Goose Lake. Env. Baseline Data Compilation Report: Appendix 8 Nov '97

NORECOL, DAMES & MOORE, INC.

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October 7, 1993

Homestake Canada Ltd.
1000 - 700 West Pender Street
Vancouver, British Columbia
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Attention: Mr. Percy Pacor
Project Manager, Goose Lake Project

RE: 1993 WATER QUALITY REPORT, GOOSE LAKE
Job No. 26656-004

Dear Percy:

The following is a brief report on the water quality results for Goose Lake for 1993.

Background

Homestake Mineral Development Company Limited (Homestake) is conducting mineral exploration at their property at Goose Lake, south of Bathurst Inlet, Northwest Territories. As part of preliminary environmental baseline studies, Homestake requested Norecol, Dames & Moore, Inc. (Norecol) to develop a program to sample water quality in Project area streams. In consultation with the Project Manager, Norecol selected six sites on inflow and outflow streams to sample (Figure 1, attached). Water quality was sampled twice during 1993: June 27 and August 30. Data are attached with means of the two samples calculated where both assays were above the detection limit. Norecol staff conducted the first sample collection and trained Homestake exploration personnel in sampling and filtering techniques. Homestake collected the second set of samples. Assays were completed by Analytical Services Laboratory in Vancouver.

The purpose of the studies was to obtain background information on water quality in advance of any significant exploration or development-related disturbances. A broad range of parameters was selected to provide a reasonably complete characterization of water quality parameters of interest for metal mines. Parameters and detection limits used are listed in the following table:

HOMESTAKE GOOSE LAKE PROJECT
1993 WATER QUALITY SAMPLING PARAMETERS

PARAMETER	DETECTION LIMIT (mg/L)
pH	0.01 units
Alkalinity	1.0
Colour	5.0 CU
Turbidity	1 NTU
Conductivity	1.0 μmhos/cm
Total Dissolved Solids	1
Total Suspended Solids	1
Hardness	1.00
Sulphate	1.0
Chloride	0.5
Ammonia	0.005
Nitrite	0.001
Nitrate	0.005
Ortho-Phosphate	0.001
Total Phosphorus	0.001
Total Mercury	0.00005
Total and Dissolved Metals	
Aluminum	0.005
Antimony	0.0001
Arsenic	0.0001
Barium	0.01
Beryllium	0.005

PARAMETER	DETECTION LIMIT (mg/L)
Bismuth	0.10
Cadmium	0.0002
Calcium	0.1
Chromium	0.001
Cobalt	0.001
Copper	0.001
Iron	0.03
Lead	0.001
Lithium	0.015
Magnesium	0.100
Manganese	0.005
Molybdenum	0.001
Nickel	0.001
Potassium	2.0
Selenium	0.0005
Silver	0.0001
Sodium	2.0
Strontium	0.001
Thallium	0.10
Tin	0.30
Titanium	0.010
Tungsten	0.10
Vanadium	0.030
Zinc	0.005

Results

Water is typical of Canadian Shield stream water quality throughout much of the Northwest Territories. It is soft, with low conductivity, low alkalinity, low nutrients and very low (usually below detection) metals levels. The pH of Project Area streams is somewhat acidic (WQ3 in August was quite acidic but may be a sampling or analytical error). The pH of Shield streams in the general area of the Goose Lake Project are usually in the slightly alkaline range, although pHs in the slightly acidic range can also occur due to organic acids or other natural sources, particularly where the buffering capacity is low. While metals levels are low and there is therefore a relatively high capacity to assimilate metals inputs, the buffering capacity of the water is also very low as indicated by alkalinity and hardness. Thus the capacity of the water to buffer changes in its chemistry are also very low and small inputs of metals could have a large effect on stream chemistry.

The indicators of acid generation, aluminum, iron, manganese and sulphate, are all low indicating that, despite the presence of metal sulphides, leaching and oxidation of sulphides has not measurably affected surface waters. In the context of the low buffering capacity of Project area streams this indicates sulphide oxidation (acid generation) at the site is negligible.

Dissolved copper concentrations on two streams flowing into Goose Lake were at or above federal criteria for receiving environments (0.003 and 0.006 mg/L) in June and August, suggesting some metals export from land surfaces. Iron is dissolving into the water of the same two of the streams flowing into Goose Lake, suggesting mineralization in the bedrock in these drainages may be slightly higher than other drainages sampled.

There is no apparent seasonality in data from these two samples which may be a result of the timing of sampling or a true lack of seasonality during the open water season.

Conclusions

Water of Project area streams can be considered pristine; however, assimilative capacity is relatively low due to the lack of buffering capacity of the soft water.

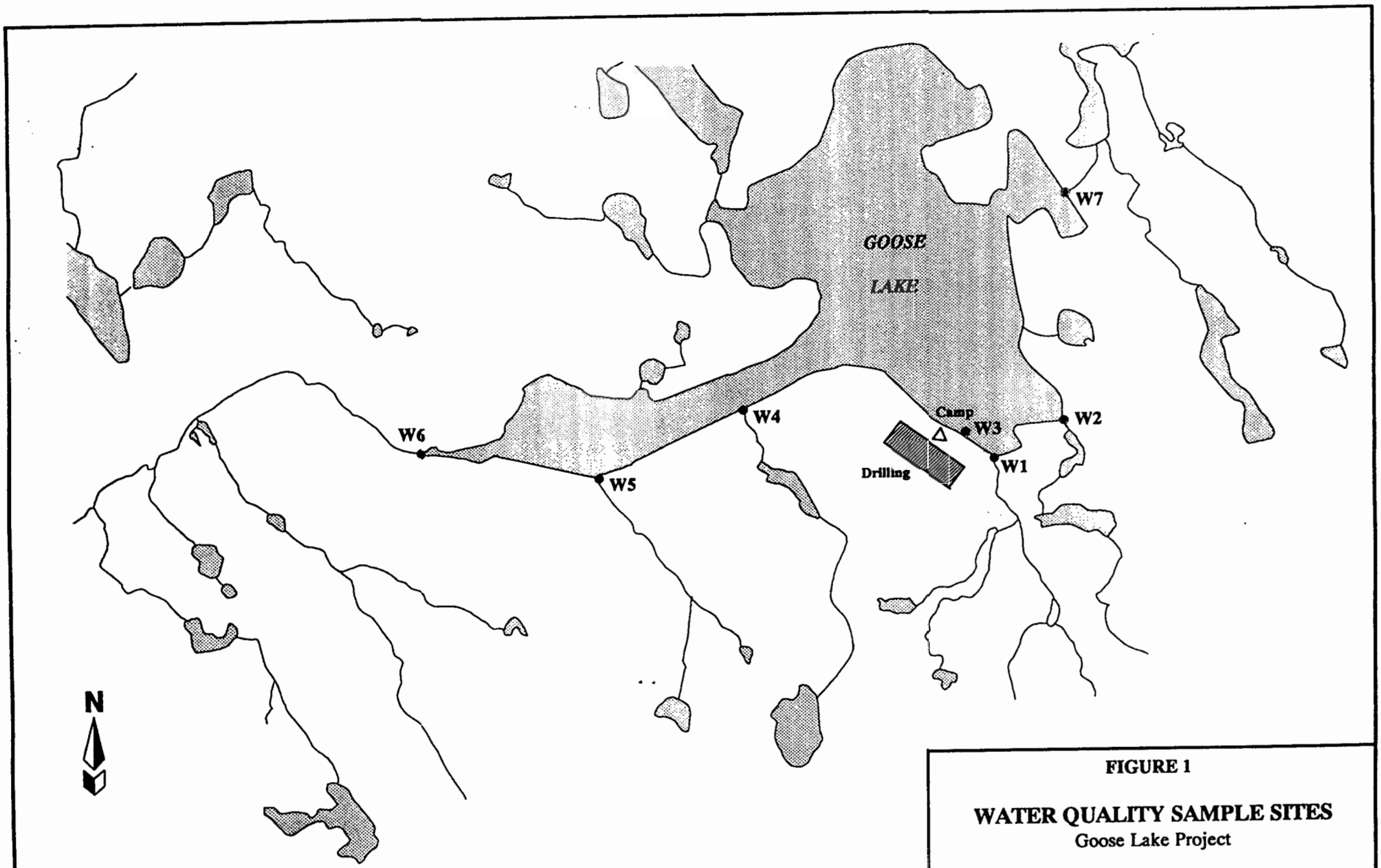
I trust this report meets your requirements for 1993 baseline studies. Please contact me if you have any questions about the foregoing.

Yours truly,

NORECOL, DAMES & MOORE, INC.

Bruce Ott, Ph.D.
Senior Project Manager

BSO:ldl



SCALE: 1:20,000

FIGURE 1

WATER QUALITY SAMPLE SITES
Goose Lake Project

HOMESTAKE MINERAL DEVELOPMENT CO.

OCTOBER 1993	26656-004

NORECOL, DAMES & MOORE, INC.

HOMESTAKE MINERAL DEVELOPMENT COMPANY GOOSE LAKE PROJECT

1993 WATER QUALITY RESULTS

PARAMETER	WQ1 930627	WQ1 930630	WQ1 MEAN	WQ2 930627	WQ2 930630	WQ2 MEAN	WQ3 930627	WQ3 930630	WQ3 MEAN	WQ4 930627	WQ4 930630	WQ4 MEAN	WQ5 930627	WQ5 930630	WQ5 MEAN	WQ6 930627	WQ6 930630	WQ6 MEAN	WQ7 930630	TRAVEL 930627	BLANK 930630
Physical Tests																					
Colour CU	30.1	9.3	19.7	13.5	<5.0		14.8	5.4	10.1	23.5	23.1	23.3	37.9	37	37.45	13.5	5.1	9.3	5	-	<5.0
Conductivity umhos/cm	12.1	17.4	14.75	10.8	23.7	17.25	11	15	13	13.2	22.7	17.95	10.5	17.9	14.2	13.4	29.3	21.35	12.6	-	1.5
Total Dissolved Solids	9	10	9.5	7	12	9.5	7	8	7.5	10	12	11	7	10	8.5	10	17	13.5	7	-	<1
Hardness CaCO3	4.47	5.49	4.98	3.69	7.93	5.81	3.63	4.08	3.855	5.07	9.23	7.15	4.26	6.97	5.615	4.61	9	6.805	3.78	-	0.42
pH	5.6	6.11	5.86	5.75	6.25	6	5.82	4.81	5.315	6	6.2	6.1	5.95	6.24	6.095	6.2	6.23	6.215	6.33	-	5.98
Total Suspended Solids	2	2	2	<1	3		<1	3		<1	6		<1	1		<1	1		1	-	<1
Turbidity NTU	0.51	0.85	0.68	0.52	0.52	0.52	0.7	0.6	0.65	0.5	2.33	1.415	0.6	0.58	0.58	0.5	0.7	0.6	0.57	-	<0.10
Dissolved Anions																					
Alkalinity - Total CaCO3	3.1	5.6	4.35	2.7	5.1	3.9	2.3	6.4	4.35	3.8	7.1	5.45	2	5.8	3.9	3	6.1	4.55	4.4	-	<1.0
Chloride Cl	<0.5	1.3		0.5	3	1.75	0.5	0.8	0.65	0.5	1.1	0.8	0.6	0.8	0.7	0.6	1.3	0.95	0.8	-	<0.5
Sulphate SO4	2	1.6	1.8	<1.0	<1.0		<1.0	<1.0		2.3	<1.0		<1.0	2.6		2	4.8		<1.0	-	<1.0
Nutrients																					
Ammonia Nitrogen N	<0.005	0.007		<0.005	<0.005		<0.005	0.008		<0.005	0.018		<0.005	<0.005		<0.005	<0.005		0.01	-	<0.005
Nitrate Nitrogen N	<0.005	<0.005		<0.005	0.019		<0.005	<0.005		<0.005	<0.005		<0.005	<0.005		<0.005	0.038		<0.005	-	<0.005
Nitrite Nitrogen N	0.001	0.004	0.0025	0.002	0.004	0.003	0.001	0.003	0.002	0.001	0.005	0.003	<0.001	0.004	0.002	<0.001	0.004	0.002	0.005	-	<0.001
ortho-Phosphate P	0.002	0.003	0.0025	0.004	0.002	0.003	0.004	0.004	0.004	0.003	0.003	0.003	0.002	0.002	0.002	0.002	0.001	0.0015	0.002	-	<0.001
Total Phosphorus P	0.005	0.005	0.005	0.008	0.005	0.0065	0.006	0.004	0.005	0.007	0.007	0.007	0.005	0.004	0.0045	0.005	0.002	0.0035	0.004	-	<0.001
Total Metals																					
Mercury T-Hg	<0.00005	<0.00005		<0.00005	<0.00005		<0.00005	<0.00005		<0.00005	<0.00005		<0.00005	<0.00005		<0.00005	<0.00005		<0.00005	<0.00005	<0.00005
Dissolved Metals																					
Aluminum D-Al	0.033	0.009	0.021	0.017	0.007	0.012	0.024	0.008	0.016	0.029	0.019	0.024	0.093	0.073	0.083	0.029	0.015	0.022	<0.005	<0.005	<0.005
Antimony D-Sb	<0.0001	<0.0001		<0.0001	<0.0001		<0.0001	<0.0001		<0.0001	<0.0001		<0.0001	<0.0001		<0.0001	<0.0001		<0.0001	<0.0001	<0.0001
Arsenic D-As	<0.0001	<0.0001		<0.0001	<0.0001		<0.0001	0.0001		<0.0001	0.0001		<0.0001	<0.0001		<0.0001	0.0001		<0.0001	<0.0001	<0.0001
Barium D-Ba	<0.010	<0.010		<0.010	<0.010		<0.010	<0.010		<0.010	<0.010		<0.010	<0.010		<0.010	<0.010		<0.010	<0.010	<0.010
Beryllium D-Be	<0.005	<0.005		<0.005	<0.005		<0.005	<0.005		<0.005	<0.005		<0.005	<0.005		<0.005	<0.005		<0.005	<0.005	<0.005
Bismuth D-Bi	<0.10	<0.10		<0.10	<0.10		<0.10	<0.10		<0.10	<0.10		<0.10	<0.10		<0.10	<0.10		<0.10	<0.10	<0.10
Cadmium D-Cd	<0.0002	<0.0002		<0.0002	<0.0002		<0.0002	<0.0002		<0.0002	<0.0002		<0.0002	<0.0002		<0.0002	<0.0002		<0.0002	<0.0002	<0.0002
Calcium D-Ca	0.954	1.24	1.10	0.784	2.01	1.397	0.774	0.825	0.7995	1.09	1.97	1.53	0.888	1.45	1.169	0.941	1.86	1.4005	0.758	<0.050	0.167
Chromium D-Cr	<0.001	0.003		<0.001	0.002		<0.001	<0.001		<0.001	<0.001		<0.001	0.004		<0.001	0.003		0.002	<0.001	<0.001
Cobalt D-Co	<0.001	<0.001		<0.001	<0.001		<0.001	<0.001		<0.001	<0.001		<0.001	<0.001		<0.001	<0.001		<0.001	<0.001	<0.001
Copper D-Cu	0.003	0.003	0.003	0.001	0.002	0.0015	0.001	0.002	0.0015	0.002	0.003	0.0025	0.006	0.003	0.0045	0.001	0.002	0.0015	0.001	<0.001	<0.001
Iron D-Fe	0.075	<0.030		0.031	<0.030		<0.030	<0.030		0.054	0.23	0.142	0.068	0.062	0.065	<0.030	<0.030		<0.030	<0.030	<0.030
Lead D-Pb	<0.001	<0.001		<0.001	<0.001		<0.001	<0.001		<0.001	<0.001		<0.001	<0.001		<0.001	<0.001		<0.001	<0.001	<0.001
Lithium D-Li	<0.015	<0.015		<0.015	<0.015		<0.015	<0.015		<0.015	<0.015		<0.015	<0.015		<0.015	<0.015		<0.015	<0.015	<0.015
Magnesium D-Mg	0.507	0.581	0.544	0.422	0.704	0.563	0.412	0.489	0.4505	0.574	1.05	0.812	0.496	0.812	0.654	0.548	1.06	0.804	0.457	0.011	<0.010
Manganese D-Mn	<0.005	<0.005		<0.005	<0.005		0.007	<0.005		<0.005	0.008		<0.005	<0.005		<0.005	<0.005		<0.005	<0.005	<0.005
Molybdenum D-Mo	<0.001	<0.001		<0.001	<0.001		<0.001	<0.001		<0.001	<0.001		<0.001	<0.001		<0.001	<0.001		<0.001	<0.001	<0.001
Nickel D-Ni	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.003	0.0025	0.002	0.004	0.003	0.002	0.002	0.002	0.001	<0.001	<0.001
Phosphorus D-P	<0.30	<0.30		<0.30	<0.30		<0.30	<0.30		<0.30	<0.30		<0.30	<0.30		<0.30	<0.30		<0.30	<0.30	<0.30
Potassium D-K	<2.0	<2.0		<2.0	<2.0		<2.0	<2.0		<2.0	<2.0		<2.0	<2.0		<2.0	<2.0		<2.0	<2.0	<2.0
Selenium D-Se	<0.0005	<0.0005		<0.0005	<0.0005		<0.0005	<0.0005		<0.0005	<0.0005		<0.0005	<0.0005		<0.0005	<0.0005		<0.0005	<0.0005	<0.0005
Silver D-Ag	<0.0001	<0.0001		<0.0001	<0.0001		<0.0001	<0.0001		<0.0001	<0.0001		<0.0001	<0.0001		<0.0001	<0.0001		<0.0001	<0.0001	<0.0001
Sodium D-Na	<2.0	<2.0		<2.0	<2.0		<2.0	<2.0		<2.0	<2.0		<2.0	<2.0		<2.0	<2.0		<2.0	<2.0	<2.0
Strontium D-Sr	0.004	<0.001		0.003	0.01	0.007	0.003	<0.001		0.006	<0.001		0.006	<0.001		0.003	<0.001		<0.001	<0.001	<0.001
Thallium D-Tl	<0.10	<0.10		<0.10	<0.10		<0.10	<0.10		<0.10	<0.10		<0.10	<0.10		<0.10	<0.10		<0.10	<0.10	<0.10
Tin D-Sn	<0.30	<0.30		<0.30	<0.30		<0.30	<0.30		<0.30	<0.30		<0.30	<0.30		<0.30	<0.30		<0.30	<0.30	<0.30
Titanium D-Ti	<0.010	<0.010		<0.010	<0.010		<0.010	<0.010		<0.010	<0.010		<0.010	<0.010		<0.010	<0.010		<0.010	<0.010	<0.010
Tungsten D-W	<0.10	<0.10		<0.10	<0.10		<0.10	<0.10		<0.10	<0.10		<0.10	<0.10		<0.10	<0.10		<0.10	<0.10	<0.10
Vanadium D-V	<0.030	<0.030		<0.030	<0.030		<0.030	<0.030		<0.030	<0.030		<0.030	<0.030		<0.030	<0.030		<0.030	<0.030	<0.030
Zinc D-Zn	<0.005	0.015		<0.005	0.008		<0.005	<0.005		<0.005	0.006		<0.005	0.006		<0.005	0.007		<0.005	<0.005	<0.005