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40-8084

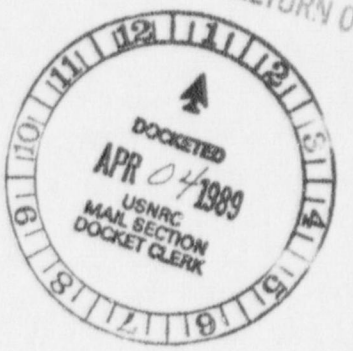
RIO ALGOM MINING CORP.

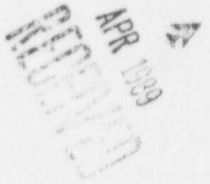
La Sal Route
MOAB, UTAH 84532

Phone: (801) 686-2215
FAX 801-686-~~2216~~ 2557

RETURN ORIGINAL TO PDR, HQ.

31 Mar 1989





Mr. R. Dale Smith, Director
Uranium Recovery Field Office, Region IV
U.S. Nuclear Regulatory Commission
P. O. Box 25325
Denver, Colorado 80225-0325

Docket No. 40-8084
Source Material License No. SUA-1119
Re: License Condition No. 53

Dear Mr. Smith:

Attached is Rio Algom Mining Corp's proposed groundwater action plan as required by License Condition 53.

In addition Rio Algom requests that License SUA-1119, Condition 53 (A), be amended as follows for the correct well list for water levels:

MW wells 1, 2, 4, 5, 7, 8, 9, 10, 11, 12. H wells 38, 48, 55, 56, 71, 72, 73, 77, 78. LT wells 5, 6, 7, 10, 12. GW wells 17, 19, 20. RW wells 1, 2.UT wells 7. Change D-3 and D-10 wells to DH-3 and DH-10. DM80 wells 1, 2, 3, 4.

A physical inventory of the existing wells on Rio Algom Mining Corp property showed that some of the wells listed by Condition 53 (A) no longer exist. Most of the nonexistent wells have been sealed with bentonite, the remaining holes have caved.

Enclosed please find cheque for $150.00 minor amendment fee. If you have any questions please call 801-686-2217.

Log AM89-2
Remitter
Check No. 56654
Amount $150-2A
Fee Category AMD
Type of Fee
Date Check Rec'd. 4/25/89
Date Completed
By:

Respectfully,

B. K. Reaveau
B. K. Reaveau
Radiation Safety Officer

R. S. Pattison
R. S. Pattison
Manager

DESIGNATED ORIGINAL

Certified By Mary C. Hood

BKR:wr

Attachments

DF07
1/1

89-2553

GROUNDWATER

CORRECTIVE ACTION PLAN

RIO ALGOM MINING CORP

LISBON OPERATIONS

Groundwater
Corrective Action Plan

Rio Algom Mining Corp, in order to comply with NRC's requests has acquired the consulting services of Dr. Donald Langmuir, Hydrochem Systems Corp., Golden, CO and EarthFax Engineering Inc., Salt Lake City, UT. After consultation with these companies, there are several mechanisms taking place at the Lisbon Mine site that are beneficial to our preconceived ideas of groundwater pollution. Rio Algom expects to have the full plan in operation within 120 days. The following is a summary of the current status of that plan:

(1) All water discharge from the Lisbon Mine has ceased (3 Oct 88).
(2) All Mill effluent discharge has ceased (Jan 89).
(3) Upper tailings interim stabilization approximately 1/2 completed.
(4) Upper tailings standing water pond, dried up as of 22 Mar 89.
(5) Bisco Lake drying up. Down 4 feet from normal operation levels of 6725 msl.
(6) Continue OWUT-9 pump-back.

During operations, the mine water discharge to Bisco Lake was in the order of 350 gpm. which created a lake of about 20 acre-feet capacity. This source of water is believed to be a major flow contributor under the principal drainage area of the mill and under the upper tailings, thus providing the driving force for outward migration of polluted water in this northwestward direction.

Mill solutions such as washdown water, spills, etc. naturally drained north towards the 80 ft. thickener and to the upper tailings. This previously saturated area probably caused additional mounding by unsaturated downward flow to enter the seepage from Bisco Lake during mill operations. At present, with no additional input, other than snow melt and precipitation run off, Bisco Lake is drying up as well as the saturated area near the 80 ft. thickener. Along with this, the upper tailings impoundment has lost all standing water from its surface. It would stand to reason that if the upper tailings impoundment is a pollution source (ie. the pump back well OWUT-9 source) and with the elimination of the above mentioned surface water hydraulic heads, OWUT-9 would also lower its output. For this reason, it is believed that Bisco Lake has been the driving force for groundwater contamination.

Rio Algom Mining Corp proposes the following groundwater action plan:

A. "Delineate the areal extent of contamination of hazardous constituents."

Rio Algom proposes to sample on a quarterly basis for one (1) year the following wells:

NORTH: RW-1, RW-2, MW-7, MW-8, MW-5, DM80-1, H-56, H-72, and OWUT-9.
SOUTH MW-1, MW-2, MW-6A, and MW-13.

The water samples from these wells will be analyzed for: pH, water level, Uranium-Nat, Sulfate, Chloride, and Conductivity.

These species were chosen to provide data for determining the pollution plume because they are very mobile in groundwater, unlike the metals.

Dr. Langmuir points out that under existing site conditions some of the metals listed by NRC are in reality not expected to be in solution.

> "Several constituents reported in violation of limits would not be expected to be significantly soluble in the neutral to alkaline groundwaters present near the site. These include Cadmium, Nickel, Lead, Thorium* and Radium. These species are usually removed from groundwater naturally, by adsorption into clays and oxyhydroxides at pH's above 6.0. In the high alkalinity , and high sulfate waters present at the site, they would also tend to be removed by coprecipitation with oxyhydroxides, carbonates or sulfate solids at pH's below 7." (Langmuir Report)

* Using Thorium as an example, illustrating the suspension versus true solution argument. For Well H-56 using the period 1/83 thru 2/88 (chosen because both Sulfate and Thorium numbers are available for each sample date) the Thorium Data gives 1.26E-8 +/- 1.70E-8 while the Sulfate is 6829.0 +/- 1496.21. Plots of these data show that while Thorium is "noisy", Sulfate tracks very well. According to Dr. Langmuir, "noisy" plots are indicative of suspended rather than solution.

"That one or more of these species are reported exceeding Condition 53 limits in waters from five of the observation wells may reflect their presence associated with colloidal-sized materials in the water, rather than their presence in true solution." (Langmuir Report)

In the past Rio Algom has by procedure used a standard well pump with exposed impeller to sample monitoring wells. This pump normally, dependent on depth, produced 6-8 gpm which may be dislodging suspended material from the draw down area of the pump.

Rio Algom will modify its procedures for use of a variable rate pump and the use of filter media less than 0.45 micrometers porosity. A more stringent filtering routine coupled with a variable rate pump may clarify this. However, it is also surmised that suspended matter may be put into solution by acidifying the sample prior to Vender Laboratory submission.

B. "How the monitoring interval (ie. type and intervals of well screen or slotted casing) of the wells are proposed to be determined."

Well data for most of our wells has already been supplied to NRC in previous reports. An investigation by Rio Algom Mining Corp last November revealed that no previous data had been submitted to NRC on well numbers H-56, MW-5, MW-6A and MW-13. Well completion data is attached for H-56 and

MW-5 is an open hole sealed with five feet of 8 5/8 inch steel casing at the well head. We will therefore research the well completion details of MW-6A and MW-13 and mail them to NRC by 17 Apr 1989. If NRC needs the details on any other wells that may have been overlooked by us please let us know as soon as possible so that we can supply that data.

C. "The data in the Southern area suggest that the chosen background well may be impacted from seepage."

From our knowledge and confirming VLF data obtained by Earthfax Engineering, Inc. in 1984 a major fracture exists in the Dakota Sandstone trending about 50° west of north. The proposed background well (MW-13) in the southern aquifer lies about 400 feet south of this fracture and all of Lisbon's tailings lie well to the north -- the nearest tailings lying next to the lower embankment are at least 700 feet away. Also, potentiometric data shows that flow in this southern aquifer is to the west, roughly in the direction of the above mentioned fracture. The fracture therefore acts as a groundwater sink and it is not possible to pollute MW-13 from the Lisbon tailings. It can thus be kept as the background well for the southern aquifer.

MW-13 is physically located near the Lisbon fault. Waters reaching this well flow Westward from the Keystone-Wallace Copper Mine and Mill which ceased operation in 1975. The listed species that MW-13 exceeds the limits in are Arsenic and Lead. The Arsenic values average for the period 8/87 thru 8/88 is 0.011 mg/L compared to 0.024 reported in tailings. The Lead values are probably erroneous and do not exist as discussed previously. In regard to the Lead analyses, the vendor laboratory that analyzed the samples upon which NRC has based its groundwater limits used a lower limit of detection of 0.1 mg/L. This was confirmed by telecon and the laboratory given instruction to use a lower limit of detection. The reported data with one exception was all 0.1 mg/L.

D. "Implement a corrective action program due to exceedance of groundwater protection standards with an objective of returning the concentrations of Arsenic, Cadmium, Gross Alpha, Lead, Molybdenum, Nickel, Radium 226 and 228, Thorium 230 and Uranium to the concentrations specified in subsection (B) and (C)."

Rio Algom Mining Corp after consultation now believes that the Condition 53 concentrations which were based on the six (6) samples taken every two weeks during the June to September period in 1988 are not truly representative samples of the site groundwater. We agree that our sampling technique and sample preparation are in question. To correct this we propose to resample the wells quarterly over one (1) year period utilizing the techniques outlined.

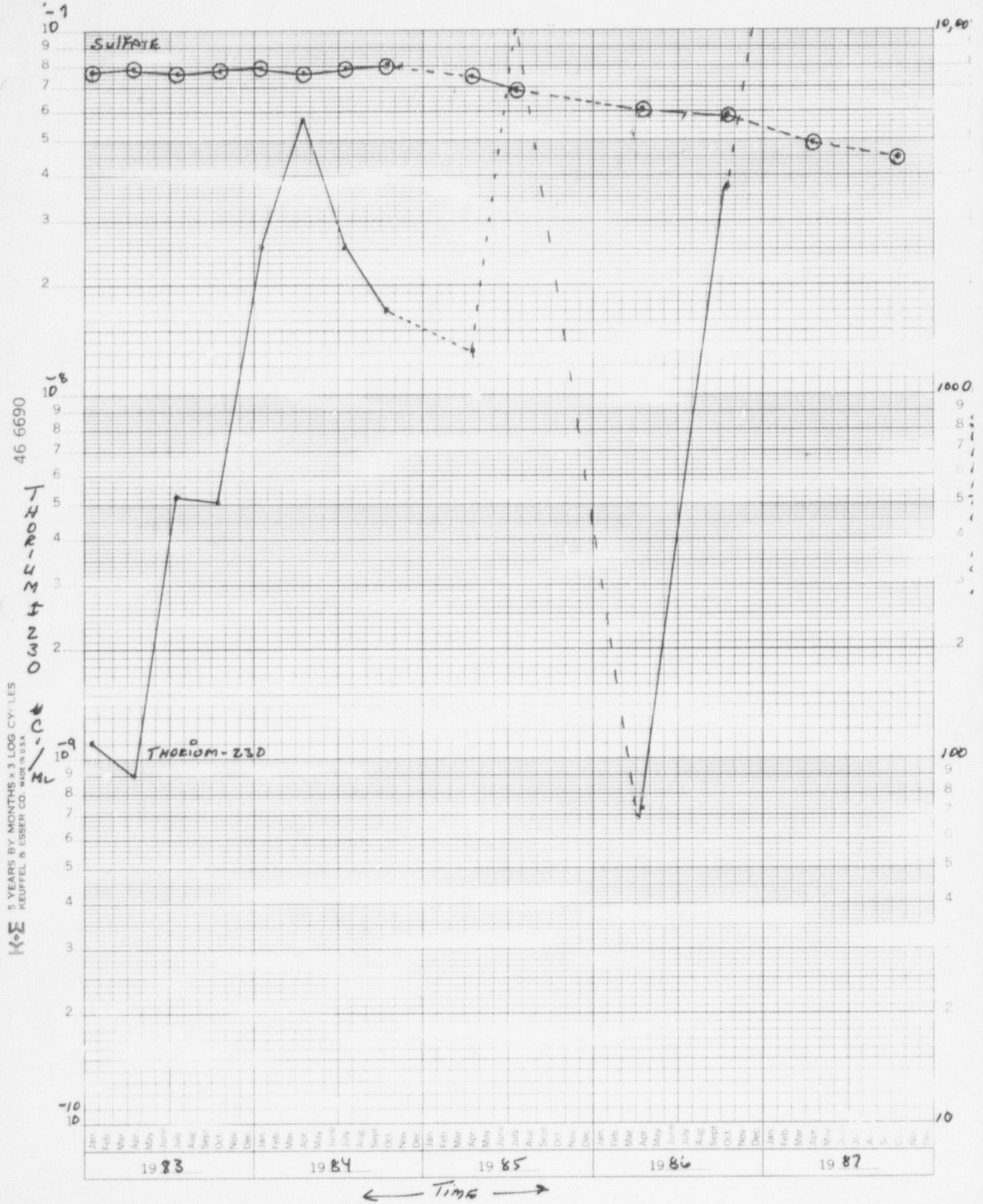
E. Summation of Corrective Actions underway or proposed.

(1) No Mine discharge.
(2) No Mill discharge.
(3) Completion of interim stabilization of upper tailings impoundment.
(4) Elimination of Upper Tailing Impoundment surface water.
(5) Elimination of Bisco Lake hydraulic head.
(6) Continuing OWUT-9 pump back.
(7) Sampling of additional wells for areal extent determination.
(8) Quarterly water depth measurements on listed Condition 53 wells.

Thorium vs Sulfate Well H-56

Date	Thorium	Sulfate
1/83	1.10E-9	7708.0
2/83	9.00E-10	7904.0
3/83	5.27E-9	7798.0
4/83	5.10E-9	7818.0
1/84	2.53E-8	7997.0
2/84	5.71E-8	7736.0
3/84	2.54E-8	7949.0
4/84	1.72E-8	8096.0
2/85	1.32E-8	7500.0
4/85	-0-	6967.0
2/86	7.30E-10	6153.7
4/86	3.73E-8	5938.3
2/87	-0-	4980.0
4/87	-0-	4529.0
2/88	1.02E-9	3362.0
Avg	1.26E-8	6829.0
s	1.70E-8	1496.21

WELL H-56


SULFATE
THORIUM-230
10,000
1000
100
10
10⁻⁷
10⁻⁸
10⁻⁹
10⁻¹⁰
THORIUM 230 pC / ML
46 6690
KEUFFEL & ESSER CO. MADE IN U.S.A.
5 YEARS BY MONTHS x 3 LOG CYCLES
1983
1984
1985
1986
1987
TIME

HYDROCHEM SYSTEMS CORP.
109 S. Lookout Mtn. Circle
Golden, CO 80401

March 26, 1989

To: Rio Algom Mining Corporation, Lisbon Uranium Mill,
La Sal, Utah

From: Donald Langmuir, PhD, President Hydrochem Systems Corp.

Subject: Corrective-action plan for remediation of ground-water contamination at the Lisbon Uranium Mill

Below are some of my thoughts relating to NRC's requirement that your company take corrective action to reduce concentrations of certain species in the waters from observation wells MW-6A, MW-13, MW-5, H-56, and OW-UT-9.

Rio Algom is already involved in an extensive and costly program of remedial action which should improve water quality from the above wells. This program has logically followed closure of the mining operation in 1988. Since mining has stopped, the underground workings have been allowed to flood. Thus, no longer is mine water being pumped into Bisco Lake, or new tailings added to the upper and lower ponds. This means that the ground-water mound created by Bisco Lake and the tailings ponds should rapidly dissipate. Natural recharge, given the average precipitation rate of about 12 inches a year, has contributed a small fraction of the ground-water recharge that maintained this mound during operation of the mine. The consequent dewatering of the Dakota-Burro Canyon Formation can be expected to be rapid and will have two beneficial results. First, with the reduction in hydraulic gradients, the rates and amounts of movement of ground waters away from the Rio Algom property will decrease. Secondly, with no further mine water or tailings input to ground water, ground waters previously affected by the mining should improve in quality with time because of mixing and dilution with fresh natural ground water recharge. This process is certain to change the quality of waters in the observation wells, and in most cases should improve that quality both short term and long term. Observation well OW-UT9 has been pumped continuously since November 1983, with its water discharged to the upper and lower tailings ponds where much of that water is lost to evaporation. If such pumping is continued, with the discharge perhaps limited to the lower pond, the dewatering process should be enhanced.

The NRC has proposed that Rio Algom Mining Corp. initiate corrective action to reduce concentrations of certain constituents

in the five observation wells listed above, based on sampling of those wells from June to August, 1988. However, because the mine was closed in December, 1988, and because of subsequent remedial activities initiated by the company and described above, it is almost certain that the ground-water composition determined in mid-1988 while the mine was still operating, differs significantly from its present composition following closure. It is obviously premature and scientifically indefensible at this time, therefore, for NRC to dictate further corrective actions be taken by Rio Algom Corporation. Additonal samplings are needed to establish the time-dependence of ground-water quality resulting from mine closure and on-going remediation efforts. That quality is certain to improve generally over the long term.

To document and quantify dewatering of the Dakota-Burro Canyon Formation, I would suggest that static water levels be measured in the observation wells on a quarterly basis for the next 12 months. Concurrently, the wells should be sampled for chemical and isotopic analysis. The question of further remediation can then be revisited in a year after consideration of the updated water quality and water level data.

Separately, there are valid reasons to question the significance of some of the concentration data obtained from the 1988 sampling. (1) For example, the lead concentration in MW-5 is reported as 0.1 mg/l, exceeding the NRC limit of 0.05 mg/l set for the northern well waters. Examination of the reported lead data for the other well waters from the same chemical analytical laboratory shows numerous lead values at 0.1 mg/l, and none lower than this. One can infer that 0.1 mg/l is the limit of detection for lead as analyzed by this laboratory. At the detection limit for any particular species, uncertainties are typically as large as +/- 50%. Clearly the water from MW-5 should be resampled, and analyzed using a technique with a lower detection limit before one concludes that it violates the NRC limit.

(2) Several constituents reported in violation of limits would not be expected to be significantly soluble in the neutral to alkaline ground waters present near the site. These include Cd, Ni, Pb, Th-230, Ra-226 and Ra-228. These species are usually removed from ground water naturally, by adsorption onto clays and oxyhydroxides at pH's above 6. In the high alkalinity, and high sulfate waters present at the site, they would also tend to be removed by coprecipitation with oxyhydroxides, carbonates or sulfate solids at pH's below 7. That one or more of these species are reported exceeding Condition 53 limits in waters from five of the observation wells may reflect their presence associated with colloidal-sized materials in the water, rather than their presence in true solution. If this surmise is correct, then concentrations of these species should be reduced by filtration prior to sample preservation and laboratory analysis. I realize that Rio Algom

already filters all well water samples through a 0.45 micrometer filter. However, because NRC's concerns should only apply to concentrations in true solution filter sizes smaller than 0.45 micrometers should be considered. Colloidal sized suspended matter, which is typically present in shallow ground waters, is by definition mostly smaller than 0.45 micrometers in size. Major amounts of metals can be associated with such colloidal material (Kennedy, Zellweger & Jones, 1974, Water Resources Research 10(4), 785). The higher yield wells generally, and especially wells which pull from fractures in the Dakota-Burro Canyon Formation, are most likely to pump up colloidal-sized suspended matter. According to EarthFax (1984) fractures are present near observation wells H-36, MW-6A and OWUT-9. For these wells, a lowering of the pump rate should be considered to minimize turbulence around the well which tends to dislodge such particulate material.

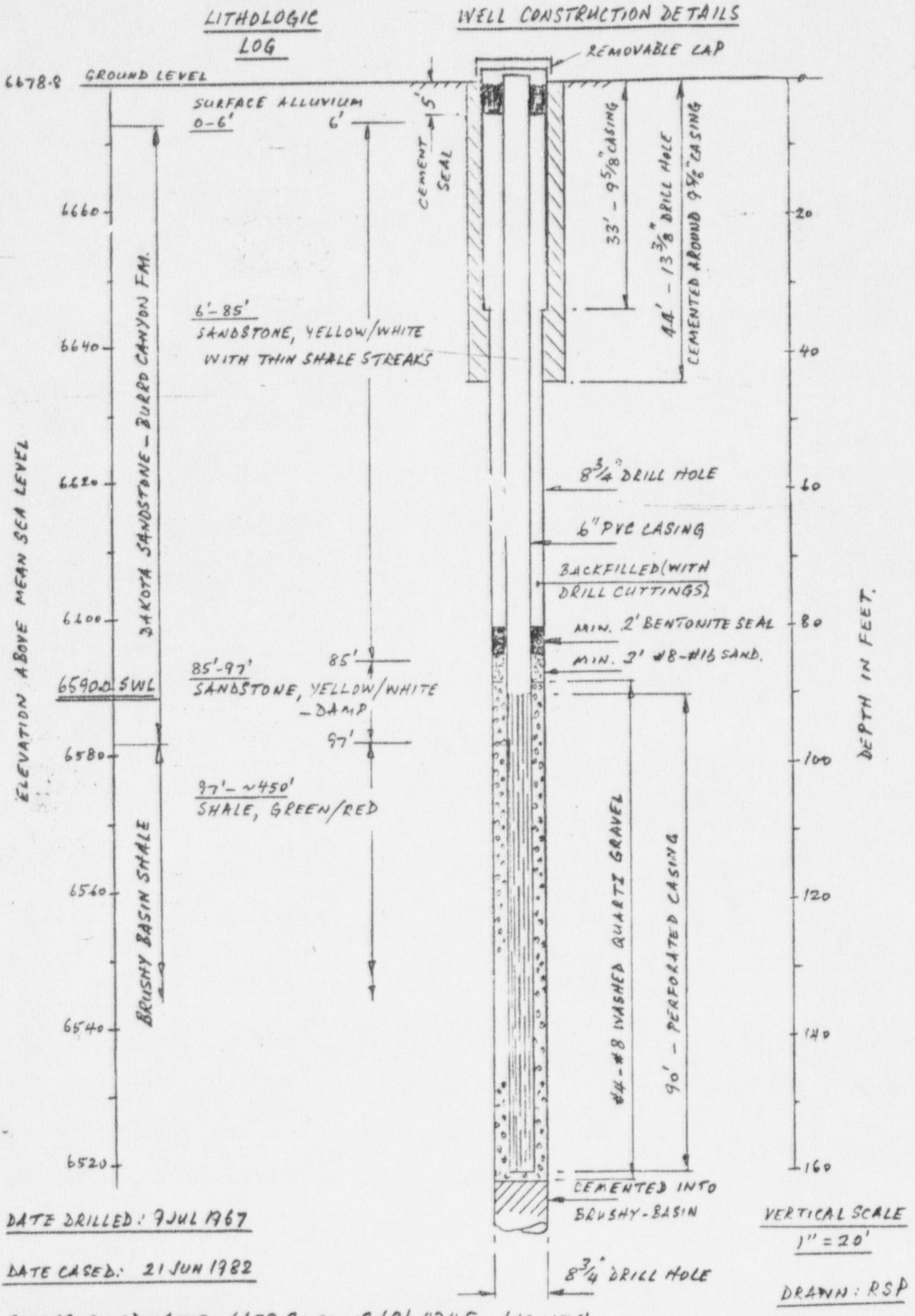
These are some of my thoughts and recommendations for consideration in your pending report for NRC. Please let me know if I can be of further assistance.

Yours truly,

Donald Langmuir

Donald Langmuir, PhD, President
Hydrochem Systems Corporation
103 South Lookout Mtn. Circle
Golden CO 80401

MONITOR WELL DETAILS | HOLE NO. : H-56 | 15 NOV 1988



DATE DRILLED: 7 JUL 1967

DATE CASED: 21 JUN 1982

COLLAR COORDINATES: 6678.8 MSL, 2,636,434 E, 610,117 N.

VERTICAL SCALE 1" = 20'

DRAWN: RSP