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PLATEAU MINING COMPANY

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Please file under ACT/007/006 #3, 4

June 27, 1984

JUN 27 1984

Mr. James W. Smith, Jr.
Coordinator of Mined Land Development
Division of Oil, Gas, and Mining
4241 State Office Building
Salt Lake City, Utah 84114

RE: Special Stipulation No. 6, Refuse Pile Research Plots, December 9, 1984 Division Letter. ACT/007/006

Dear Mr. Smith:

Enclosed is the Plateau Mining Company partial response to your December 9, 1984 letter expressing concerns relative to deficiencies in our comments to your August 16, 1983 letter. We have attempted in this letter to review the events and subsequent correspondence relating to Special Stipulation No. 6, Refuse Pile Research Plots and to answer your December 9, 1983 letter pertaining to this stipulation. Also included are the methodologies and procedures for the 1984 and 1985 Refuse Pile Research Plots data collection.

We hope that this will clarify our research program and our commitment to use these test plots to extract meaningful information to aid in effectively reclaiming our mined property and returning it to its productive post mine land use.

Please contact me if you have any further questions.

Sincerely,

PLATEAU MINING COMPANY

Ben Grimes
Environmental Coordinator

BG/kc

Enclosure

cc: Kent Crofts, Getty Mining Company
Clem Parkin, Getty Mining Company

REFUSE PILE RESEARCH STUDY

RECEIVE

JUN 27 1984

DIVISION OF OIL
GAS & MINING

INTRODUCTION

Reclamation and revegetation of the Refuse Pile was first discussed in the Star Point Mine's Mining and Reclamation Plan, ACT/007/006, Volume IV, submitted February 20, 1981. The reclamation plan called for 10" of topsoil to be respread over the regraded coal waste and reseeded to a perennial seed mixture. The revegetation methods were not proposed in the permit application pending the collection and analysis of the 1981 vegetation field data. During the interim, Plateau Mining Company (PMC) submitted a right-of-way application with the Bureau of Land Management (BLM) to locate a portion of the coal waste pile on public land. Following an environmental assessment, the BLM requested in an August 21, 1981 letter to the Utah Division of Oil, Gas and Mining (the Division) that the Division attach a list of various terms and conditions to the Plateau Mining and Reclamation Plan. One of the BLM's concerns was the reclamation potential of the site. The stipulations proposed by the BLM requested that the coal waste be analyzed to determine if the material contained any elements which could cause plant growth problems and that a seed mixture be developed based on test plots results. On October 14, 1981, Plateau Mining Company was issued a right-of-way grant No. U-47965. Before the issuing of the BLM right-of-way grant, the Division gave approval for the refuse waste pile, on October 1, 1981. The approval was given with construction and reclamation plan stipulations. Also stated in the letter was the statement that approximately 10 inches of topsoil would be redistributed and that a final seed mixture would be proposed following completion of the vegetation surveys. The Division Stipulation No. 9-22-1 states that the terms and conditions set forth by the BLM be fulfilled. In stipulation 9-22-4, PMC was asked to submit the results of the revegetation test plots and discuss how these results would apply to the permanent revegetation plan. Responses to the stipulations were made by Plateau Mining Company on November 17, 1981.

Plateau Mining Company's written response to the stipulations in the November 17, 1981 letter to the Division contained an Interim Refuse Pile Reclamation Plan. It provided for the replacement of 10 inches of topsoil, hydroseeding, and an organic wood fiber hydromulch. Selected areas would also receive the implantation of clumps of transplanted vegetation and the hand planting of nursery stock. The proposed seed mixture, which was recommended by the Utah Division of Wildlife Resources, contained 8 grasses, 5 forbs, and 4 shrub species at a rate of 20.5/lbs/acre. In a PMC letter dated May 28, 1982, a minor modification of the Refuse Pile Expansion Plan was requested. The basis for the request was an overestimation of the topsoil available for reclamation. As part of the proposed minor revision, PMC requested that the Division and PMC cooperate in implementing a number of test plots, originally proposed by the BLM, on the existing refuse pile. The purpose of the test plots was to gain insight into the methods and procedures, including topsoil depths, necessary for revegetation. The proposed reclamation plan called for a three phase program. The first step was to revegetate the site using a hydromulch system. A seed mixture consisting of 8 grasses and three forb species was proposed, to be applied at 22 lbs/acre, plus 20 lbs/acre of a cereal grain cover crop. Fertilizer (16-16-8) was to be applied at 200 lbs/acre. Secondly, depressions were to be gouged into the surface to provide for water retention and to help control surface soil erosion. The third phase consisted of excavating clumps of existing vegetation with a front-end loader and transplanting the clumps onto the site. These proposed activities were to have been completed by the fall of 1982. Subsequent vegetation monitoring was to begin in the Summer of 1983.

As a result of the request for input from the Division into the test plot design, Thomas L. Portle, Reclamation Soil Specialist, responded by letter on June 2, 1982 with recommendations for treatments and experimental design. The objective of the proposed study design was to satisfy the requirements of Stipulation 9-22-3 and Stipulation #6. Specifically, the test plots were to help determine the level of fertility amendments to be used in conjunction with topsoil and subsoil depths which would meet the revegetation success standards. The results of the study were also to be used to evaluate excess soil substitute material for reclamation needs at other sites on the mine property and the most

economical usage of the material. Plot dimensions were to be 10 x 10 feet with 2 foot buffer strips set up in a split-plot design with 4 replications. Treatments were to be soil materials, depth of soil material, and fertilizer rates. Soil materials and depths were for both subsoil and topsoil at 5, 10, and 20 inch depths, and topsoil over subsoil at 2 and 5 inches of topsoil over 5, 10, 15, and 18 inches of subsoil. Fertility treatments were 200 lbs/acre and 100 lbs/acre of 16-16-8, 200 tons/acre of sewage sludge, and a control with no fertility amendments. It appears that in order to tie the research study to the implementation of a feasible reclamation project, it was proposed that the minimum depth of the soil material be within the capability of the equipment to distribute it accurately. Also that the soil material or combination of soil materials should not exceed a total depth of 20 inches.

Further comment on the study plots was contained in the Division's June 9, 1982 response to the adequacy of PMC's November 17, 1981 reply to the special stipulations. It was pointed out that PMC had failed to provide soil depth requirements relative to site-specific reclamation needs. In view of the proposed study plots, PMC was asked to identify specific data needs which would be satisfied by the proposed test plots as well as data needs which would not be addressed by the test plots. A compliance schedule for data aquisition and submission of the results was to be provided by PMC. PMC responded to these questions on August 18, 1982, stating that the purpose of the test plots was to determine the effect of fertilizer on germination and growth, the suitability of the seed mixture being used at PMC, the best soil depths for topsoil and subsoil material, and the reclamation methods for other disturbed areas. Future needs were said to be the long term affect of stockpiled topsoil, the best seeding rates, the proper rhizobuim strain to be used with the legume species being planted, and the germination and plant establishment on topsoil from different soil types. The Division's response to the August 18, 1982 letter was that PMC had not utilized all of the test plot conditions cited in the June 2, 1982 Division test plot recommendation letter and that an account of what was implemented in the field was not forwarded to the Division. Consequently, in a August 16, 1983 letter, the Division required that PMC provide a full account of

exactly what was implemented, data on 1983 germination and plant establishment, and survival. It also asked for justification of disruption of the test plots in the event that the proposed unit-train conveyor system was actually to encroach on the plots. This information was provided in a PMC letter dated September 23, 1983. PMC presented a plot diagram and treatment key, seed mixture planted, a synopsis of the test plot implementation procedures, and a summary of the 1983 germination and survival data. Reference to the test plots was also made in the November 30, 1983 submission of a minor modification of the Starpoint Mine's Mining and Reclamation Plan associated with the proposed unit-train loadout facility. On page 784-21 of the minor modification application under the sub-title of Topsoil Handling and Reclamation Procedures Related to Revegetation, a statement was made that the west end of the study plots would be disturbed by the conveyor system. It goes on to state that data collection would continue from the test plots until construction activities prevent further sampling, and that PMC will make appropriate arrangements concerning the test plots prior to their being disturbed.

At the present time, it appears that there will be no disturbance to the test plots until 1985. This will allow a minimum of three years of data to be collected on all of the treatments and continued sampling on the undisturbed plots. Three years of data should provide sufficient information on the effects the treatments have on the revegetation potential of the site. If necessary, long term data from the undisturbed plots will be available for subsoil at the 10 inch depth and on topsoil at 10 and 20 inch depths.

The following narrative contains PMC's response to the remaining Division's concerns about Stipulation No. 6, Research Study Plots, and the procedures for collecting and reporting the data.

RESPONSE TO STIPULATION NO. 6

In a letter dated December 9, 1983, the Division commented on the September 23, 1983 PMC response to Special Stipulation No. 6. as contained in their August 16, 1983 letter. The Division identified the following deficiencies:

DIVISION CONCERN #1

PMC should address the potential impact of coal spillage from the conveyor belt onto the test plots, which will be in close proximity to the conveyor system.

PMC RESPONSE:

The conveyor system will not spill coal onto the test plots. As shown in the November 30, 1983 Minor Modification, Map 3, Proposed Surface Facilities Map, the conveyor will cross the refuse pile in an approximately 100 foot deep cut at a distance of 50 to 150 feet away from the nearest undisturbed test plot. The conveyor will be covered with metal housing which will substantially prevent the wind from blowing coal dust onto the plots.

DIVISION CONCERN #2

PMC should identify a probable location(s) for test plots necessary to provide equivalent information lost due to conveyor belt encroachment upon the existing lots.

PMC RESPONSE:

PMC will relocate the test plots in consultation with the Division at the time when it is known that disturbance to them is eminent. Presently, it appears that at least three years of data and possibly more will be collected before disturbance. At that time, PMC will be in a better position to delineate a new test plot area if it is determined that one is still necessary. The need to reestablish a new test plot will take into account the number of years of data that has been generated, the efficacy of the data, and the value of the remaining undisturbed plots relative to their potential to yield meaningful long term data.

DIVISION CONCERN #3

PMC should provide the rationale for deviation from the June 2, 1982 letter on test plot design and specifically address the following:

a. Why were "controls" not implemented in each depth treatment to test the effect of the "no fertilizer" treatment?

PMC RESPONSE:

Soils data from the coal waste material and the adjacent soil series indicates that there is a deficiency of nitrogen and phosphorus. In order to achieve a reasonable plant cover to stabilize the site, it is accepted that some fertilizer will have to be applied. The rate of 100 lbs/acre of 16-16-8 will be used as the control level in the test plots.

b. Why were replications not implemented in the study, or shown on Map #1?

PMC RESPONSE:

In reference to Map No. 1, there are three replications to the subsoil treatment and 3 replications of the topsoil treatment. For each soil treatment there are two depth replications. The effect of fertilizer treatment is replicated six times. During the 1984 and 1985 data collection, each treatment will be further separated into three replications. See Figure 1 and Figure 2 in the Methods section for a diagram of a plot and plot identification labels.

c. Why were the depth treatments as described in the September 23, 1983 submission implemented in an uneven fashion on the horizontal plane?

PMC RESPONSE:

Depth treatments were not implemented in an uneven fashion on the horizontal plane. Map No. 1 shows the treatment extending the entire length of the slope.

DIVISION CONCERN NO. 4

PMC should provide the sampling methodology used to generate Table #3.

PMC RESPONSE:

Table 3, 1983 Germination and Survival on Refuse Pile Vegetation Topsoil test plots, contains the estimated density of perennial plant seedlings on the refuse pile test plots. These estimates were made by counting the number of each plant species rooted within a ¼ M^2 quadrat. A total of 90 ¼ M^2 quadrats were read for each soil treatment, i.e. 45 in each fertilizer treatment. Quadrats were randomly placed within each treatment.

In the original Table 3 that was submitted on September 23, 1983, there were metric to English conversion errors. A copy of the revised Table 3 is enclosed below. Also, please reference the Plateau Mining Company Annual Reclamation Report, January 1984, Table 18, 1983 Seedling Density Refuse Pile Study, for plant densities by species. A copy of the reclamation report that pertains to the Refuse Pile Research Plots is attached for your convenience of reference.

TABLE 3A *
1983 GERMINATION AND SURVIVAL
REFUSE PILE VEGETATION - TOPSOIL TEST PLOTS (#/FT ^{2})

		FERTILIZER	
PLOT	TREATMENT	100#/a	200#/a
A	Coal Waste	0.71	- - -
B	20" Subsoil	3.57	4.25
D	10" Subsoil	2.79	3.20
D	10" Subsoil	2.79	3.20
C	10" TOP/10" Subsoil	1.99	2.49
E	20" TOPSOIL	1.11	1.66
F	10" TOPSOIL	0.90	1.16
G**	1" TOPSOIL	2.51	- - -

** All plots are north aspect except G which is south aspect

* Revised May 1984

METHODS

The Refuse Pile Research Study Plots are comprised of two main treatments, soil material and depth of soil material. Soil materials are composed of topsoil, subsoil, layered topsoil/subsoil, and coal waste material. Each source of soil material has been applied at depths of ten inches and twenty inches with the exception of the layered topsoil/subsoil which was applied at a depth of twenty inches only and the coal waste material which is the refuse material over which the other soil materials has been placed. Each main soil treatment plot is divided into two fertilizer sub-treatments and three slope effect plots. Fertilizer, 16-16-8, was applied at the rates of 100 lbs/acre and 200 lbs/acre. Fertilizer treatment plots have been partitioned into slope factors, upper, middle and lower slope with three sub-plots within each slope factor plot. A diagram of this is presented in Figure 1, Example of the Division of Treatments Into Sub-Sampling Plots.

Sub-plots will serve as the basic unit for the location of randomized transects for data collection.

Within each sub-plot, a transect will be placed perpendicular to the slope at a randomly selected distance from the lower right corner of the plot. One transect will be read per sub-plot for a total of three transects per replication. A total of nine transects will be read per fertilizer sub-treatment for a total of 18 transects per soil material treatment at each depth. Each transect will consist of 100 point-hits for plant cover and three $\frac{1}{4}m^2$ quadrats for plant production. This results in 1800 cover hits and 54 quadrats per main soil material treatment.

Data collection will begin in mid-July. Plant parameters which will be measured are percent cover by species and total production by life form. Production data will further be separated by annuals and perennials. Cover estimates will be derived from a 10-point frame placed at 10 equally spaced intervals along the transect. Plant production will be estimated from clipping three $\frac{1}{4}m^2$ quadrats randomly placed along the transect. Plants will be clipped at ground level. Transect averages will comprise one datum for statistical analysis.

Statistical analysis will be performed to determine if significant differences exist in cover and production between treatments. The statistical test to be applied will be a multi-way ANOVA based on the plot design which is a nested split-split, incomplete, randomized block design. This design is best illustrated in Figure 2 Refuse Pile Research Study Data Organization For Computer Impact And Field Form Identification. Soil material is the first factor in the analysis and consists of four levels: (1) topsoil, (2) subsoil, (3) layered topsoil/subsoil, (4) coal waste. Factor two is soil depth at two levels of 10 inches and 20 inches. Factor three is fertilizer rate at two levels, 100 lbs/acre and 200 lbs/acre. Factor four takes into account the differences due to effect of the position on the slope. The first three factors are implemented in rectangular plots which extend the entire length of the slope from the ridge to the toe of the slope. Factor number four divides the slope into the upper, middle, and lower one-third of the slope. Data will be collected and organized according to the outline presented in Figure 2, Refuse Pile Research Study Data Organization For Computer Input And Field Form Identification. In addition to the analysis of variance, the data will be subjected to the Duncan's Multiple-Range Test which will rank and give significant differences between treatment means. All of the analysis will be performed at the 0.05 confidence level and run on Getty Oil Company's IBM computer network, SAS Institute, Statistical Analysis System.

Field data will be summarized, analyzed, and a formal report will be prepared for submission to the Division by September 30. Ultimately the results will be evaluated in terms of the technical feasibility of the treatment and the economic consideration of those treatments which achieve an acceptable revegetation success standard.

Acceptable revegetation will be determined by comparison of plant cover on the research plots to that of the Topsoil Reference Areas which were established in 1982 for the purpose of evaluating revegetation success. Cover on the research plots will need to be equal to or greater than the cover on the reference areas.

FIGURE 1

SUBDIVISION OF TREATMENT INTO REPLICATIONS AND SUB-PLOTS.

FERTILIZER SUB-TREATMENT

*R_1= UPPER 1/3 OF SLOPE

R_2= MIDDLE 1/3 OF SLOPE

R_3= LOWER 1/3 OF SLOPE

S_3 S_2 S_1 *

* R_n= REPLICATION

S_n= SUB-PLOT

FIGURE 2. REFUSE PILE RESEARCH STUDY,
Data ORGANIZATION FOR COMPUTER INPUT AND FIELD FORM IDENTIFICATION

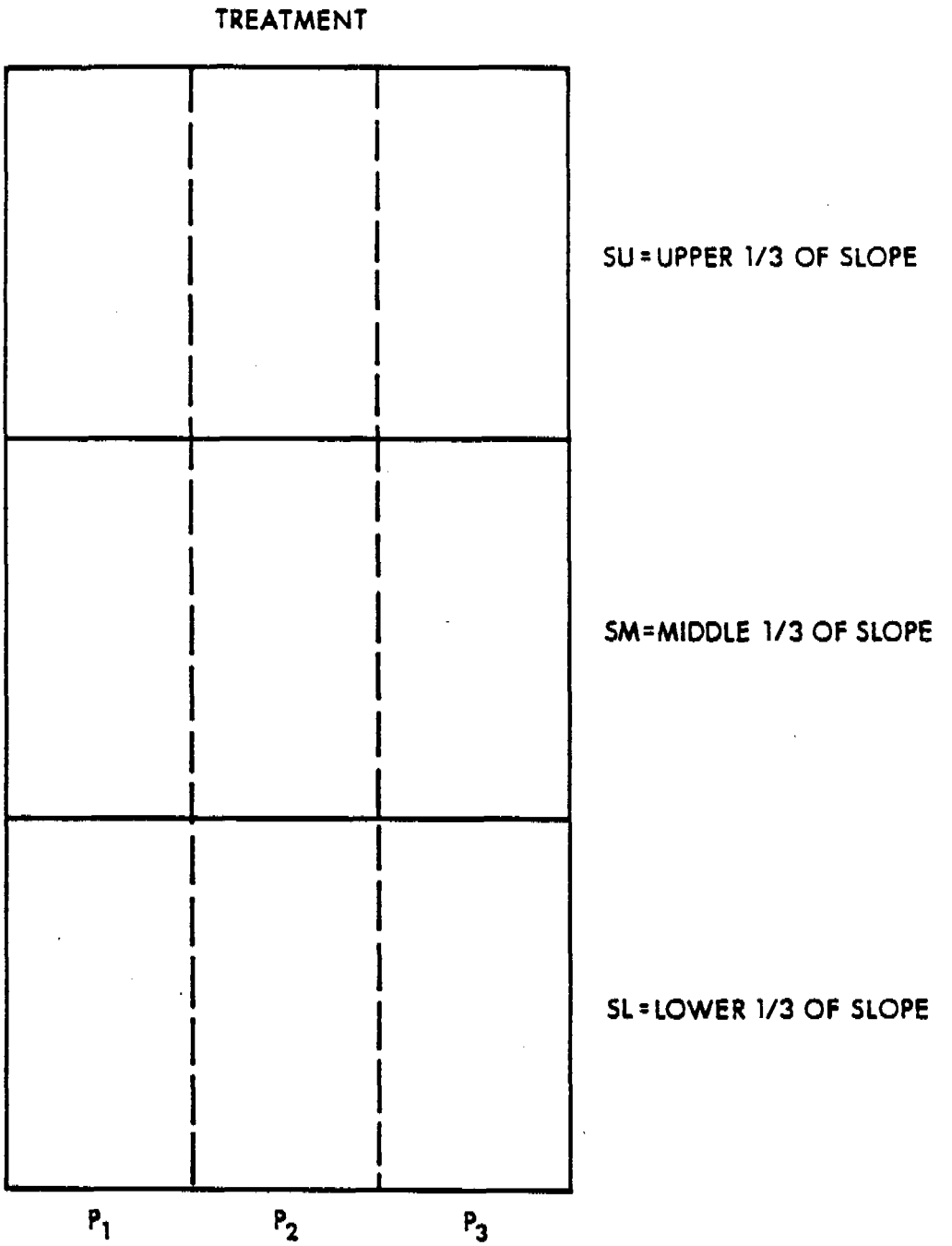

FIGURE 1 - EXAMPLE OF THE DIVISION OF TREATMENTS INTO SUB-SAMPLING PLOTS.

NOTE : P_n = SUB-SAMPLING PLOT.

TREATMENT = SOIL MATERIAL + SOIL DEPTH + FERTILIZER.

REFUSE PILE RESEARCH STUDY
DATA ORGANIZATION FOR COMPUTER INPUT AND FIELD FORM INFORMATION

				Mn = SOIL MATERIAL							
				M1 = TOPSOIL		M2 = SUBSOIL		M3 = 10" TOP/10" SUB		M4 = COAL WASTE	
				Fn = FERTILIZER RATE		Fn = FERTILIZER RATE		Fn = FERTILIZER RATE		Fn = FERTILIZER RATE	
				F1 = 100 NO./a	F2 = 200 NO./a	F1 = 100 NO./a	F2 = 200 NO./a	F1 = 100 NO./a	F2 = 200 NO./a	F1 = 100 NO./1	F2 = 200 NO./1
Dn = DEPTH OF SOIL MATERIAL	D1 = 10" DEPTH	SLOPE FACTOR	SU	SU M1-F1-D1	SU M1-F2-D1	SU M2-F1-D1	SU M2-F2-D1	—	—	SU M4-F1-D1	SU M4-F2-D1
			SM	SM M1-F1-D1	SM M1-F2-D1	SM M2-F1-D1	SM M2-F2-D1	—	—	SM M4-F1-D1	SM M4-F2-D1
			SL	SL M1-F1-D1	SL M1-F2-D1	SL M2-F1-D1	SL M2-F2-D1	—	—	SL M4-F1-D1	SL M4-F2-D1
	D2 = 20" DEPTH	SLOPE FACTOR	SU	SU M1-F1-D2	SU M1-F2-D2	SU M2-F1-D2	SU M2-F2-D2	SU M3-F1-D2	SU M3-F2-D2	—	—
			SM	SM M1-F1-D2	SM M1-F2-D2	SM M2-F1-D2	SM M2-F2-D2	SM M3-F1-D2	SM M3-F2-D2	—	—
			SL	SL M1-F1-D2	SL M1-F2-D2	SL M1-F1-D2	SL M1-F2-D2	SL M1-F1-D2	SL M1-F2-D2	—	—

FIGURE 2