3/12
Jordan 3-1
Howard hh 3-12
Steve 3/12

Paul B. Anderson
Consulting Geologist
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Salt Lake City, Utah
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March 9, 1990

Mr. Deane H. Zeller, District Manager
Salt Lake District Office
U.S. Bureau of Land Management
2370 South 2300 West
Salt Lake City, Utah 84119

RE: Comments on USGS study proposal for the Bonneville Salt Flats dated January 18, 1990.

Dear Mr. Zeller:

Thank you for this opportunity to comment on the current proposal from the USGS.

There appears to be a high likelihood that any decision concerning the Bonneville Salt Flats management will be contested legally. The design of the study efforts should keep this fact in mind, and perhaps the BLM should seek legal advice early in the process of the study design. Specifically, I offer the following comments:

Objectives

As I mentioned in the Technical committee's first meeting, I would encourage the BLM to try to get more specific about the kind of information needed to aid in making policy decisions. For example, how much salt is present now and in the past? How much salt (or brine) leaves the boundaries of the study area during a given time period? Where does it go? What are the rates of removal? What are the mechanisms for removal?

The objectives of the present study proposal will provide answers to many or perhaps all of these hypothetical questions. If a list of specific questions which the BLM needs answered is developed at the beginning of the study, it will help in guiding the USGS in their work and avoid misconceptions between what the BLM thought they were going to receive and what they end up with at the end of the study.

Lines (1979, WSP 2057) states, "Future study or monitoring on the Salt-Flats should be keyed to remedial measures that might

be implemented to resolve the conflict between uses." Since this is not part of the present objectives, I assume that Lines' definitions of the conflicts between users is not adequate and that any study of remedial measures to resolve conflicts will follow after the present study is completed?

Plan of Study - Task 1

Under this section I would recommend that after a review of references and existing data, a summary be produced which specifies which of the objectives (or questions) have been answered by previous work so a duplication of effort is carefully avoided. If some of the previous workers' conclusions lack substance, the reasons for such a determination should be described.

Task 2

I have concerns about using LANDSAT to accomplish this task. My experience with Utah weather tells me that wind "storms" rarely last more than 24 hours. I am not familiar with the temporal coverage of LANDSAT but question whether numerous images in short time periods are available. I feel the idea of photo tracking movement of the pond water across the salt flats is a good one, it is the methods which cause concern. Perhaps new coverage using IR aerial photography would be more effective.

Task 3

As part of this exercise, please consider running a sensitivity analysis on the effect of fluid density of the brine. I am curious as to the impact this will have on head. If the impact is very slight, or within the margin of anticipated error for the final model, perhaps a 3-D flow model (without solute transport) will answer the objectives of the study.

Lines (1979) showed, through scraping studies, that halite is deposited on the top surface of the playa during episodes of evaporation (discharge). The potentiometric surface of the shallow brine aquifer is below the land surface during most of the seasonal discharge from the aquifer. Will the use of a saturated solute transport model have trouble modeling changes in brine chemistry which take place in the unsaturated zone?

Task 7

Mr. Coltharp mentioned that there are old pvc piezometers laying on top of the salt surface and he believes they were installed by Lines during his study. If the piezometers to be installed during this study are to last more than a few years it seems a new methodology for installation must be developed.

Task 9

In order to access how man-made stresses are related to the quality of the racing surface, a control area seems essential. Pilot Valley is a reasonable choice. Lines did look at Pilot Valley hydrology but made no observations about surface morphology changes in Pilot Valley while conducting such observations on the Bonneville raceway. Pilot Valley playa is not a precise analogy to Bonneville but should be looked at in terms of a "best case" analogy for natural perturbations to surface morphology.

Task 12

All results from the modeling study must have an explanation of error factors. As mentioned in our last meeting, I have concerns about modeling the large fractures which exist in the shallow brine aquifer. This will be particularly important in a solute transport model.

Summary

The USGS is certainly well qualified to perform the study and has assembled an excellent team to work on the project. The funds are low for the work necessary to provide good answers to the study objectives.

Thank you for this opportunity to comment.

Sincerely,

Paul B. Anderson
Consulting Geologist

THE UNIVERSITY OF UTAH

March 13, 1990

Mr. Steve Brooks
Bureau of Land Management
Salt Lake District Office
2370 South 2300 West
Salt Lake City, Utah 84119

Dear Steve:

Thank you for inviting me to be a member of the Technical Review Team for the Bonneville Salt Flats Study. Please find attached my review of the U.S.G.S. study plan dated 1/18/90. As I mentioned on the telephone, I will be able to attend the committee meeting scheduled for 1:00 p.m., March 23, 1990. I look forward to meeting you there. If you have any queries prior to our meeting please contact me at one of the following phone numbers:

581-3864 (campus office)
487-0178 (home office)

Sincerely,

Craig B. Forster
Research Assistant Professor

Department of Geology and Geophysics

College of Mines and Earth Sciences
717 W. C. Browning Building
Salt Lake City, Utah 84112-1183
(801) 581-7162

FAX U of U Mines and Earth Sciences
(801) 581-5560

EFFECTS OF BRINE WITHDRAWALS ON THE HYDROLOGIC SYSTEM
OF THE BONNEVILLE SALT FLATS AREA, UTAH

REVIEW OF STUDY PLAN DATED 1/18/90
Craig Forster
(3/13/90)

The objectives of the proposed study plan are reasonable and appropriate. The overall plan to determine the relative importance of factors that control removal and supply of salt in the Bonneville salt flats area seems to be a good way of evaluating the impact of brine extraction on conditions at the racetrack. Factors to be considered in the study include surface processes (salt transport by wind and surface water) and subsurface processes (salt transport in saturated and unsaturated regions of the groundwater flow system).

Proposed studies of LANDSAT imagery and aerial photography are likely to provide good insight into the changing character of the ground surface through time and may help to evaluate the relative importance of salt transport by wind and surface water. This approach; however, will not provide quantitative estimates of the mass of salt in transit at any particular time and may require considerable commitment of manpower and resources to prepare and perform the comparative studies alluded to in the proposal. Constructing and monitoring "traps" to collect wind and water borne salt might augment the proposed image studies. In addition, on-the-ground observations (direct visual observation and/or unattended camera recording) might help to quantify the relative importance of processes acting at the ground surface.

Proposed numerical modeling of the large-scale groundwater flow system is likely to provide the estimates of depth-to-water and solute concentration that will be needed to estimate conditions at the lower boundary of the unsaturated zone. Although simulating the saturated groundwater flow system allows the connection between brine extraction and salt transport in the shallow subsurface to be evaluated, insufficient documention has been provided to evaluate the ability of HST3D (I have a copy of the documentation for the Konikow and Bredehoeft model) to handle the proposed modeling study. An overview of the scale of the problem to be modeled and the associated initial boundary value problem should be included in the detailed plan of study.

Aquifer testing has been proposed; presumably to provide the hydraulic data needed to calibrate and constrain the saturated groundwater flow model. Given the wealth of pre-existing hydraulic testing results in the study area, it would seem that little would be gained by carrying out additional pumping tests. The need for additional testing might best be evaluated after at least one year of data collection and synthesis is completed. My expectation; however, is that plans to perform pumping tests can be eliminated.

USGS considering this - may delay

What are conditions for doing or not doing tests

Although plans to study processes controlling salt transport at the ground surface and in the saturated zone are addressed in reasonable detail, the current proposal provides little information on plans to characterize salt transport and accumulation in the unsaturated zone. Brine extraction might modify the processes of salt transport by (1) changing the moisture conditions that control evaporation-driven transport in the unsaturated zone and by modfying the likelihood for wind and water scouring of salt from the ground surface and by (2) influencing solute concentration and rate of delivery of salt through the saturated zone to the overlying unsaturated zone. Because the character of the unsaturated zone is likely subject to large seasonal fluctuations, it seems appropriate to consider longterm, continuous (and intermittent) monitoring of processes acting in the shallow subsurface. One approach might involve setting up one or more observation stations, each containing the following instrumentation:

1) a piezometer nest equipped with electronic pressure transducers to measure vertical head gradients below the water table and to provide access for collecting water samples for chemical analyses

2) tensiometers equipped with electronic pressure transducers to measure vertical head gradients above the water table

3) a neutron access tube for intermittent logging of vertical variations in moisture content

4) soil moisture instrumentation for continuous monitoring of soil moisture content

5) suction lysimeters to collect fluid samples for chemical analyses

6) designated location for repeated measurement and characterization of salt crust

7) designated locations for repeated collection of shallow cores to determine changes in mineralogy and mass of salts precipitated in the pore space

Continuous recording of information should be initiated as soon as possible, wherever possible. Because the shallow subsurface is likely to be highly dynamic, all measurements must be assessed in the context of the range of variability observed on both daily and seasonal timescales.

Although I like the idea of modeling geochemical flow paths and reactions, insufficient documention has been provided to evaluate the ability of SNORM to handle the proposed modeling study.

Recommendations

1. Provide a detailed outline of anticipated expenditures and manpower commitment. Because I am unfamiliar with personnel costs in the USGS, I would like to see both dollar estimates and person-hour estimates in the final budget proposal. My initial reaction is that insufficient manpower and resources have been allocated to carry out the plans alluded to in the current proposal.

2. Consider postponing, and possibly eliminating, plans for additional aquifer testing.

3. Provide detailed documentation for numerical models to be used in the study (HST3D and SNORM) and clarify how the models will be applied.

4. Consider a greater emphasis on collecting and synthesizing the data needed to characterize and model salt transport processes occurring in shallow regions of the flow system (i.e., extending from the ground surface to perhaps 10 meters below the minimum water table elevation).

REILLY WENDOVER

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675 EAST 2100 SOUTH, SUITE 220
SALT LAKE CITY, UTAH 84106

A Division of Reilly Industries, Inc

Jordan ___
Howard ___
Steve ___

March 8, 1990

Mr. Deanne Zeller
District Manager
Salt Lake District Office
Bureau of Land Management
2370 South 2300 West
Salt Lake City, Utah 84119

Dear Mr. Zeller:

In response to your letter of January 24, 1990, we are submitting comments concerning the preliminary draft of the study plan proposed by the U.S. Geological Survey ("USGS") with respect to the Salt Flats Study which was attached to the letter of H. L. Case, III of January 18, 1990. Inasmuch as the materials furnished to us have been characterized as a preliminary draft, we would ask that you also accept these comments as being preliminary. When the final draft of the study has been prepared we would request the opportunity to provide further comments to the extent they appear appropriate based upon any changes made between the preliminary draft and a final draft.

These comments are submitted on behalf of Reilly Industries ("Reilly") and they represent the position of the company based upon the preliminary information that has been provided.

General Comments.

In prior correspondence we have identified to the Bureau of Land Management ("BLM") our concern with regard to the conclusions the BLM has apparently reached with respect to conditions on the Salt Flats. The BLM position is reflected in the tone of the paragraph identified by the USGS as "Problem"

inasmuch as the characterization of the problem assumes that there has been a reduction in salt thickness and also assumes that there have been stresses on the hydrologic system. Reilly would prefer to characterize the "scope" of the study as an attempt to quantify the hydrologic and geologic happenings in the area of the Salt Flats rather than assume the result. Realistically, Reilly believes that the scientific position would be to determine if a problem really exists rather than assume the conclusions of the study. In order to accomplish these purposes, we would suggest that changes need to be made in the scope of the report and in its title. Therefore, we would suggest that the study could be captioned "Bonneville Salt Crust Study" and the word "problem" could be changed to "scope." The characterization of the scope of the study could also be changed to reflect these comments.

Brooks & USGS will talk and present on the field trip.

From the information provided to Reilly and from the previous contacts with the USGS, it appears that the boundaries of the study area still have not been defined. While we recognize that the boundaries might fluctuate based upon data collected, it appears to Reilly that some definition of the boundaries should be included within the study plan. The extent of those boundaries could have a significant impact on Reilly's comments as well as Reilly's acceptance of the credibility of the study.

The scope of the study also needs to clearly articulate the extent of the examination of the physical and chemical balance that will occur during the study. In reading the current paragraph defining the problem, it is not clear that the study will include an analysis of the chemical make up of the system as well as the physical existence of the system. Reilly believes all of these factors are important to an adequate study.

no plan to do detailed chemical analysis USGS will clarify this

In addition to the items mentioned above, Reilly also believes that the study should include an evaluation of the dynamics of the hydrologic system. In this analysis, Reilly believes that one critical element that is lacking is the measurement of surface elevation both historically and during the conduct of the study. Such elevations to be relevant would need to be compiled for the entire area of the study and would need to be measured on a regular and consistent basis in order to obtain valid data on this particular issue.

Specific Comments.

Problem.

In addition to the general comments made above, we believe that specific changes should be made in the paragraph captioned "problem." We believe the "scope" paragraph should include an indication that the study will evaluate all impacts on the salt crust not just the effects of mining. Therefore, the first sentence should be changed by adding references to the evaluation of the potential effects of mining, racing and climatic effects such as temperature, season, wind, precipitation, water levels and surface water.

Objectives.

The objectives section should have as its first objective:

1. Adequate evaluation of past data.

Reilly is deeply concerned that the USGS should conduct a thorough review of existing data. A determination should then be made either validating the existing data or identifying the data as deficient with some analysis as to the reason for the deficiency. The Salt Flats have been the subject of numerous technical evaluations by private individuals and by governmental agencies. Such data should be carefully collected and evaluated in connection with the present study by the USGS.

Plan of Study.

Task 1.

In addition to simply reviewing existing literature pertinent to the study area, we recommend that Task 1 should include an adequate validation of the data obtained with some characterization as to that validity. In this regard, the data gathering should not be limited to those items referenced in the Lines Reports and should be expanded to a gathering and retrieval of data from all relevant sources.

USGS will clarify wording does Reilly have other data? Tie to Task 4.

Task 2.

The definition of the surface ponds should include an evaluation of the chemistry of such water to the extent feasible.

Task 4.

Reilly will comment in separate correspondence with regard to the request dated December 26, 1989 regarding data needs. In that regard Reilly will evaluate relevance to the study based upon the boundary definition as well as the protection that can be given to Reilly regarding confidentiality. Again, Reilly is concerned that all data collected pursuant to Task 4 should be collected and then validated or identified as deficient depending upon the criteria used by the USGS with respect to such data. Reilly is particularly concerned that all sources of data should be carefully evaluated including the identification of individuals who are knowledgable concerning the Salt Flats and the identification of other data sources not commonly recognized or easily identified.

Why? Any and all sources of data.

Task 5.

In addition to the items mentioned in Task 5, Reilly believes all existing benchmarks and other control points should also be identified and then field checked during the study.

Use cadastral survey - vertical movement may be a problem

Task 6.

Once available data has been identified and reviewed, it appears to be desirable to consider an analysis of brine samples for other chemical constituence in addition to those identified in the present description of Task 6.

list will be provided to Reilly

Task 7.

Reilly believes that the methods and procedures used in the past to measure salt thicknesses must be carefully evaluated. A clear definition of the methods, procedures and criteria to be used in the present study must be carefully defined prior to any field work in performance of this Task.

?

Task 8.

Reilly needs to have clarified the indication in Task 8 regarding the imposition of stress on the aquifer through the adjustment of water levels in the brine collection ditches. This appears to be a task that will impose limitations on Reilly's productive capacity and needs to be clarified.

?

This issue is too qualitative (historical part) and shouldn't be part of the study.

good if: 9-11 miles long.

good if: damp in morning - dry up in afternoon

best years: mid-late summer 79, late summer '88

too dry - the mag flops regardless of speed: problem if too dry

Is Pilot valley a location for a test site; comparison.

Task 9.

Reilly questions the scientific basis of a determination as to what would constitute "an acceptable raceway surface." It is Reilly's experience that surface conditions fluctuate rapidly and are difficult to define. Reilly is also aware that there have been historical variations in the amount of preparation given to the track by those that administer its use. Reilly is concerned that it will be particularly difficult to correlate meteorologic, water level, mineralogic, surface sediment and soil moisture data with those historical occasions during which an "acceptable raceway surface" existed. The performance of this task should be more clearly defined.

Task 12.

Prior to performing Task 12, the USGS should provide preliminary information (from Task 3 and other sources) to substantiate the apparent conclusion that a variable density flow model will assist in evaluating the effects of mining, racing and climate on the salt crust.

Porous media v. fracture flow

Task 13.

The plan should specify that the quarterly progress reports will be submitted to the Technical Review Committee members at lease two weeks prior to the Committee's quarterly meetings to allow for appropriate evaluation prior to discussion at the meetings.

In addition to the foregoing, Reilly has concerns with regard to the scheduling and the ability of the USGS to meet the timetables set forth in the plan. Particularly, Reilly is concerned that the validation of existing data and the performance of Tasks 1 and 4 as set out in the current plan may require more time than is currently estimated in the plan and as depicted in the schedule contained on figure 2.

We would be happy to discuss any of the foregoing comments with you if you so desire.

Very truly yours,

John E. Fendt

John E. Fendt
General Manager

proposed

CHARTER
SALT LAKE DISTRICT
BONNEVILLE SALT FLATS
TECHNICAL REVIEW COMMITTEE

Bureau of Land Management

1. Official Designation: Salt Lake District Technical Review Committee for the Bonneville Salts Flats study.

2. Committee Objectives and Scope: Provide technical review and advice to the Bureau of Land Management District Manager regarding the Bonneville Salt Flats study to be conducted by the United States Geological Survey. The Bonneville Salt Flats have been designated as an Area of Critical Environmental Concern with management goals of maintenance and preservation. The results desired of the salt flats study are to identify and quantify the processes causing salt loss and evaluate recommendations for mitigating salt loss. ~~and to recommend specific measures which would reduce salt loss and/or replace the salt lost.~~ The committee will function as an oversight group to help maintain the technical integrity, credibility, and objectivity of the salt flats study. Specific duties of the committee are to provide technical review and advice in the following areas 1) reviewing the BSF Study Plan and making recommendations to the District Manager about how the study should be designed and conducted in order to attain the desired results; 2) evaluate study methods to determine their suitability for attaining desired results; 3) periodically reviewing study progress to assure to the extent possible that the study is yielding or will yield desired results; 4) evaluate study results and recommended methods, actions or practices that will mitigate salt loss and/or replace lost salt; and 5) serve as technical experts as needed on behalf of the U.S. Bureau of Land Management and Geological Survey.

3. Period of Time Necessary for the Committee's Activities: Since its functions are related to a specific project scheduled for completion in 1992 the activities of the Committee are expected to be completed by December 1993. for duration of study

4. Official to Whom the Committee Reports: Salt Lake District Manager, Bureau of Land Management, U.S. Department of Interior.

5. Administrative Support: Administrative support for activities of the Committee will be provided by the Salt Lake District Office. Support will include taking meeting minutes, copying, paying necessary travel expenses, and other needs.

6. Duties of the Committee: At the request of the District Manager or his designee, the Committee will meet periodically to analyze and comment on the scope, methodologies, and other factors associated with the Salt Flats study plan and ongoing study.

7. Committee's Composition and Qualifications: The Committee's membership shall consist of members with a scientific background, chiefly in the earth sciences including geology, hydrology, engineering and related fields. Other considerations include residence in area, interest, and experience. The committee will comprise 6 to 10 members who are appointed and serve at the pleasure of the District Manager.

8. Member Selection and Service:

a. To be eligible for appointment to the Committee, a person must be qualified through education, training, knowledge, or experience to give informed advice regarding the salt flats hydrological and geological setting and to provide technical review and comment on studies of the salt flats.

b. Vacancies occurring by reason of removal, resignation, or other factors will be filled for the balance of the vacating member's term in the same manner in which the original appointment was made.

c. All members will serve without salary, but will be reimbursed for travel and per diem expenses at current rates for Government employees, should they be required to be in travel status.

9. Subcommittee's: To facilitate the functioning of the Committee, subcommittee's may be formed to study and develop recommendation on selected issues for consideration by the full Committee. Meetings of any Committee or subcommittee shall be called and conducted in accord with federal and Bureau of Land Management regulations and guidelines.

10. Committee Officers: With the exception of the first year the Committee will elect a Chairperson, Vice Chairperson, and secretary/recorder from among its members at the first meeting of each calendar year. The District Manager will appoint the Chair person, Vice Chairperson, and Secretary/Recorder the first year. Chairpersons and members of any subcommittees formed will be appointed by the Committee Chairperson with the concurrence of the District Manager or his designee.

11. Meetings: Meetings of the Committee will be called by the Chairperson, with the concurrence of the District Manager or his designee.

Meetings of subcommittee's will be called by the Committee chairperson/vice chairperson after consultation with the subcommittee chairperson. Meeting notices will be sent to each member and other interested persons which set forth clearly and precisely the issues or topics to be discussed and will provide specific times and places for the meeting. Committee meeting agendas must be reviewed in advance by the District Manager or his designee.

12. Committee Records: Detailed minutes of each meeting, including recommendations made, and copies of all studies and reports received, issued, or approved in conjunction with activities of the Committee and its subcommittee's, will be maintained at the District Office, and with the exception of confidential or propriatary information and USGS interpretive work prior to publication, will be available for public inspection and copying during regular business hours.

13. Estimated Operating Costs: Activities of the Committee annually will require an estimated $5,000 (including 1/4 work year) of Federal employee support.

14. Meeting Frequency: The Committee will normally meet quarterly, but in no case less than annualy. Additional meetings may be called by the District Manager or his designee or Chairperson in connection with special needs.

15. Termination Date: The Committee will terminate four years from the date this charter is approved, unless prior to that date, it is terminated by the District Manager or his designee.

16. Authority: Creation of the Committee is in furtherance of the Secretary of the Interiors's statutory responsibilities for administration of the lands and resources managed by the Bureau of Land Management.

_____ _____

District Manager Date