

APPENDIX C

Well Development Field Report

North Jackson Company

Well Development Report

Project Name: GW Discharge Operational Permit

Contact: North Jackson Company
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Summary of Activities

Field Date(s): 3/27/08, 3/29/08, 3/31/08, 4/2/08, 4/3/08 and 4/4/08

Activities: Monitoring well development of QAL026A/D/E, QAL050A, QAL053A, QAL055A, QAL056A, QAL057A/D.

Low well yield prevented airlift pumping and surging to be performed on wells QAL029A/D, QAL051A, QAL052A.

Field Report Attachments

Field Analytical Data Summary	Yes
Flow Measurement	No
Water Sampling Log	No
Chain of Custody Numbers	N/A

Laboratory Analysis

None

Field Team Members: Chris Cantway (CEC), Dan Wiitala (DWW) and
Andy Maracini (AJM)

**North Jackson Company
Groundwater Field Data Summary**

Final Well Development Indicator Parameters

Project Name: GW Discharge Operational Permit

Sample ID	Development Date(s)	Total Depth (from TOR) (ft)	Depth to Water (ft)	Spec Cond (µmhos/cm @ 25°C)	pH (SU)	Turbidity (NTU)
QAL026A	3/31/08 & 4/5/08	48	43.28	39	7.8	17
QAL026D	3/29/08	83	50.32	62	9.1	20
QAL026E*	3/27 & 3/29/08	119	49.62	125	8.6	21
QAL029A	4/4/08	50	42.00	i	i	i
QAL029D	4/4/08	77	52.00	i	i	i
QAL050A	4/2 & 4/3/08	120	107.20	84	9.1	20
QAL051A	4/3/08	107	102.71	i	i	i
QAL051D	4/3, 4/4 & 4/5/08	120	104.00	106	9.0	7
QAL052A	4/4/08	125	117.30	i	i	i
QAL053A	4/3 & 4/4/08	93	78.89	114	8.9	21
QAL055A	4/3 & 4/4/08	115	102.40	85	9.1	21
QAL056A	4/3, 4/4 & 4/5/08	92	75.62	61	9.4	18
QAL057A	3/31, 4/2 & 4/3/08	118	107.00	76	9.3	22
QAL057D	3/31, 4/2 & 4/3/08	130	106.00	104	9.0	14

i Insufficient water for collection of field parameters.
 * Well required under Part 632 Mining Permit MP 012007.
 Well QAL026E is not being sampled for water quality.

North Jackson Company Well Development Log

Proj. Name: GW Discharge Operational Permit
Weather: Cloudy, ~30°s F (3/31/08)
Well ID: QAL026A

Date(s): 3/31/08 & 4/5/08
Personnel: CEC
Contractor: Boart Longyear

Static Water Level (ft TOR): 43.28
Well Depth (ft TOR): 48
Well Volume (gal): 0.8

Remarks: Developed with submersible pump with manual surging.
Tried air jetting on 4/5/08 (insufficient yield for method).

Date/Time	Spec. Cond. (µmhos/cm @ 25°C)	pH (SU)	Turbidity (NTU)	Approx. Pumping Rate (gpm)	Total Volume Removed (gal)	Comments
3/31/08 0800-0900	--	--	--	--	--	Start surge at 20 min intervals.
3/31/08 0900-0958	41	8.1	495	0.2	10	Surged ~30 min, pumped ~30 min.
3/31/08 0958-1100	39	7.9	80	0.2	21	Surged ~6 min, pumped remainder.
3/31/08 1100-1200	38	7.8	22	0.2	33	Pumped.
3/31/08 1220	39	7.8	17	0.2	37	Stop.

Note: Water quality parameters correspond to end of time period.

North Jackson Company Well Development Log

Proj. Name: GW Discharge Operational Permit
Weather: Sunny, dry, ~30°s F
Well ID: QAL026D

Date(s): 3/29/08
Personnel: DWW
Contractor: Boart Longyear

Static Water Level (ft TOR): 50.32
Well Depth (ft TOR): 83
Well Volume (gal): 8.6

Remarks: Developed with air lift pumping and manual surge tool.

Date/Time	Spec. Cond. (µmhos/cm @ 25°C)	pH (SU)	Turbidity (NTU)	Approx. Pumping Rate (gpm)	Total Volume Removed (gal)	Comments
3/29/08 1306-1336	64	9.0	17	3	90	Pump on at 1306, set up to surge after this period
3/29/08 1344-1445	63	9.1	140	4	210	Surged ~15 min, pumped 30 min.
3/29/08 1445-1525	63	9.1	28	4	370	Pumped.
3/29/08 1535	62	9.1	20	4	410	Stop.

Note: Water quality parameters correspond to end of time period.

North Jackson Company Well Development Log

Proj. Name: GW Discharge Operational Permit
Weather: Sunny, dry, ~20°s F (3/27/08)
Well ID: QAL026E

Date(s): 3/27 & 3/29/08
Personnel: DWW/AJM
Contractor: Boart Longyear

Static Water Level (ft TOR): 49.62
Well Depth (ft TOR): 119
Well Volume (gal): 17.7

Remarks: Developed with air lift pumping and manual surge tool.

Date/Time	Spec. Cond. (µmhos/cm @ 25°C)	pH (SU)	Turbidity (NTU)	Approx. Pumping Rate (gpm)	Total Volume Removed (gal)	Comments
3/27/08 0900-1200	--	--	--	--	--	Set airlift pump and pumped for 3 hrs to test pump/equipment.
3/27/08 1335-1404	125	8.6	430	4	116	Pumped.
3/29/08 1100-1220	126	8.6	79	4	276	Surged ~30 min, pumped ~40 min.
3/29/08 1220-1240	125	8.6	26	4	356	Pumped.
3/29/08 1250	125	8.6	21	4	396	Stop.

Note: Water quality parameters correspond to end of time period.

North Jackson Company Well Development Log

Proj. Name: GW Discharge Operational Permit
Weather: Partly cloudy, ~40°s F
Well ID: QAL029A

Date(s): 4/4/08
Personnel: CEC
Contractor: Boart Longyear

Static Water Level (ft TOR): 42
Well Depth (ft TOR): 50
Well Volume (gal): ~1.2

Remarks: Well yield too low for development by air-lift pumping/surging. Well developed with low-flow dedicated submersible pumping during sampling events.

Date/Time	Spec. Cond. (µmhos/cm @ 25°C)	pH (SU)	Turbidity (NTU)	Approx. Pumping Rate (gpm)	Total Volume Removed (gal)	Comments
4/4/08 1305	--	--	--	--	--	Start airjet.
4/4/08 1445	--	--	--	--	--	Start pumping.
4/4/08 1600	i	i	i	i	i	Stopped pumping. No water, silt blocked hose

i Insufficient water for collection of field parameters.

North Jackson Company Well Development Log

Proj. Name: GW Discharge Operational Permit
Weather: Partly cloudy, ~40°s F
Well ID: QAL029D

Date(s): 4/4/08
Personnel: CEC
Contractor: Boart Longyear

Static Water Level (ft TOR): 52
Well Depth (ft TOR): 77
Well Volume (gal): ~4.3

Remarks: Well yield too low for development by air-lift pumping/surging. Well developed with low-flow dedicated submersible pumping during sampling events.

Date/Time	Spec. Cond. (µmhos/cm @ 25°C)	pH (SU)	Turbidity (NTU)	Approx. Pumping Rate (gpm)	Total Volume Removed (gal)	Comments
4/4/08 1300	--	--	--	--	--	Airjet for ~5 min., dry after 2 min.; stopped airjet.
4/4/08 1351-1354	--	--	--	--	--	Started airjet, dry after 3 min.; stopped airjet.
4/4/08 1356	i	i	i	i	i	Dry.

i Insufficient water for collection of field parameters.

North Jackson Company Well Development Log

Proj. Name: GW Discharge Operational Permit
Weather: Sunny, ~30°s F (4/2/08)
Well ID: QAL050A

Date(s): 4/2 & 4/3/08
Personnel: CEC
Contractor: Boart Longyear

Static Water Level (ft TOR): 107.2
Well Depth (ft TOR): 120
Well Volume (gal): 2.5

Remarks: On 4/2/08 well developed with hydrolift w/ manual surge tool.
On 4/3/08 well developed with airjet and hydrolift and pump.

Date/Time	Spec. Cond. (µmhos/cm @ 25°C)	pH (SU)	Turbidity (NTU)	Approx. Pumping Rate (gpm)	Total Volume Removed (gal)	Comments
4/2/08 1430-1520	--	--	--	0.8	11	Start pumping/surging ~6 in. off the bottom.
4/2/08 1520-1620	82	9.2	67	0.8	41	Pumping.
4/2/08 1620-1720	82	9.2	63	0.8	89	Pumping.
4/2/08 1720-1820	82	9.2	72	0.8	137	Pumping.
4/3/08 1035-1155	--	--	--	--	--	Airjet for 1 hr, started pump at 1150.
4/3/08 1155-1250	83	9.1	54	1.5	227	Pumping.
4/3/08 1250-1330	84	9.1	26	1.5	272	Pumping.
4/3/08 1345	84	9.1	20	1.5	295	Stop.

Note: Water quality parameters correspond to end of time period.

North Jackson Company Well Development Log

Proj. Name: GW Discharge Operational Permit
Weather: Sunny, ~30°s F
Well ID: QAL051A

Date(s): 4/3/08
Personnel: CEC
Contractor: Boart Longyear

Static Water Level (ft TOR): 102.71
Well Depth (ft TOR): 107
Well Volume (gal): 1.1

Remarks: Well yield too low for development by air-lift pumping/surging. Well developed with low-flow dedicated submersible pumping during sampling events.

Date/Time	Spec. Cond. (µmhos/cm @ 25°C)	pH (SU)	Turbidity (NTU)	Approx. Pumping Rate (gpm)	Total Volume Removed (gal)	Comments
4/3/08 0950	--	--	--	--	--	Start airjet; slight mist, mostly sand.
4/3/08 1030	i	i	i	i	i	Stop airjet; no pumping, not enough yield

i Insufficient water for collection of field parameters.

North Jackson Company Well Development Log

Proj. Name: GW Discharge Operational Permit
Weather: Sunny, ~30°s F (4/3/08)
Well ID: QAL051D

Date(s): 4/3, 4/4 & 4/5/08
Personnel: CEC
Contractor: Boart Longyear

Static Water Level (ft TOR): 104
Well Depth (ft TOR): 120
Well Volume (gal): 4

Remarks: Well developed with airjet and hydrolift II pump.

Date/Time	Spec. Cond. (µmhos/cm @ 25°C)	pH (SU)	Turbidity (NTU)	Approx. Pumping Rate (gpm)	Total Volume Removed (gal)	Comments
4/3/08 0903-0950	--	--	--	--	--	Start airjet and run to 0945, start pumping 0950.
4/3/08 0950-1155	--	--	--	0.5-2	190	Pumping.
4/3/08 1155-1245	110	9.0	130	1	240	Pumping.
4/3/08 1245-1350	108	9.0	66	1	305	Pumping.
4/3/08 1350-1445	106	9.0	51	1	360	Pumping.
4/3/08 1445-1550	106	9.0	62	1	385	Stopped pumping after 6 hrs.
4/4/08 1830-1900	--	--	--	--	--	Airjet for 30 min.
4/5/08 0830-1025	--	--	--	--	--	Airjet for 1 hr, then start pumping at 0945.
4/5/08 1115	106	9.0	7	1	475	Stop.

Note: Water quality parameters correspond to end of time period.

North Jackson Company Well Development Log

Proj. Name: GW Discharge Operational Permit
Weather: Sunny, ~30°s F
Well ID: QAL052A

Date(s): 4/4/08
Personnel: CEC
Contractor: Boart Longyear

Static Water Level (ft TOR): 117.3
Well Depth (ft TOR): 125
Well Volume (gal): 2.2

Remarks: Well yield too low for development by air-lift pumping/surging. Well developed with low-flow dedicated submersible pumping during sampling events.

Date/Time	Spec. Cond. (µmhos/cm @ 25°C)	pH (SU)	Turbidity (NTU)	Approx. Pumping Rate (gpm)	Total Volume Removed (gal)	Comments
4/4/08 1045-1130	--	--	--	--	--	Airjet for 45 min., very little water.
4/4/08 1140-1200	i	i	i	i	i	Start pumping at 1140, very low yield.

i Insufficient water for collection of field parameters.

North Jackson Company Well Development Log

Proj. Name: GW Discharge Operational Permit
Weather: Sunny, dry, ~30°s F (4/3/08)
Well ID: QAL053A

Date(s): 4/3 & 4/4/08
Personnel: CEC
Contractor: Boart Longyear

Static Water Level (ft TOR): 78.89
Well Depth (ft TOR): 93
Well Volume (gal): 4.2

Remarks: Well developed with airlift pumping/manual surging.

Date/Time	Spec. Cond. (µmhos/cm @ 25°C)	pH (SU)	Turbidity (NTU)	Approx. Pumping Rate (gpm)	Total Volume Removed (gal)	Comments
4/3/08 1530-1645	--	--	--	--	--	Airjet running.
4/3/08 1700-1830	--	--	--	1	90	Pumping.
4/4/08 0830-1430	--	--	--	1	450	Pumping.
4/4/08 1430-1625	115	8.7	136	2	460	Start pumping at 1430; airjet at 1440-1615; 1620 start pumping.
4/4/08 1625-1645	115	8.9	28	1	480	Pumping.
4/4/08 1645-1655	114	8.9	21	1	490	Stopped pumping at 1655.

Note: Water quality parameters correspond to end of time period.

North Jackson Company Well Development Log

Proj. Name: GW Discharge Operational Permit
Weather: Cloudy, ~40°s F (4/3/08)
Well ID: QAL055A

Date(s): 4/3 & 4/4/08
Personnel: CEC
Contractor: Boart Longyear

Static Water Level (ft TOR): 102.4
Well Depth (ft TOR): 115
Well Volume (gal): 3.9

Remarks: Well developed with airjet & hydrolift II pump.

Date/Time	Spec. Cond. (μ mhos/cm @ 25°C)	pH (SU)	Turbidity (NTU)	Approx. Pumping Rate (gpm)	Total Volume Removed (gal)	Comments
4/3/08 1450-1550	--	--	--	--	--	Airjet running.
4/3/08 1600-1700	87	9.1	144	0.7	7	Start pump at 1600.
4/3/08 1700-1745	89	9.1	231	0.7	39	Pumping.
4/3/08 1745-1845	91	9.1	137	0.7	81	Readings at 1830; stopped pump at 1845.
4/4/08 0830-0915	87	9.0	58	1	126	Start pump at 0830.
4/4/08 0915-1005	86	9.1	31	1	176	Pumping.
4/4/08 1005-1045	85	9.1	21	1	216	Stopped pumping at 1045.

Note: Water quality parameters correspond to end of time period.

North Jackson Company Well Development Log

Proj. Name: GW Discharge Operational Permit
Weather: Sunny, ~30°s F (4/3/08)
Well ID: QAL056A

Date(s): 4/3, 4/4 & 4/5/08
Personnel: CEC
Contractor: Boart Longyear

Static Water Level (ft TOR): 75.62
Well Depth (ft TOR): 92
Well Volume (gal): 3.9

Remarks: Well developed with airjet & hydrolift II pump.

Date/Time	Spec. Cond. (µmhos/cm @ 25°C)	pH (SU)	Turbidity (NTU)	Approx. Pumping Rate (gpm)	Total Volume Removed (gal)	Comments
4/3/08 1700-1800	--	--	--	--	--	Airjet running.
4/4/08 0830-1015	--	--	--	--	--	Airjet running.
4/4/08 1030-1230	59	9.4	42	1.5	180	Pumping.
4/4/08 1230-1320	59	9.4	116	1	233	Puming (stopped 1300-1310 to add gas).
4/4/08 1320-1550	60	9.4	190	1	383	Pumping, stopped at 1650, readings at 1550.
4/4/08 1700-1845	61	9.4	120	1	478	Airjet from 1700-1800; start pump at 1810.
4/5/08 0845-0920	60	9.4	80	1	513	Pumping.
4/5/08 1100-1352	61	9.4	35	2	772	Airjet 1100-1200; start pump at 1205.
4/5/08 1352-1415	61	9.4	25	2	818	Pumping.
4/5/08 1415-1425	61	9.4	18	2	838	Stopped pumping at 1425.

Note: Water quality parameters correspond to end of time period.

North Jackson Company Well Development Log

Proj. Name: GW Discharge Operational Permit
Weather: Cloudy, ~30°s F (3/3/08)
Well ID: QAL057A

Date(s): 3/31, 4/2 & 4/3/08
Personnel: CEC
Contractor: Boart Longyear

Static Water Level (ft TOR): 107
Well Depth (ft TOR): 118
Well Volume (gal): 3.3

Remarks: Well developed with hydrolift pump & surge.

Date/Time	Spec. Cond. (µmhos/cm @ 25°C)	pH (SU)	Turbidity (NTU)	Approx. Pumping Rate (gpm)	Total Volume Removed (gal)	Comments
3/31/08 1410-1450	79	9.5	430	1	10	Start pumping/surging 1410.
3/31/08 1450-1540	77	9.4	43	1	60	Pumping.
3/31/08 1540-1645	77	9.4	100	1	125	Pumping.
3/31/08 1645-1755	76	9.4	54	1	195	Stopped pumping at 1755.
4/2/08 0905-1055	74	9.4	110	0.5	198	Start pumping/surging 0905; hose pulled 1035 due to ice in cap obstructing flow; 1050 flow established.
4/2/08 1055-1125	74	9.4	36	0.5	213	Pumping.
4/2/08 1125-1205	74	9.4	18	0.5	228	Raised pump ~2' at 1126; readings at 1156; stopped at 1205.
4/3/08 1240-1510	80	9.2	43	1.5	258	Airjet running 1240-1350; start pump at 1410.
4/3/08 1510-1605	78	9.3	39	1.5	340	Pumping.
4/3/08 1605-1715	78	9.3	28	1.5	445	Pumping.
4/3/08 1715-1825	77	9.3	30	1.5	550	Pumping.
4/3/08 1825-1910	76	9.3	22	1.5	618	Stopped pumping at 1910.

Note: Water quality parameters correspond to end of time period.

North Jackson Company Well Development Log

Proj. Name: GW Discharge Operational Permit
Weather: Cloudy, ~30°s F (3/31/08)
Well ID: QAL057D

Date(s): 3/31, 4/2 & 4/3/08
Personnel: CEC
Contractor: Boart Longyear

Static Water Level (ft TOR): 106
Well Depth (ft TOR): 130
Well Volume (gal): 6.1

Remarks: Well developed with hydrolift pump & surge.

Date/Time	Spec. Cond. (µmhos/cm @ 25°C)	250	Turbidity (NTU)	Approx. Pumping Rate (gpm)	Total Volume Removed (gal)	Comments
3/31/08 1245-1345	--	--	--	--	--	Surge with manual surge black tool.
3/31/08 1345-1445	120	8.4	530	0.1	6	Pumping with airlift pump.
3/31/08 1445-1555	119	8.8	214	0.1	12	Pumping with airlift pump.
3/31/08 1555-1645	115	8.8	107	0.1	17	Pumping with airlift pump.
3/31/08 1645-1740	112	8.8	55	0.1	23	Stopped pumping at 1740.
4/2/08 1210-1315	105	9.1	46	1.0	88	Started pumping at 1210.
4/2/08 1315-1345	99	9.1	45	0.3	110	Pumping.
4/2/08 1345-1416	104	9.1	10	0.3	117	Stopped pumping at 1416.
4/4/08 1200-1235	--	--	--	--	--	Airjet.
4/4/08 1300-1400	112	9.0	23	2	237	Started hydrolift pump at 1300.
4/4/08 1400-1505	104	9.0	14	2	367	Stopped pumping at 1505.

Note: Water quality parameters correspond to end of time period.