle size distribution was determined for both pre- and post-mining conditions from soil samples collected from the site. Two soil samples were collected from the undisturbed areas to represent pre-mining soil conditions. Similarly, three soil samples were collected for post-mining conditions from the reclaimed watersheds. All soil samples were submitted to Applied Geotechnical Engineering Consultants, Inc. (AGEC) in Salt Lake City for analysis. The analyses consisted of an undispersed particle size distribution analysis by wet sieving and hydrometer. This type of analysis provides a representative particle size distribution of the eroded soils.

CHAPTER 3
RESULTS, DISCUSSION, AND RECOMMENDATIONS

3.1 PRE-MINING AND POST-MINING TOPOGRAPHY

The pre-mining topography was determined from the USGS 7.5 minute Quadrangle for Rilda Canyon, Utah. The topography for this quadrangle was based on 1970 aerial photography. Figure 3-1 presents this topography along with the pre-mining watershed boundaries for the drainages applicable to the sediment analysis. The watershed boundaries identified for this analysis were determined by the extent of the reclaimed areas so that comparisons could be made between pre-mining and post-mining sediment yields.

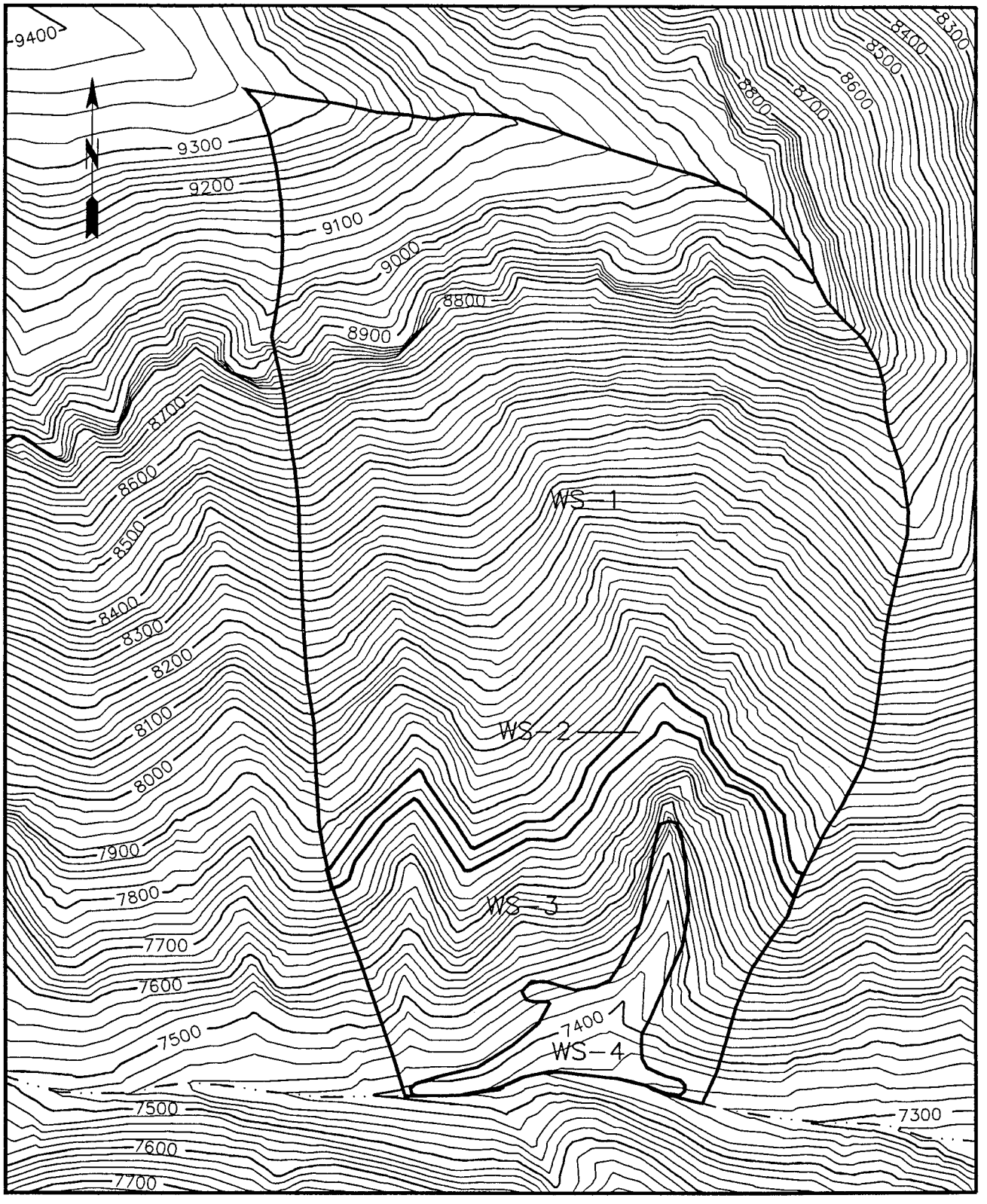
The watershed boundaries for the post-mining sediment analysis, and the topography for the undisturbed watersheds, are shown on Plate 1.

3.2 PRECIPITATION DEPTH

The precipitation depth value for the site area was determined from NOAA (1973). The 10-year, 24-hour storm depth of 2.0 inches was used to evaluate the sediment production from both the pre-mining site and the reclaimed site. This value was used to correspond to the regulatory compliance requirement for sediment ponds, which ensures that the 10-year, 24-hour storm event be treated.

3.3 CURVE NUMBER VALUES

For the pre-mining (undisturbed) conditions, the vegetative type within the watersheds identified on Figure 3-1 consists of primarily the Pinion-Juniper unit as presented on Plate 9-1 of the permit document. The curve number value for this vegetation type is based on hydrologic soil group and vegetative cover. Figure 2-1 was used with these inputs to



LEGEND

APPROXIMATE WATERSHED BOUNDARY

0' 500'

SCALE

CONTOUR INTERVAL = 20'

FIGURE 3-1. PRE-MINING TOPOGRAPHY AND WATERSHED BOUNDARIES

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determine the curve number for the pre-mining conditions. Although several other vegetation types (sage-grass, conifer) have been identified within the study area, their distribution is minimal. In addition, the curve numbers for the other vegetation types are lower than that of the Pinion-Juniper unit and, therefore, the analysis is considered a conservative one. Based on the soil permeability classification and soil texture presented in Chapter 8 of the permit document, the hydrologic soil group for all of the soils in the mine area fall in a C group.

The vegetation cover representative of both pre-mining and post-mining conditions was monitored by Mr. Patrick Collins of Mt. Nebo Scientific, Inc. Curve numbers for the pre-mining watersheds were calculated from the vegetation distribution presented on Plate 9-1 and the ground cover density (living cover and litter) as measured by Mr. Collins for the undisturbed (reference) area. The average ground cover density of the reference area was 56.5%. The curve number for this vegetative unit, based on Figure 2-1, was determined to be 71.

For the post-mining conditions, the curve numbers were also determined based on the soils and vegetation characteristics. The vegetation type and cover densities reported by Mr. Collins, along with Figure 2-1, were used to determine the curve number for the reclaimed area. The vegetation within the reclaimed area consisted of shrubs, forbs, and grasses. The cover density of 51.3% was reported for the reclaimed area which resulted in an average curve number of 72. Refer to Appendix A for the pre- and post-mining curve number calculations.

3.4 RUNOFF HYDROGRAPH CALCULATIONS

For the pre-mining area shown in Figure 3-1, Table 3-1 presents the watershed characteristics and the anticipated peak flows and runoff volumes. Table 3-2 presents the watershed characteristics, anticipated peak flows, and runoff volumes of the post-mining

TABLE 3-1

Watershed Characteristics for Pre-Mining Site Area

Parameters	Watershed			
	WS-1	WS-2	WS-3	WS-4
Drainage Area (ac)	106.0	5.0	24.4	4.8
Hydraulic Length (ft)	2500	150	1000	1000
Average W.S. Slope (%)	53.4	58.0	55.2	49.7
Curve Number	71	71	71	71
Time of Conc. (hr)	0.196	0.020	0.094	0.098
10yr-24hr Runoff Volume (ac-ft)	2.35	0.11	0.54	0.11
10yr-24hr Peak Flow (cfs)	16.72	1.40	6.82	1.34

* Calculations are presented in Appendices A and C.

TABLE 3-2

Watershed Characteristics for Post-Mining Site Area

Parameters	Watershed			
	WS-1	WS-2	WS-3	WS-4
Drainage Area (ac)	106.0	5.0	24.4	4.8
Hydraulic Length (ft)	2500	150	1000	1000
Average W.S. Slope (%)	53.4	40.0	55.2	38.1
Curve Number	71	72	71	72
Time of Conc. (hr)	0.196	0.023	0.094	0.109
10yr-24hr Runoff Volume (ac-ft)	2.35	0.12	0.54	0.12
10yr-24hr Peak Flow (cfs)	16.72	1.57	6.82	1.50

* Calculations are presented in Appendices A and D.

watersheds. The computer printouts and calculations for these results are presented in Appendix C and Appendix D for pre- and post-mining conditions, respectively.

3.5 SEDIMENT VOLUME AND CONCENTRATION DETERMINATIONS

The sediment production anticipated from the pre-mine and reclaimed areas was determined using the Revised Universal Soil Loss Equation (RUSLE). The inputs for the site area are the runoff volume, peak flow, soil-erodibility factor, sediment particle size distribution, land-slope factor, and the control-practice factor. The soil-erodibility factor was determined, based on information presented in Chapter 8 of the permit document, as an average for the soils found in the site area. The average value of 0.37 was used, due to the similar soil types across the property. The sediment particle size distributions were determined from undispersed sieve and hydrometer analyses. The results of these analyses are presented in Appendix B. The control-practice factor was selected based on the vegetation type and cover density for each watershed. The land-slope factor was determined for each drainage area, based on the representative length and slope of the contributing area from the drainage divide to a drainage channel. The calculated pre-mine sediment volumes and concentrations are summarized in Table 3-3 and the calculations are presented in Appendices A and C. The post-mine sediment volumes and concentrations area summarized in Table 3-4 and calculations are presented in Appendices A and D.

3.6 SUMMARY OF RESULTS

The SEDCAD + output presented in Appendices C and D, and the summaries in Tables 3-3 and 3-4, shows that the peak sediment concentration calculated from the entire drainage as indicated for the outlet of the study area under reclaimed conditions (193,187 mg/l) is slightly lower than the concentration for pre-mined conditions (196,524 mg/l) at the same point. Based on these comparisons, it is apparent that the sediment production from the reclaimed mine site is comparable to that of the pre-mine site area.

TABLE 3-3

Pre-Mining Sediment Volume and Concentration Determinations

Watershed I.D.	K Value	L Value (ft)	S Value (%)	CP Value	Sediment Volume (tons)
#1 (WS-1)	0.37	300	53.4	0.07	339.8
#2 (WS-2)	0.37	100	58.0	0.07	7.0
#3 (WS-3)	0.37	300	53.4	0.07	93.7
#4 (WS-4)	0.37	150	49.7	0.07	9.1

Peak routed sediment concentration = 195,878 mg/l

TABLE 3-4

Post-mining Sediment Volume and Concentration Determinations

Watershed I.D.	K Value	L Value (ft)	S Value (%)	CP Value	Sediment Volume (tons)
#1 (WS-1)	0.37	300	53.4	0.07	339.8
#2 (WS-2)	0.37	100	40.0	0.08	6.5
#3 (WS-3)	0.37	300	53.4	0.07	93.7
#4 (WS-4)	0.37	150	38.1	0.08	9.2

Peak routed sediment concentration = 192,877 mg/l

In addition, the 24-hour volume-weighted settleable solids concentration for pre-mining conditions is 78.89 milliliters/liter (ml/l) (see Appendix C). This is slightly greater than the post-mining concentration of 78.20 ml/l (see Appendix D).

Based on these results, the post-mining site conditions provide comparable, if not slightly better erosion protection than did the pre-mining conditions. Therefore, removal of the sediment control facilities should not adversely effect the hydrologic regime. Thus, it is recommended that the sediment control facilities at the site be removed and the final reclamation be completed.

CHAPTER 4

REFERENCES

Civil Software Design. 1992. SEDCAD+ Version 3 - Training Manual. Ames, IA.

National Oceanic and Atmospheric Administration. 1973. Precipitation-Frequency Atlas of the Western United States: Volume VI - Colorado. NOAA Atlas 2. National Weather Service. Silver Spring, Maryland.

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Williams, Jimmy R. 1975. Sediment-Yield Prediction with Universal Equation using Runoff Energy Factor. Proceedings of the Sediment-Yield Workshop. USDA Sedimentation Laboratory. Oxford, Mississippi.

APPENDIX A

HYDROLOGIC CALCULATIONS

Huntington No. 4 Mine

Pre-Mining Veg. Data for Curve Numbers

The vegetation cover data reported by Patric Collins of Mt. Nebo Scientific for the Reference Area (undisturbed) will be used to represent pre-mining conditions. Using Mr. Collins' data for pre- and post-mining conditions assures that the methods of measurement are comparable. In addition, the vegetation type is fairly constant over the entire watershed. If the vegetation varies (ie., conifer or sagebrush) the curve number would be lower; Therefore a more conservative curve number will be used.

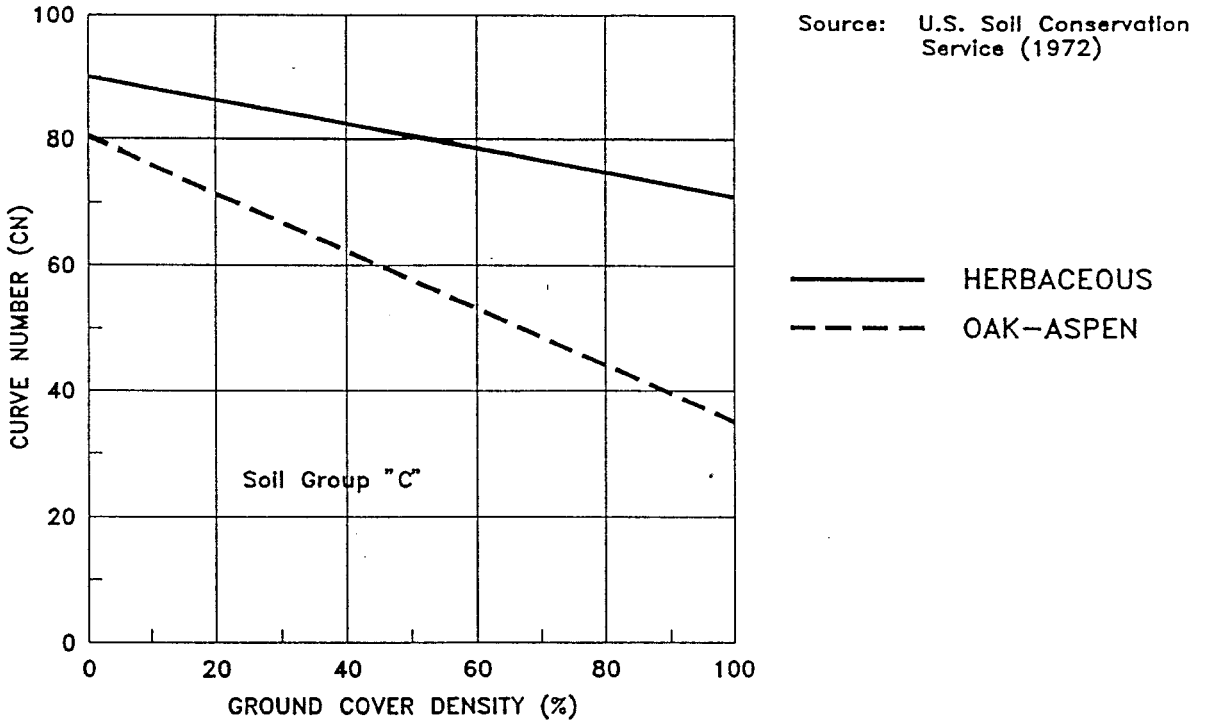
* Watersheds WS-1, WS-2, WS-3 and WS-4

Veg Type = Pinion / Juniper / Curl leaf Mt. Mahogany

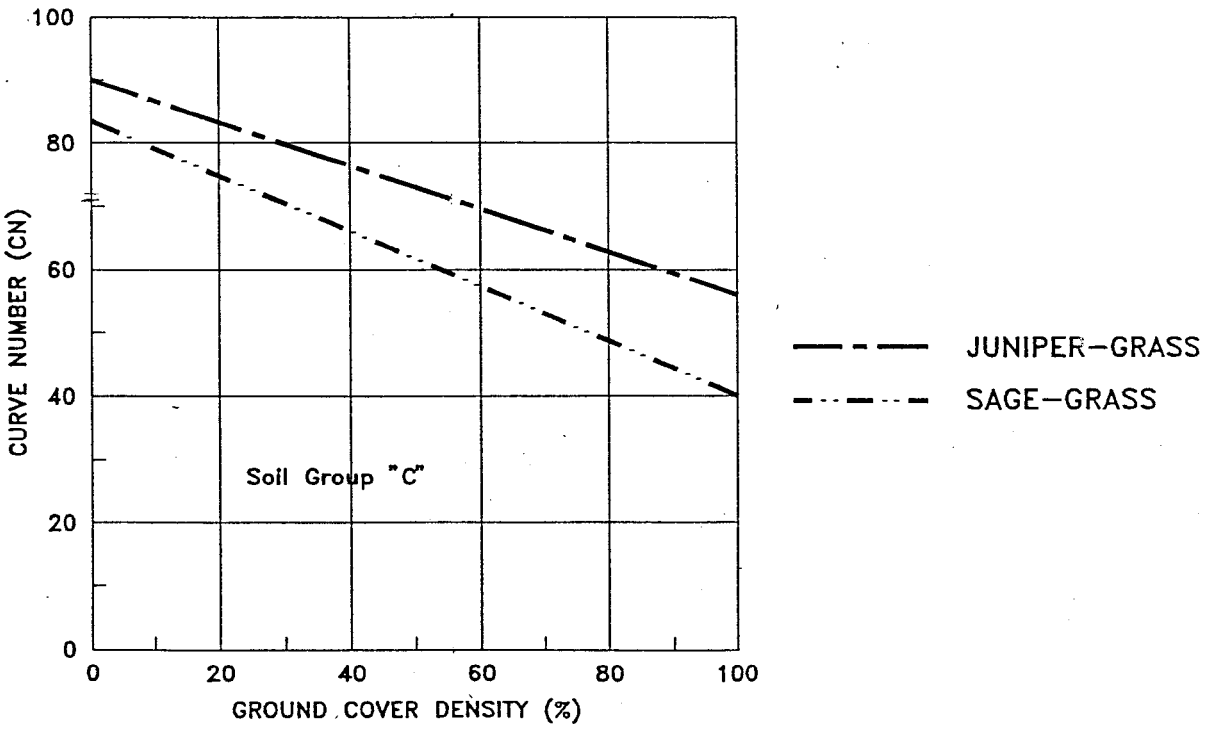
% ground cover = 34.67 (living cover) + 21.83 (litter)
= 56.50%

CN = 71

Note: The watershed boundaries are defined to separate disturbed and undisturbed areas. Although the pre-mining watersheds are all undisturbed, the boundaries are still defined for continuity sake. Error in comparing pre-mining conditions with post-mining conditions will be minimized with the same watershed boundaries.



HERBACEOUS AND OAK–ASPEN COMPLEXES



JUNIPER–GRASS AND SAGE–GRASS COMPLEXES

FIGURE 2–1. GRAPHS FOR ESTIMATING RUNOFF CURVE NUMBERS OF FOREST–RANGE COMPLEXES IN THE WESTERN UNITED STATES.

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Huntington #4 Mine

Pre-Mining Watershed Data

① Watershed Slopes

Use Simplified Contour Length Method (Chang, 1989) for Watersheds WS-1, WS-3 and WS-4.

$$WS = .25(EM-EN)(LC_{25}+LC_{50}+LC_{75})/Area * 100$$

EM = Max Elev.
EN = Min Elev.

LC_{25}, LC_{50}, + LC_{75} = Contour lengths at 25, 50 + 75% of EM − EN.

WS = ave. watershed Slope (%)

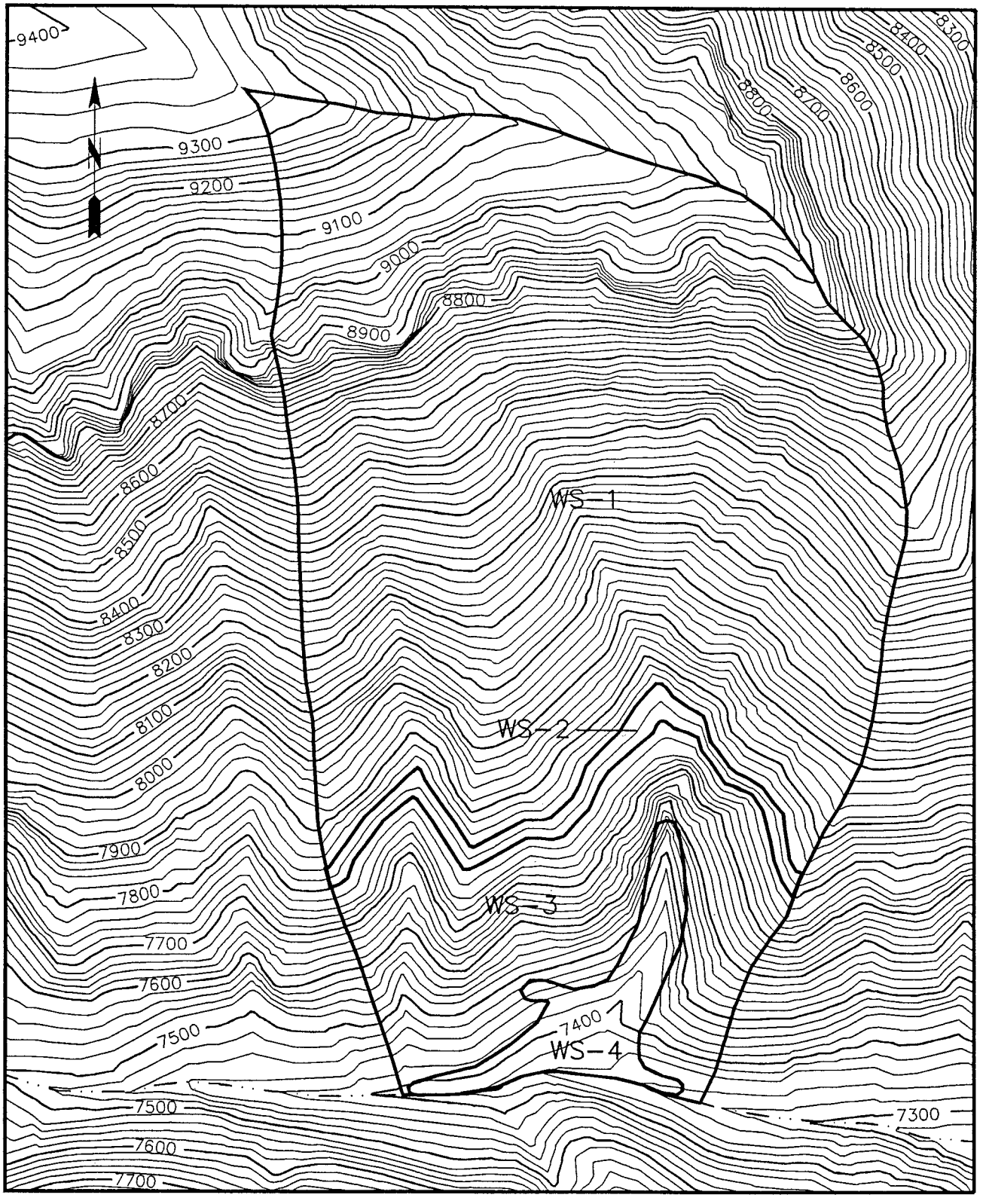
Watershed	EM	EN	LC_{25}	LC_{50}	LC_{75}	Area (ft^2)	WS (%)
WS-1	9335	7840	2500	2220	1880	106.0 Ac 4,617,360 ft^2	53.4 %
WS-3	7800	7340 460	1200	1500	2400	24.4 Ac 1,062,864 ft^2	55.2 %
WS-4	7560	7340 220	850	590	450	4.8 Ac 209,088 ft^2	49.7 %

WS-2 : because of the different shape of WS-2, measure slope (rise/run) every 400' along contour and average.

7830 7750 WS = 58% Area = 5.0 Acres

Hydraulic Length

WS-1	2500'
WS-2	150'
WS-3	1000'
WS-4	1000'



LEGEND

APPROXIMATE WATERSHED BOUNDARY

0' 500'

SCALE

CONTOUR INTERVAL = 20'

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PRE-MINING TOPOGRAPHY

Huntington # 4 Mine

Time of Concentration Calc's (Pre-Mining)

$T_c = 1.67\,L$ L = Lag time (hrs.)

$$L = \frac{l^{.8}(S+1)^{.7}}{1900\,y^{.5}}$$

l = Hyd. length (ft.)
y = ave. watershed slope (%)

$S = \frac{1000}{CN} - 10$ CN = curve number

WS-1

$l = 2500'$ CN = 71
$y = 53.4\%$ S = 4.09

L = .118 hrs.
T_c = .196 hrs.

WS-2

$l = 150'$ CN = 71
$y = 58\%$ S = 4.09

L = .012 hr.
T_c = .020 hr.

WS-3

$l = 1000'$ CN = 71
$y = 55.2\%$ S = 4.09

L = .056 hr.
T_c = .094 hr.

WS-4

$l = 1000'$ CN = 71
$y = 49.7\%$ S = 4.09

L = .059 hr
T_c = .098 hr

* Note — Travel times or routing parameters were not used for the subwatersheds. The results, therefore, are more conservative.

Huntington #4 Mine

Pre-Mining Soil Parameters

① Soil Erodibility Factor, K

From data presented in chapter 8 of the permit document, the K value is 0.37.

② Soil Gradations

Soil samples were collected from several locations representative of pre-mining conditions. These distributions were averaged to provide a composite pre-mining distribution. (See attached)

③ Land-Slope Data

Watershed	representative length (ft.)	representative slope (%)
WS-1	300'	53.4
WS-2	100'	58.0
WS-3	300'	55.2
WS-4	150'	49.7

④ CP Factor [a]

Watershed	% ground cover	CP Factor [a]
WS-1	56.5%	.07
WS-2	↓	.07
WS-3		.07
WS-4		.07

(a) Use Figures 7 + 8 in Israelson et al (1984) assuming a 25% canopy of tall weeds. (average values from Fig. 7+8)

Huntington No. 4 Mine

Pre-mining Composite
Particle Size Distribution

Size (mm)	% Passing 4-U1	4-U2	Composite
4	70	65	67.5
2	67	59	63
1	64	56	60
0.5	58	52	55
0.25	47	46	46.5
0.125	31	37	34
0.063	18	18	18
0.031	6	6	6
0.016	2	3	2.5
0.008	.8	1.0	0.9
0.004	0	0.5	0.25
0.002	0	0	0
0.001	0	0	0

AGEC Results contained in Appendix B.

Huntington #4 Mine

Post-Mining Veg. Data for Curve Numbers

The curve numbers for watersheds WS-1 and WS-3 will be representative of pre-mining conditions since these watersheds are undisturbed.

CN = 71

The curve number for the reclaimed areas (watersheds WS-2 and WS-4) is based on the veg. data collected by Patric Collins of Nelso Scientific, Inc.:

Calculate average cover based on total living cover and litter data ⇒

Area	% cover
road	55.74
A	50.50
B	45.25
C	43.33
D	50.00
E	62.67
	51.25% average

Use Juniper-grass curve ⇒

CN = 72

Huntington #4 Mine

Post-Mining Watershed Data

① Watershed Slopes *

$$WS = .25(EM - EN)(LC_{25} + LC_{50} + LC_{75}) / Area \quad * 100$$

(Variables previously defined)

Watershed	EM	EN	LC_{25}	LC_{50}	LC_{75}	Area (ft^2)	WS (%)
WS-1	9335	7840	2500	2220	1880	4,617,360	53.4
WS-3	7800	7340	1200	1500	2400	1,062,864	55.2
WS-4	7560	7340	850	400	200	209,088	38.1

WS-2 = because of the odd shape of WS-2, measure slope (rise/run) every 250' along contour and average. WS = 40.0% Area = 5.0 Acres

Hydraulic length *

WS-1	2500'
WS-2	150'
WS-3	1000'
WS-4	1000'

* Refer to plate 1 for post-mining topography

Huntington #4

Time of Concentration (Post-Mining)

$T_c = 1.67\,L$

$L = \dfrac{l^{.8}(S+1)^{.7}}{1900\,y^{.5}}$ $\qquad S = \dfrac{1000}{CN} - 10$

(variables previously defined)

WS-1 $\quad l = 2500 \quad CN = 71$
$y = 53.4\% \quad S = 4.09$

$L = .118$ hr
$T_c = .196$ hr

WS-2 $\quad l = 150 \quad CN = 72$
$y = 40\% \quad S = 3.89$

$L = .014$
$T_c = 0.023$

WS-3 $\quad l = 1000' \quad CN = 71$
$y = 55.2\% \quad S = 4.09$

$L = .056$ hr
$T_c = .094$ hr

WS-4 $\quad l = 1000' \quad CN = 72$
$y = 38.1\% \quad S = 3.89$

$L = .065$
$T_c = 0.109$

* Note – Travel times or routing parameters were not used for the subwatersheds. The results, therefore, are more conservative.

Huntington #4 Mine

Post-Mining Soil Parameters

① Soil Erodibility Factor, K

As discussed previously, K=.37

② Soil Gradations

The composite gradation used for the pre-mining conditions will be used for the undisturbed watersheds WS-1 and WS-3.

The soil gradation used for WS-2 and WS-4 is a composite of samples collected of the soils in the reclaimed area (see attached).

③ Land-Slope Data

Watershed	Representative Length (ft.)	Representative Slope (%)
WS-1	300'	53.4%
WS-2	100'	40.0%
WS-3	300'	55.2%
WS-4	150'	38.1%

④ CP-Factor*

Watershed	% ground cover	CP Factor*
WS-1	56.5	.07
WS-2	51.3	.08
WS-3	56.5	.07
WS-4	51.3	.08

* Use Fig. 7+8 of Israelson et al (1984). Assume 25% canopy.

Huntington No. 4 Mine

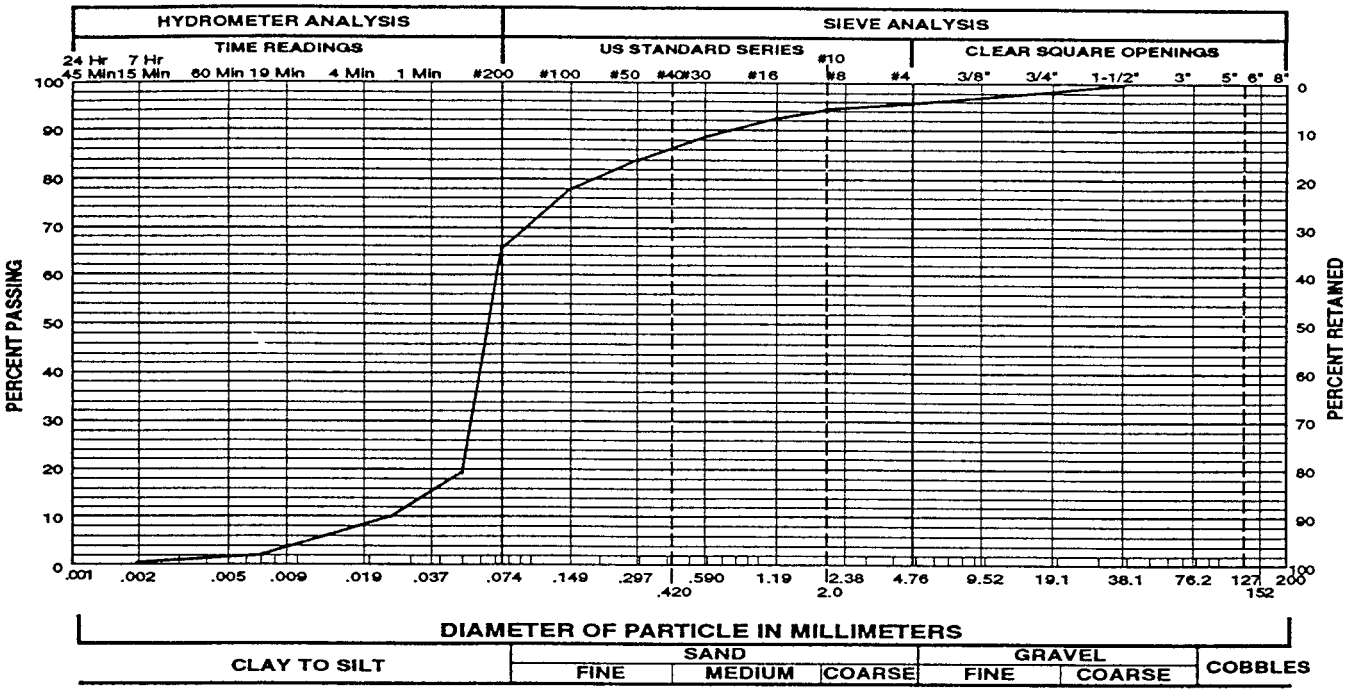
Post-mining Composite
Particle Size Distribution

Size (mm)	% Passing 4-R1	4-R2	4-R3	Composite
4	58	60	71.5	63.2
2	51.5	50	61	54.2
1	47	48	58	51.0
0.5	44	46	54.5	48.2
0.25	38	44	49	43.7
0.125	28	38	36	34.0
0.063	20	24	20	21.3
0.031	10	9.5	9.5	9.7
0.016	6	5.5	6.5	6.0
0.008	4	2.5	3.5	3.3
0.004	2.5	1.5	2.1	2.0
0.002	1.5	1.0	1.9	1.5
0.001	1.0	0	0.4	0.5

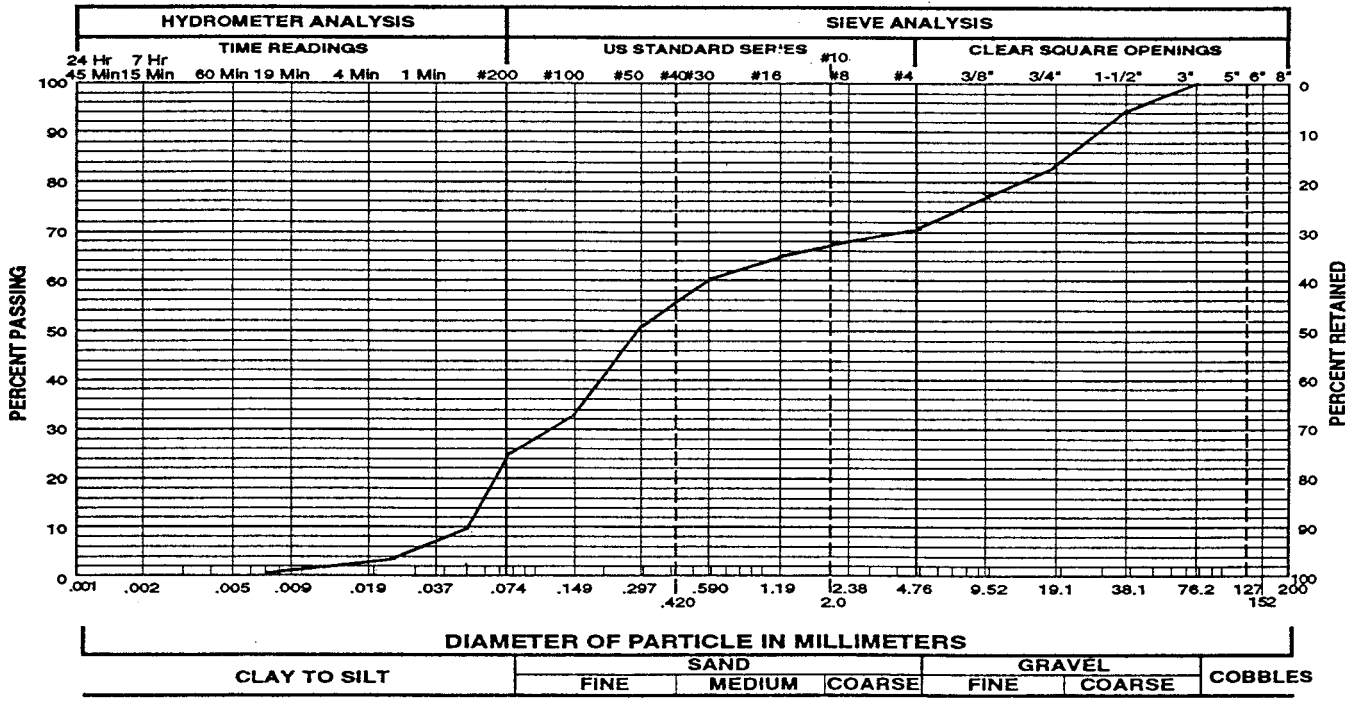
APPENDIX B

AGEC PARTICLE SIZE DISTRIBUTIONS

Applied Geotechnical Engineering Consultants, Inc.



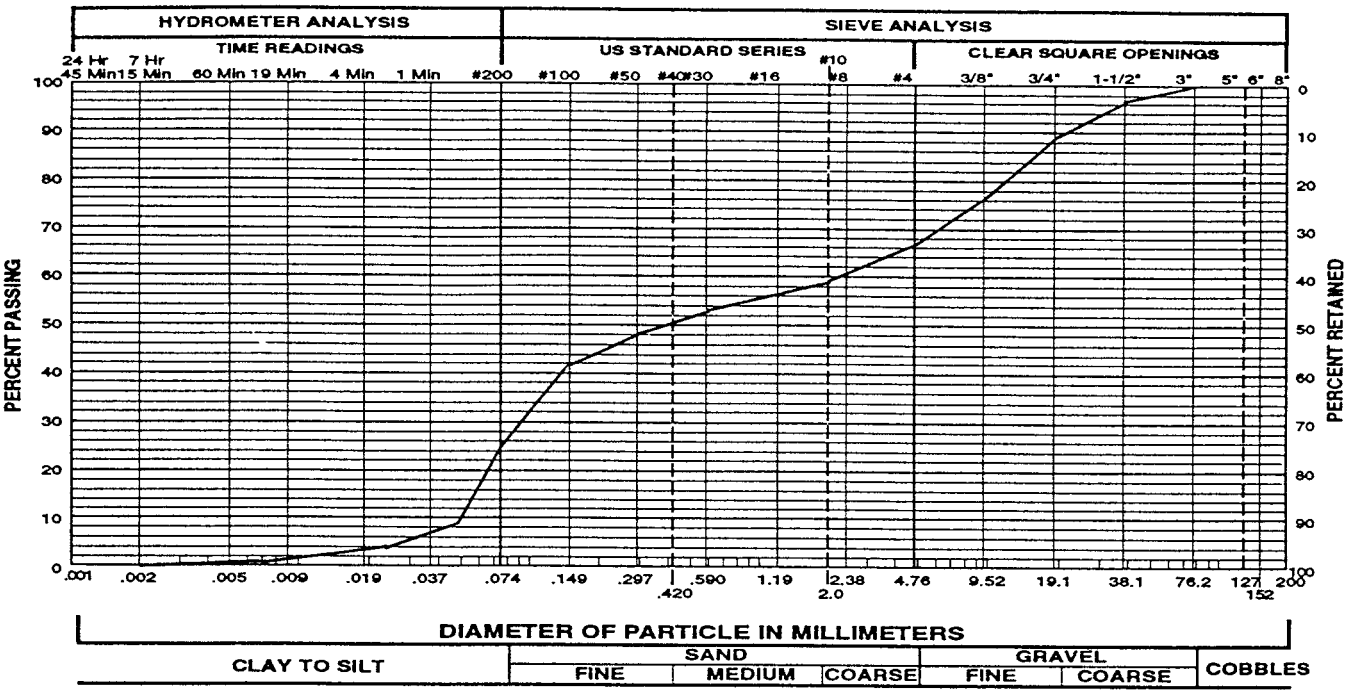
Gravel 4 % Sand 31 % Silt and Clay 65 %
Liquid Limit _____ % Plasticity Index _____ %
Sample of Sandy Silt (ML) From 3-U1



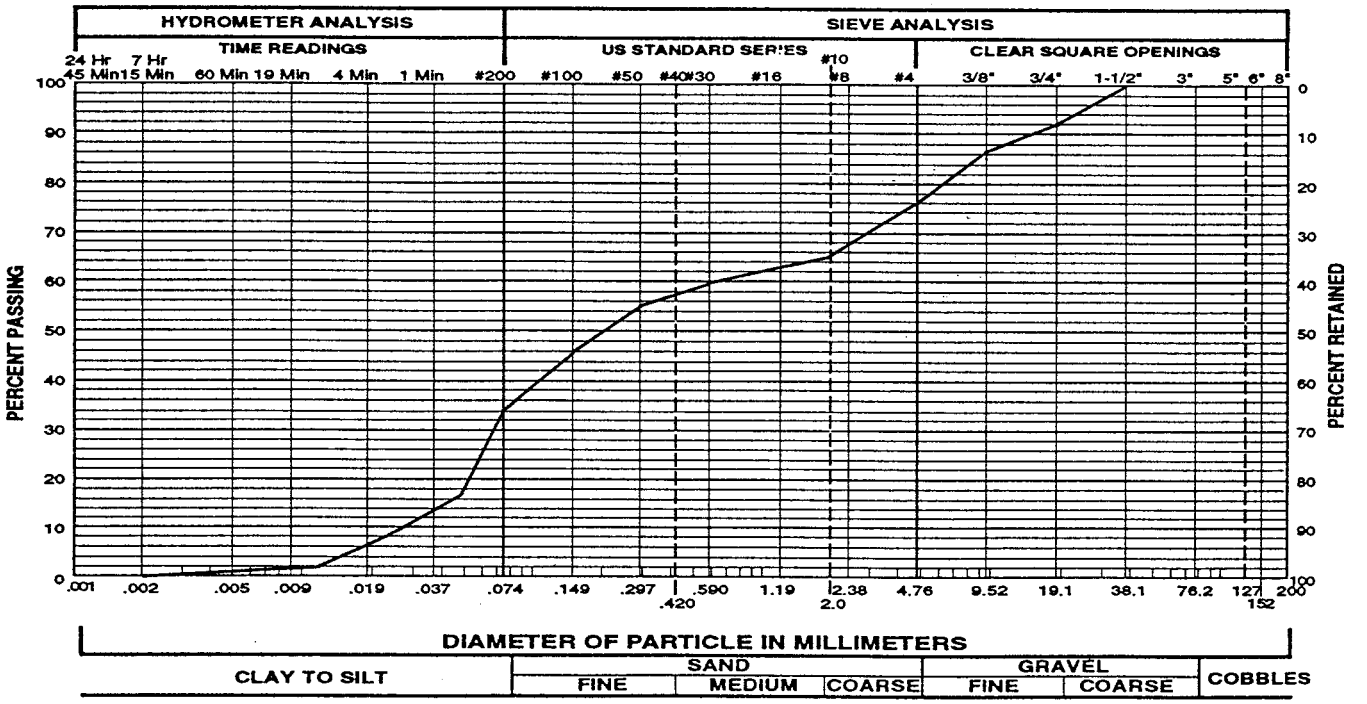
Gravel 29 % Sand 47 % Silt and Clay 24 %
Liquid Limit _____ % Plasticity Index _____ %
Sample of Silty Sand with Gravel (SM) From 4-U1

Project No. 28093 **GRADATION TEST RESULTS** Figure 1

Applied Geotechnical Engineering Consultants, Inc.



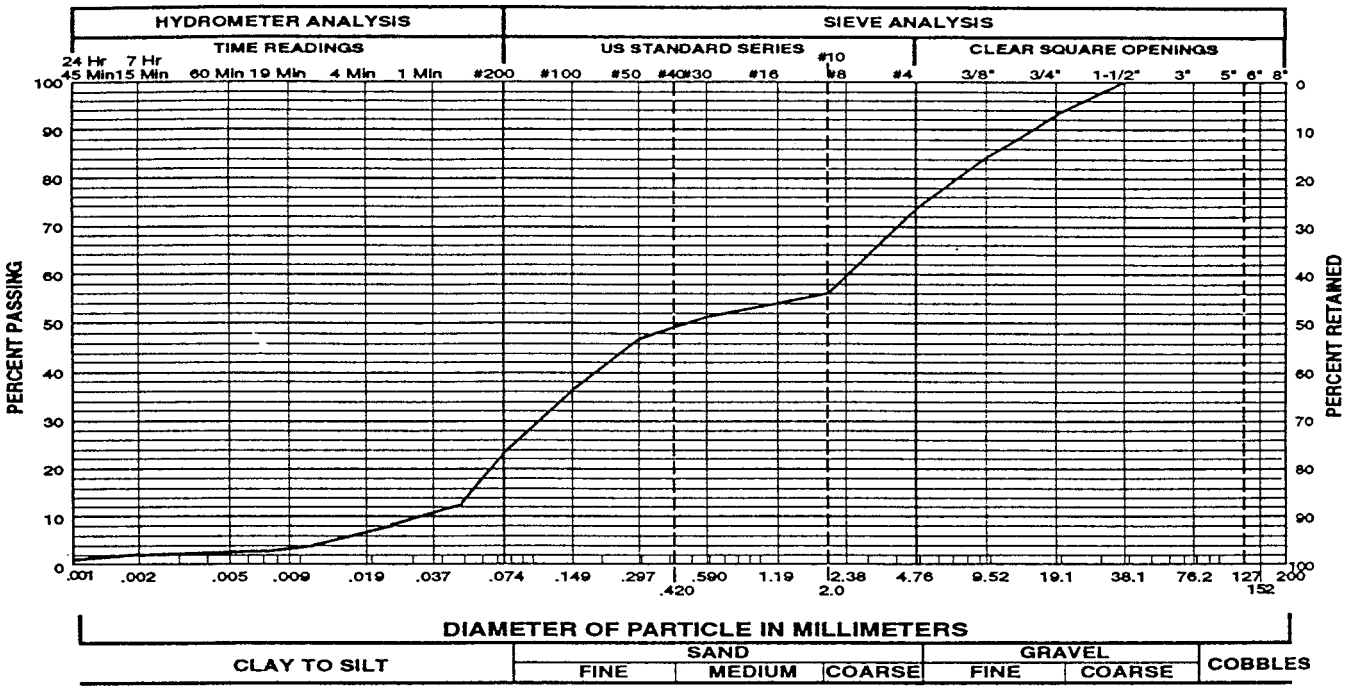
Gravel 33 % Sand 42 % Silt and Clay 25 %
Liquid Limit _____ % Plasticity Index _____ %
Sample of Silty Sand with Gravel (SM) From 4-U2



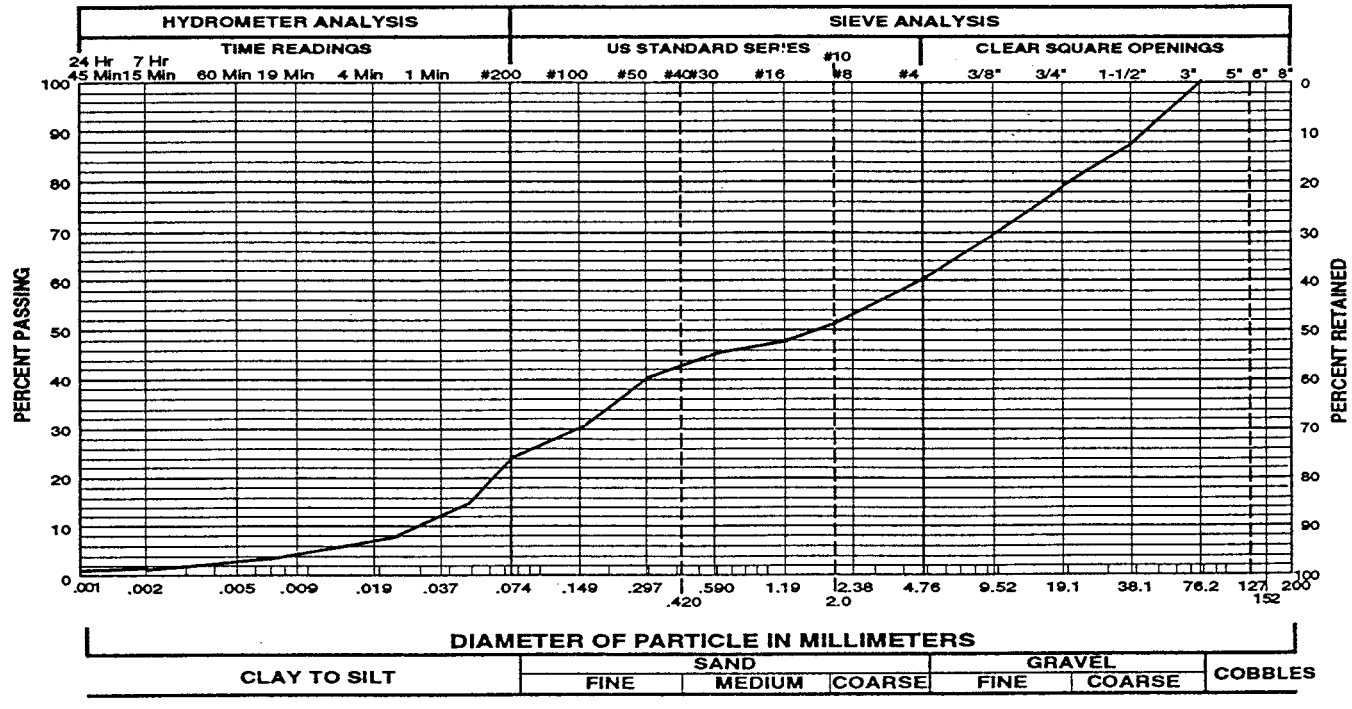
Gravel 24 % Sand 42 % Silt and Clay 34 %
Liquid Limit _____ % Plasticity Index _____ %
Sample of Silty Sand with Gravel (SM) From 3-U3

Project No. 28093 **GRADATION TEST RESULTS** Figure 2

Applied Geotechnical Engineering Consultants, Inc.



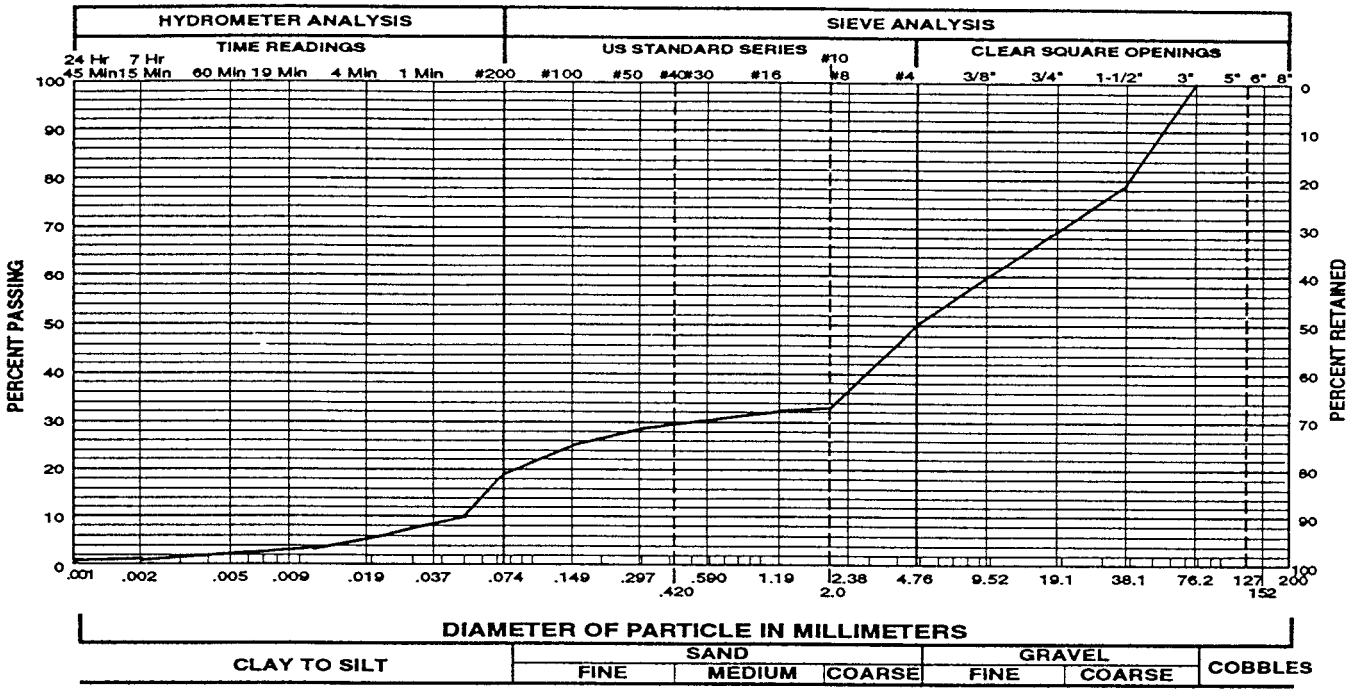
Gravel 27 % Sand 50 % Silt and Clay 23 %
Liquid Limit _____ % Plasticity Index _____ %
Sample of Silty Sand with Gravel (SM) From 3-R1



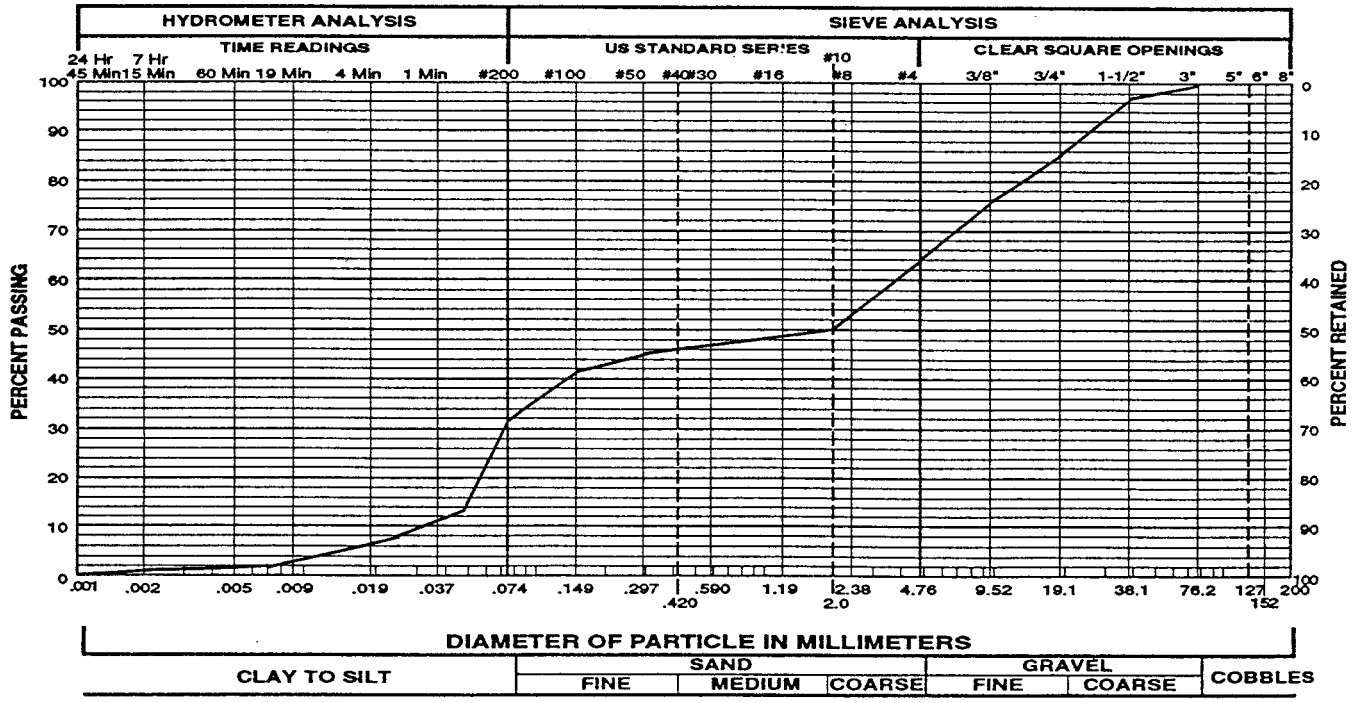
Gravel 40 % Sand 36 % Silt and Clay 24 %
Liquid Limit _____ % Plasticity Index _____ %
Sample of Silty Gravel with Sand (GM) From 4-R1

Project No. 28093 **GRADATION TEST RESULTS** Figure 3

Applied Geotechnical Engineering Consultants, Inc.



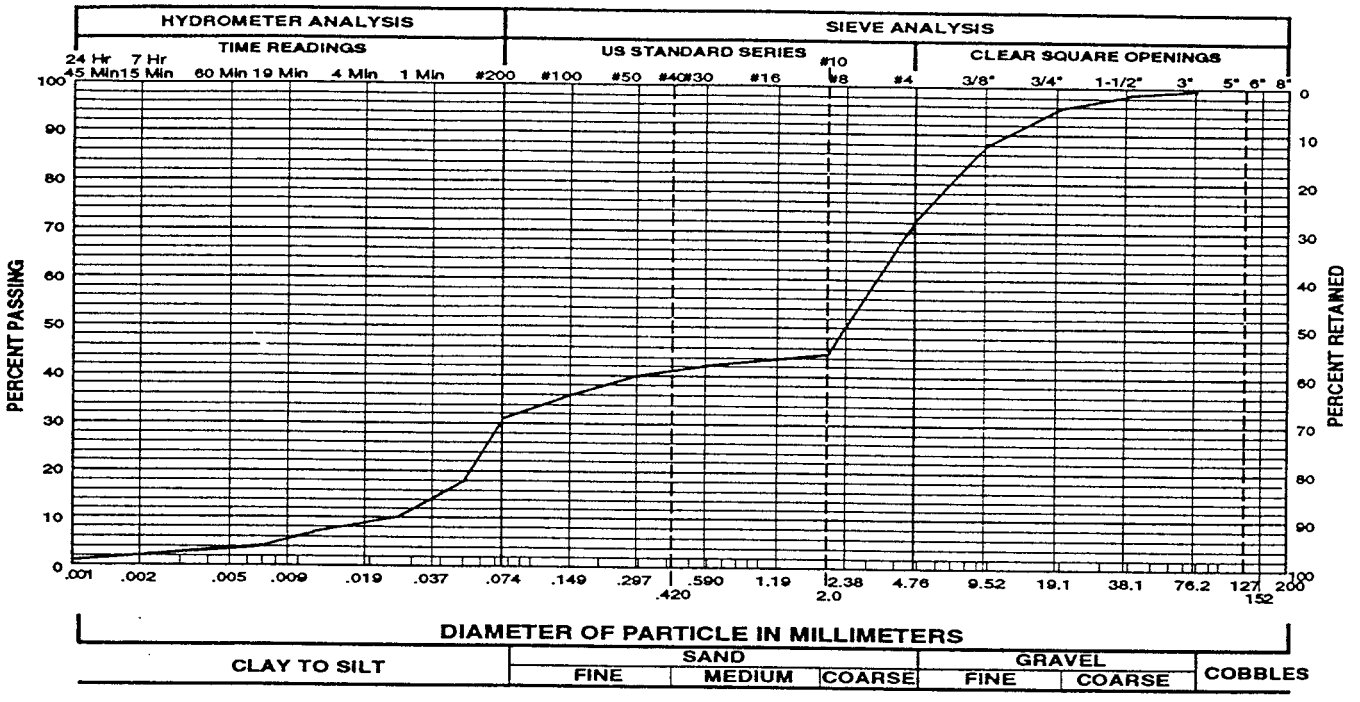
Gravel 50 % Sand 31 % Silt and Clay 19 %
Liquid Limit _____ % Plasticity Index _____ %
Sample of Silty Gravel with Sand (GM) From 3-R2



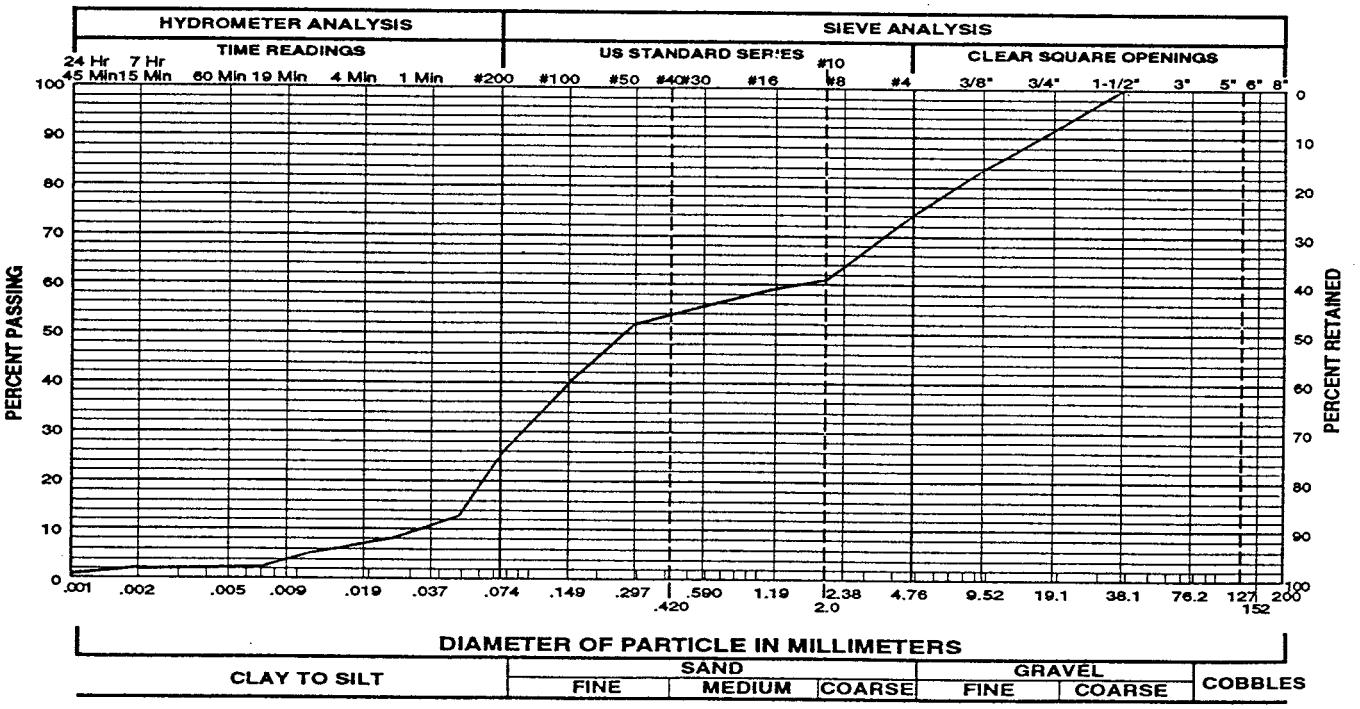
Gravel 36 % Sand 32 % Silt and Clay 32 %
Liquid Limit _____ % Plasticity Index _____ %
Sample of Silty Gravel with Sand (GM) From 4-R2

Project No. 28093 **GRADATION TEST RESULTS** Figure 4

Applied Geotechnical Engineering Consultants, Inc.



Gravel 28 % Sand 41 % Silt and Clay 31 %
Liquid Limit _____ % Plasticity Index _____ %
Sample of Silty Sand with Gravel (SM) From 3-R3



Gravel 26 % Sand 49 % Silt and Clay 25 %
Liquid Limit _____ % Plasticity Index _____ %
Sample of Silty Sand with Gravel (SM) From 4-R3

Project No. 28093 **GRADATION TEST RESULTS** Figure 5

APPENDIX C

PRE-MINING SEDCAD+ OUTPUT

CIVIL SOFTWARE DESIGN

SEDCAD+ Version 3

HUNTINGTON #4 MINE - PRE-MINING CONDITIONS

by

Name: Carol Bjork

Company Name: EarthFax Engineering INC.
File Name: D:\UC287\SEDIMENT\PRE4

Date: 12-07-1993

Civil Software Design -- SEDCAD+ Version 3.1
Copyright (C) 1987-1992. Pamela J. Schwab. All rights reserved.

Company Name: EarthFax Engineering INC.
Filename: D:\UC287\SEDIMENT\PRE4 User: Carol Bjork
Date: 12-07-1993 Time: 14:33:07
Huntington #4 Mine - Pre-mining conditions
Storm: 2.00 inches, 10 year-24 hour, SCS Type II
Hydrograph Convolution Interval: 0.1 hr

==========
GENERAL INPUT TABLE
==========

Specific Gravity: 2.50
Submerged Bulk Specific Gravity: 1.25

Particle Size Distribution(s):

Size (mm)	Pre-mine comp % Finer	Post-mine comp % Finer
4.0000	67.50	63.20
2.0000	63.00	54.20
1.0000	60.00	51.00
0.5000	55.00	48.20
0.2500	46.50	43.70
0.1250	34.00	34.00
0.0630	18.00	21.30
0.0310	6.00	9.70
0.0160	2.50	6.00
0.0080	0.90	3.30
0.0040	0.25	2.00
0.0020	0.01	1.50
0.0010	0.00	0.50

Huntington #4 Mine - Pre-mining conditions
Storm: 2.00 inches, 10 year-24 hour, SCS Type II
Hydrograph Convolution Interval: 0.1 hr

SUBWATERSHED/STRUCTURE INPUT/OUTPUT TABLE

-Hydrology-

JBS	SWS	Area (ac)	CN	UHS	Tc (hrs)	K (hrs)	X	Base-Flow (cfs)	Runoff Volume (ac-ft)	Peak Discharge (cfs)
111	1	106.00	71	M	0.196	0.000	0.000	0.0	2.35	16.72
111	2	5.00	71	M	0.020	0.000	0.000	0.0	0.11	1.40
111	3	24.40	71	M	0.094	0.000	0.000	0.0	0.54	6.82
111	4	4.80	71	M	0.098	0.000	0.000	0.0	0.11	1.34
		Type: Null			Label: WS-1,2,3 and 4					
111 Structure		140.20							3.10	
111 Total IN/OUT		140.20							3.10	20.42

SUBWATERSHED/STRUCTURE INPUT/OUTPUT TABLE

-Sedimentology-

SED: Sediment
SCp: Peak Sediment Concentration
SSp: Peak Settleable Concentration
24VW: Volume Weighted Average Settleable Concentration - Peak 24 hours
24AA: Arithmetic Average Settleable Concentration - Peak 24 hours

JBS	SWS	K	L (ft)	S (%)	CP	Tt (hrs)	PS #	SED (tons)	SCp (mg/l)	SSp (ml/l)	24VW (ml/l)	24AA (ml/l)
R 111	1	0.37	300.0	53.4	0.070	0.000	1	339.8				
R 111	2	0.37	100.0	58.0	0.070	0.000	1	8.5				
R 111	3	0.37	300.0	55.2	0.070	0.000	1	92.9				
R 111	4	0.37	150.0	49.7	0.070	0.000	1	9.1				
			Type: Null			Label: WS-1,2,3 and 4						
111 Structure								450.2				
111 Total IN/OUT								450.2	196524	153.39	78.89	28.95

APPENDIX D

POST-MINING SEDCAD+ OUTPUT

CIVIL SOFTWARE DESIGN

SEDCAD+ Version 3

HUNTINGTON #4 MINE - POST-MINING CONDITIONS

by

Name: Carol Bjork

Company Name: EarthFax Engineering INC.
File Name: D:\UC287\SEDIMENT\POST4

Date: 12-07-1993

Civil Software Design -- SEDCAD+ Version 3.1
Copyright (C) 1987-1992. Pamela J. Schwab. All rights reserved.

Company Name: EarthFax Engineering INC.
Filename: D:\UC287\SEDIMENT\POST4 User: Carol Bjork
Date: 12-07-1993 Time: 14:34:34
Huntington #4 Mine - Post-mining conditions
Storm: 2.00 inches, 10 year-24 hour, SCS Type II
Hydrograph Convolution Interval: 0.1 hr

GENERAL INPUT TABLE

Specific Gravity: 2.50
Submerged Bulk Specific Gravity: 1.25

Particle Size Distribution(s):

Size (mm)	Pre-mine comp % Finer	Post-mine comp % Finer
4.0000	67.50	63.20
2.0000	63.00	54.20
1.0000	60.00	51.00
0.5000	55.00	48.20
0.2500	46.50	43.70
0.1250	34.00	34.00
0.0630	18.00	21.30
0.0310	6.00	9.70
0.0160	2.50	6.00
0.0080	0.90	3.30
0.0040	0.25	2.00
0.0020	0.01	1.50
0.0010	0.00	0.50

Storm: 2.00 inches, 10 year-24 hour, SCS Type II
Hydrograph Convolution Interval: 0.1 hr

SUBWATERSHED/STRUCTURE INPUT/OUTPUT TABLE

-Hydrology-

JBS	SWS	Area (ac)	CN	UHS	Tc (hrs)	K (hrs)	X	Base-Flow (cfs)	Runoff Volume (ac-ft)	Peak Discharge (cfs)
111	1	106.00	71	M	0.196	0.000	0.000	0.0	2.35	16.72
111	2	5.00	72	M	0.023	0.000	0.000	0.0	0.12	1.57
111	3	24.40	71	M	0.094	0.000	0.000	0.0	0.54	6.82
111	4	4.80	72	M	0.109	0.000	0.000	0.0	0.12	1.50
		Type: Null			Label: WS-1, 2, 3, and 4					
111	Structure	140.20							3.13	
111	Total IN/OUT	140.20							3.13	20.76

SUBWATERSHED/STRUCTURE INPUT/OUTPUT TABLE

-Sedimentology-

SED: Sediment
SCp: Peak Sediment Concentration
SSp: Peak Settleable Concentration
24VW: Volume Weighted Average Settleable Concentration - Peak 24 hours
24AA: Arithmetic Average Settleable Concentration - Peak 24 hours

	JBS	SWS	K	L (ft)	S (%)	CP	Tt (hrs)	PS #	SED (tons)	SCp (mg/l)	SSp (ml/l)	24VW (ml/l)	24AA (ml/l)
R	111	1	0.37	300.0	53.4	0.070	0.000	1	339.8				
R	111	2	0.37	100.0	40.0	0.080	0.000	2	7.9				
R	111	3	0.37	300.0	55.2	0.070	0.000	1	92.9				
R	111	4	0.37	150.0	38.1	0.080	0.000	2	9.2				
				Type: Null			Label: WS-1, 2, 3, and 4						
	111	Structure							449.7				
	111	Total IN/OUT							449.7	193187	150.60	78.20	28.69