

R & M Consultants,
Letter from D. Beaver
R & M Consultants to R. Butera
(November 9, 1983)

ALASKA POWER AUTHORITY RESPONSE
TO AGENCY COMMENTS ON LICENSE
APPLICATION; REFERENCE TO
COMMENT(S):

B. 19



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ENGINEERS
GEOLOGISTS
PLANNERS
SURVEYORS

November 9, 1983

R&M No. 352333

Envirosphere Company
1617 Cole Boulevard, Suite 250
Golden, CO 80401

Attention: Mr. Don Beaver

Re: Susitna Hydroelectric Project, Slough Groundwater Studies

Dear Don:

I recently reviewed your report, September 1983 Site Visit and FY 1984 Plan of Study. In this report you requested the following 1983 data:

- ° Water levels and temperatures from wells.
- ° Slough and mainstem stage and discharge measurements.
- ° Seepage meter and piezometer data.
- ° Slough temperature and water quality data.

1. Water levels and temperatures from wells.

This data is not yet complete and will be forwarded when possible. We are awaiting reduction of Datapod chips.

2. Slough and mainstem stage and discharge measurements. Enclosed are:

- a. Water discharge records for the Susitna River at Gold Creek for water year 1982 and provisional 1983.
- b. Water discharge records for 1983 for Sloughs 8A, 9, and 11 (provisional).

3. Seepage meter and piezometer data. Enclosed are:

- a. Seepage meter program summary.
- b. Seepage meter field data collected this summer in Sloughs 8A, 9, 11, and 21.
- c. Plots of data in "b" above.
- d. Comments on seepage meter data.

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4. Slough temperature and water quality data.

- a. Selected portions of ADF&G report "Winter Aquatic Studies (October 1983 - May 1983). Covered in this report are intragravel and surface water temperatures for Sloughs 8A, 9, 11 and 21 for the period August 1982 to May 1983, and results of an incubation study which measured various water quality parameters of upwelling groundwater.
- b. A short review of ADF&G Preliminary Intergravel Temperature data for Sloughs 8A, 9, 11, and 21 covering the period June 1983 to August 1983.

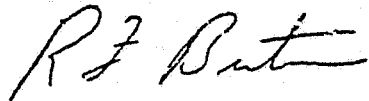
Data that needed for groundwater analysis, but not yet reduced includes:

- ° Precipitation for 1983 at Sherman.
- ° Specific mainstem water surface elevations at various discharges in the areas of Sloughs 8A, 9, 11, and 21 (ADF&G data).
- ° Results of further ADF&G incubation studies.
- ° Water levels and temperatures from wells.

The above will be forwarded as available. Please call if you have questions or desire additional data.

Very truly yours,

R&M CONSULTANTS, INC.



Robert Butera
Staff Civil Engineer

RB/kys

cc: Dr. John Bizer
Mr. Wayne Dyok

R28 5/17/83

Slough Seepage meter Program

Objective: To define the relationship between mainstem water surface elevation and upwelling rates in selected side-sloughs between Talheetha and Devil Canyon.

Methods: Seepage meter to be set ^{permanently} into substrate in areas of sloughs which are main sources of water to the slough throughout the year. Measurement of seepage rates to be made at various mainstem water surface elevations.

The data to be obtained include:

- Date and time of sampling
- mainstem flow in Susitna River at Gold Creek,
- water surface elevation in slough at seepage meter,
- water surface elevation in mainstem nearby to seepage meter,
- Temperature of upwelling water,
- seepage rate in ml./minute
- piezometric head in selected locations.

Locations: Determined from ADFG mapping of observed upwelling locations and from slough surveys. As shown on attached maps.

Report: Comparison of Q Susitna River at Gold Creek vs Seepage rate.

Seepage meter 8-1

		Average	W.S. of	Piezometer		
	Mean Daily	Vel/min	slough	Temp	Head	
Date	Q _{sc}	(ml.)	(ft. msl.)	°C	(Fe.)	Comments
1	5/20/83					Installed
1	5/22	19,000	169	573.64	3.1	
2	6/10	21,000	121	573.60	3.7	
3	7/14	19,800	28	573.59	5.5	
4	8/10	31,900	158	573.66	4.3	
5	8/11	27,700	152	573.64	-	0.14 piez. installed. Screen is 1' below substrate
6	8/27	24,700	-	-	-	0.09
7	9/21	11,000	(1 sample) 12	573.57	-	- sampled by W. Oische
8	9/23	17,500	20	573.64	-	0.02
9	10/11	9,300	18	573.65	-	0.02
10	10/27	5,300	- 7	573.33	3.1	-0.14 channel is now effluent

Comments:

- Seepage meter is located in gravel bed in area of a few small visible upwellings.
- Staff gage 0 elevation = 572.61' msl.

SEEPAGE METER 8-2

Date	Mean Daily Q cold creek	Average use of		Temp (°C)	Piezometer Head (ft.)	Comments
		Vol/min (ml.)	slough (ft. mil.)			
5/20/83						installed
5/22	19,000	122	574.76	3.4		
6/10	21,000	162	574.69	5.0		
7/14	19,800	60	574.37	7.0		
8/16	31,900	104	574.82	4.5		
9/21	11,000	-	-	-		channel dewatered
9/23	17,500	71	574.45	-		
10/11	9,300	45	574.31	2.0		water held in pool by snow and ice control downstream
10/27	5300	-	-	-		channel dewatered

Comments:

- Seepage meter located 300' downstream of berm. 1-4" cobbles in channel.
- staff gage o. elevation = 573.81' msl.

Seepage meter 9-1

Location: Slough 9 at downstream end near area of large bank.

Seepage and upwelling about 100' downstream of streamgage on RR.

Staff gage 0 elevation =

Date	Q _{sc}	Average Volume/min (ml.)	Use of slough (Ft. msl.)	Temp (°C)	Piezometer head (Ft.)	Comments
5/20/82						Installed
5/21/82	20,000	169	592.70	—		
5/24/82	17,000	169	592.60	3.4		
6/2/82	22,000	75	593.00	3.0		Can't see top of meter s. bed over
7/13/82	19,100	255	592.65	3.4	0.15	
10/11/82	9300	138	592.79	2.5	0.09	
11/27/82	5300	107	592.65	3.5	0.11	and flow of water from bank

Comments:

- Seepage meter located at downstream end of slough 9 on right bank in area of large bank seepage.
- Staff gage 0 elevation = 591.15

SEE PAGE METRIC 9-2

Location: Slough 9 in marshy area which feeds tributary of Goose
near RR tracks. Not downstream m¹/₂ of tree.

Mean Daily Average

Piezometer

Date	Discharge @ Gold Creek	Vol./in (m ³)	Staff gauge	Temp (°C)	head (ft.)	Comments
5/20/83						Installed
5/24/83	117,000	44	0.69	4.1	-	Q in stream = 11.9 cfs
6/10/83	21,000	25	0.70	4.0	-	Q in stream = 1.8 cfs
7/12/83	19,100	38	0.82	5.0	0.77	Q in stream = 1.1 cfs
8/10/83	31,900	66	1.11	5.5	1.17	Q in stream = 5.0 cfs
9/23/83	17,500	51	0.95	7.0	0.82	recent rains
10/11/83	9300	85	0.98	6.4	0.22	recent 21" snow creek high
10/27/83	5300	36	0.87	4.8	0.23	Q in stream = 0.9 cfs

Comments:

Staff gage '0' elevation = (not surveyed to date)

Seepage meter 9-3

Location: Slough 9 in marshy area which feeds tributary at corner of Slough 9 near RR tracks. Upstream meter of two Set 6 ft into silt on upwelling.

Date	Q _{sc}	Average Volume (ml)	staff gage	temp (oc)	width	Comments
5/10/82						Installed
5/24/82	17,000	180	0.69	4.1	2.4	Q in stream = 11.9 cfs
6/11/82	21,000	110	0.70	4.0		Q in stream = 1.8 cfs
7/13/82	19,100	53	0.82	5.0	0.72	Q in stream = 1.1 cfs

although flow in this stream is down the flow from marshy area has continued unabated Rise in stage is due to retardation of flow by dense growth of grass.

8/10/82	31,900	149	1.11	5.5	7.15	Q in stream = 1.5 cfs
9/23/82	17,500	84	0.95	7.0	0.90	recent failure
10/11/82	9300	71	0.98	6.4	0.93	recently 21" in now creek high from rainfall
10/27/82	5300	90	0.87	4.8	0.81	Q in stream = 0.9 cfs

Comments:

staff gage 10' elevation: (not surveyed to date)

See page note 11-1

Location: Slough 11 at Stearns site, No visible upwelling at this
Installation

Average						
U. l. m. / m ² Staff Temp min						
Date	Q _{sc}	(ml.)	Gage	(°C)	Pie.	Comments
8/12/83	27,500	138	671.16	5.5	0.04	Installed
9/21/83	11,000	-	671.07	-	0.065	No flow measurements
9/22/83	13,600	77	671.08	-	0.015	Pon. Beams
10/2/83	8300	70	671.08	3.0	0.04 (?)	Wedge 0.5 m. measured
10/11/83	9300	63	671.08	2.9	0.02	
10/27/83	5300	59	671.66	2.4	0.09	

Comments:

Staff gage elevation = 670.18

Seepage meter 11-2

Location: 110' upstream of stream-gage 20' distance of ADFG
thermograph in left bank in area of visible upwelling

Average

Vol./min Shift Temp

Date Q_{ce} (ml.) gage (C) Comments

8/12/82 24,500 60 1.11 5.2 Inlet 11.1

9/12/82 13,600 41 1.04 - w/po. rain

10/7/82 8300 41 1.04 3.6 Wayne Dine (1 mil ice cover)

10/11/82 9300 45 1.05 2.4

11/27/82 5300 40 1.01 2.4 4" ice cover on pool

Comments:

Shift gage 0' elevation = (not surveyed to date)

SEEPAGE METER 21-1

Location: Slough 21 200' downstream of staff gage 142.0568 on
right bank of staff gage 142.0570
staff gage zero elevation = 744.29

Date	Q _{sc}	Avg. Value Volume/ft. (ft.)	Slough Water (ft.)	Mainstem Water (ft.)	Head	Temp	Comments
9-83	21,000	95	744.84	748.07	3.23	4.0	Installed today
12-83	19,700	132	744.79	748.18	3.39	4.5	
10-83	31,900	104	746.29	749.44	3.15	6.5	slough overtopped
12-83	24,500	147	744.91	748.80	3.69	4.1	
2-84	27,400	117	745.35	748.89	3.54	-	
1-7/84	15,200	166	744.79	747.25	2.46	3.5	recent rains
10/7/83	8200	152	744.79	(calc. E.J.) 746.66	1.87	3.8	measured by W.D.
11/83	9200	157	744.78	(calc. E.J.) 746.86	2.08	3.8	
2/84	5200	172	744.79	746.11	1.32	3.5	lot of silt in line

Seepage meter 21-2

	Mean Daily	Average		Piezomet	Wse.	Wse.	ΔH	
	Q. and Crick	Vol/min	Temp	head	Slough	malist		
Date	(CFs)	(ml.)	(°C)	(ft)	(ml)	(ml)	Ft	Comments
5/22/83	19,000	168	3.7	-	744.94	747.61	2.67	Installed
6/9/83	21,000	258	4.0	0.29	745.03	748.07	3.04	
7/12/83	19,700	390	4.5	0.31	745.03	748.18	3.15	
8/10/83	31,900	289	5.2	0.24	746.35	749.44	1.65	slough over top
8/12/83	27,500	435	4.0	0.39	745.12	748.60	3.48	
8/25/83	27,400	382	-	0.39	745.76	748.89	3.53	slough not over topped
9/24/83	15,200	310	3.3	0.25	745.04	747.25	2.21	
10/7/83	8300	327	3.6	0.19(?)	745.01	(calculated) 746.66	1.65	measured by Wayne Dinkel
10/11/83	9300	356	3.6	0.35	745.03	(calculated) 746.86	1.83	
10/27/83	5300	337	3.5	0.38	745.03	746.11	1.08	1 lb. fox colling all over slough

Comments :

Location : In slough 21 nr staff gage 142.0568 along left bank
staff gage sea elevation = 744.15 Ft msl.