

APPENDIX 3.5-D

Geologic Logs, Well Construction Diagrams, and Well
Development Forms for the
Baseline Groundwater Monitoring Program, 1987

LOG OF TEST BORING NO.: MW-1000, 1000P							SURFACE ELEVATION: 1099.6			
CLIENT: Kennecott PROJECT: Flambeau-Baseline Ground Water Monitoring PROJECT NUMBER: 87K10-7 LOCATION: River Pillar COORDINATES: 39725 N 38958 E (APPROX)							BORING DEPTH: 55.0			
							DATE: 09/30/87			
MSL ELEV	DEPTH FR LND SURF	SAMP DEPTH INTERVAL	TYPE	#	N	REC (ft)	DESCRIPTION OF MATERIAL	CLASS	LABORATORY TESTS	DRILLING AND SAMPLE NOTES
1099.6	--0.0						Surface-Lt brn poorly graded SAND w/silt fn, loose, dry. Lg bldrs at 2-6', cuttings w/red brn sand	SP-SM		
1094.6	--5.0	6.0-7.5	ss	1	P	0.4	Red brn silty SAND, fn w/med & cse sand, fn & cse gvl, diamict, saturated	SM		
1089.6	--10.0	10.0-11.5	ss	2	P	1.2	Same as above to 10.5', then SILT, white red, yel varigated, soft, wet (saprolite)	ML		
1084.6	--15.0	15.0-16.5	ss	3	P	1.2	Same except darker red, brn, brittle, crumbly, w/qtz laminae (altered schist)	"ML"		
1079.6	--20.0	20.0-21.5	ss	4	P	0.6	Same except mostly white w/brn, w/flecks pyrite			
1074.6	--25.0	25.0-32.0	c	5		5.5	Cored 25-32 ft. Breaks at 25.4, 25.9, 26.4, 27.1, 28.1, 28.6, 29.6, & 30.5 ft. 25-28'-Lt gry & dk gry SCHIST, slightly altered, schistosity planes at about 45 degrees, rust brn (ox) parallel to schistosity, disseminated pyrite along schistosity. Vertical fracture w/iron stain at 26.3 to 26.7'. At 28', green & white schist, vert break from 28-28.3' horz break at 28.3'. Pyrite vein at 28.3 to 28.8'. At 28.3' white, lt gray, dk gray schist, more altered than above, w/near vertical breaks	RK	RQD = 79% Frac freq = 1.2/ft	
1072.1	--27.5							1a		
1069.6	--30.0									
1067.1	--32.5	32.0-42.0	c	6		3.9	Cored 32-42 ft. As above, white, gray SCHIST, altered, w/disseminated pyrite, near vertical planes of schistosity, brittle, broken in core barrel, longest pieces 0.7, 0.4, 0.6, 0.4, 0.4 ft long Oxidation (iron stain) along schistosity At bottom of core, vy soft, lt gray schist w/pyrite vein, breaks parallel to foliations		RQD = 39% Frac freq = 2/ft	
1064.6	--35.0									
1062.1	--37.5						(Sericite - Quartz Schist)			P - Pushed
1059.6	--40.0									
DRILLING DATA							WATER LEVEL INFORMATION			
START DATE: 09/30/87							DEPTH AT COMPLETION:			
COMPLETION DATE: 10/01/87							LATER TIME/DEPTH:			
LOGGED BY: BJS							LATER TIME/DEPTH:			
DRILLING METHOD: Mud rotary, tricone bit to 25', carbide bit 25-55'							CAVE IN DEPTH:			
DRILLING CONTRACTOR: Luisier Drilling, Inc.							DRILLING LOSSES:			

LOG OF TEST BORING NO.: MW-1000, 1000P
 CLIENT: Kennecott
 PROJECT: Flambeau-Baseline Ground Water Monitoring
 PROJECT NUMBER: 87K10-7
 LOCATION: River Pillar
 COORDINATES: 39725 N 38958 E (APPROX)

SURFACE ELEVATION: 1099.5
 BORING DEPTH: 55.0
 DATE: 09/30/87

MSL ELEV	DEPTH FR LND SURF	SAMP DEPTH INTERVAL	TYPE	#	N	REC (ft)	DESCRIPTION OF MATERIAL	CLASS	LABORATORY TESTS	DRILLING AND SAMPLE NOTES
1059.5	--40.0									
1057.0	--42.5	42.0-46.0	c	7		4.0	Gray, white altered schist w/dissem. pyrite, brittle, slightly harder than above, w/near vertical breaks along foliation. Breaks at 42.3, 42.75, 43.05, 43.35, 43.70, 44.0, 44.6, 45.3, 45.7, 46.15 ft. At about 43.5 & 44.0 ft, horz breaks w/clay & silt layer, soft, wet, red brn		RQD = 71% Frac freq = 2.3/ft	
1054.5	--45.0	46.0-51.0	c	8		4.8	Gray, white altered schist w/dissem. pyrite & pyrite in veins up to 0.8" thick, brittle, more cohesive than above. Breaks are about 30 degrees from vert. Breaks at 46.8, 47.5, 48.0, 48.3, 48.8, 49.8, 50.8 ft.	RK 1a	RQD = 94% Frac freq = 1.3/ft	
1052.0	--47.5									
1049.5	--50.0	51.0-55.0	c	9		4.0	Same as above. Breaks at 51.6, 52.2, 52.6, 53.6, 53.9, & 55.0 ft. Soft clayey layer about 3" thick @ approx 52.4'		RQD = 95% Frac freq = 1.5/ft	
1047.0	--52.5									
1044.5	--55.0						55'-End of boring in altered sericite schist			
1042.0	--57.5									
1039.5	--60.0									
1037.0	--62.5									
1034.5	--65.0									
1032.0	--67.5									

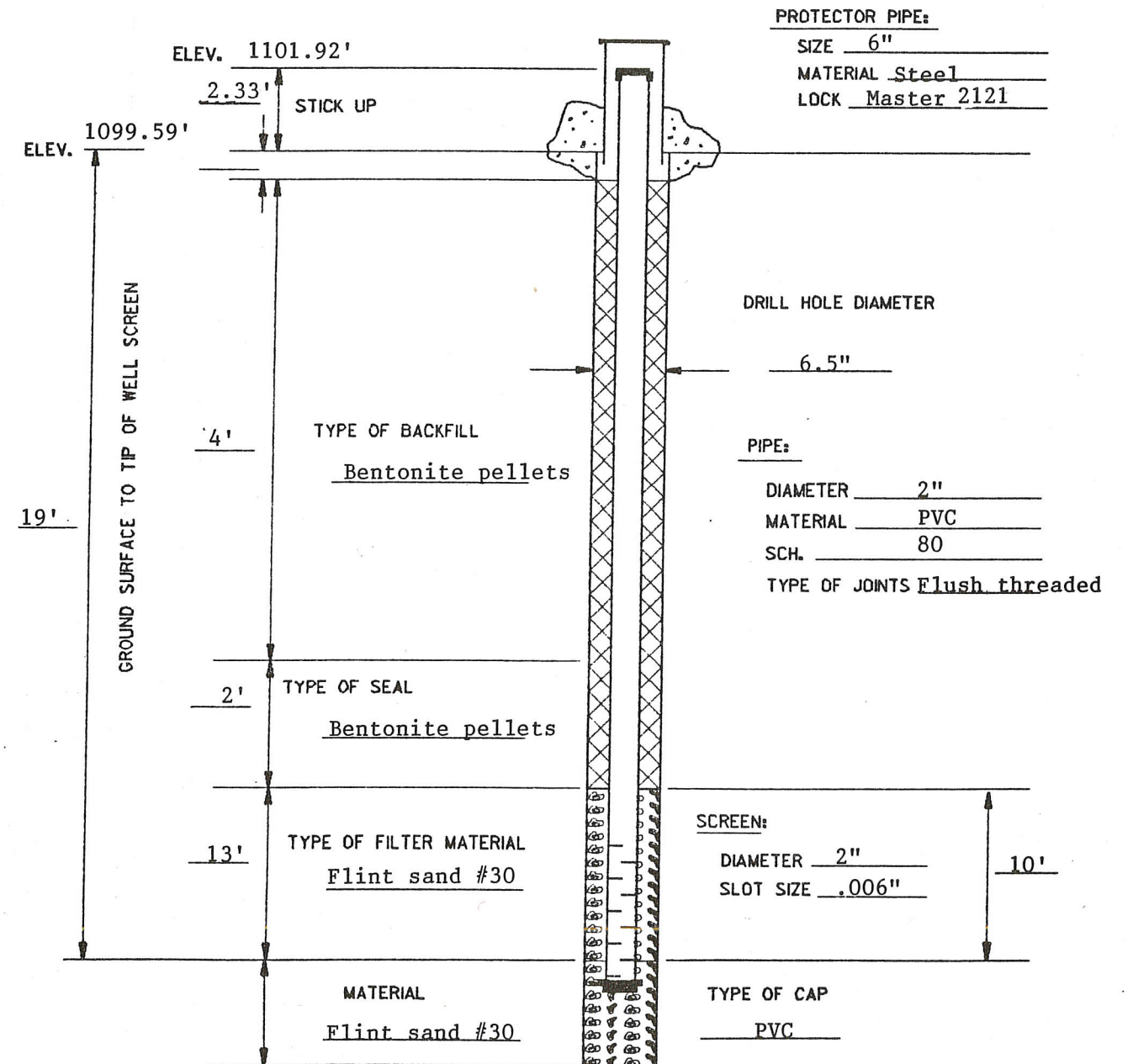
DRILLING DATA
 START DATE: 09/30/87
 COMPLETION DATE: 10/01/87
 LOGGED BY: BJS
 DRILLING METHOD: Mud rotary, tricone bit to 25', carbide bit 25-55'
 DRILLING CONTRACTOR: Luisier Drilling, Inc.

WATER LEVEL INFORMATION
 DEPTH AT COMPLETION:
 LATER TIME/DEPTH:
 LATER TIME/DEPTH:
 CAVE IN DEPTH:
 DRILLING LOSSES:

MONITORING WELL INSTALLATION DIAGRAM

WELL NO: MW-1000
 DATE INSTALLED: 10-01-87
 DRILLER: Luisier Well Drilling
 DRILLING METHOD: Mud rotary
 COORDINATES: 39,725.52N 38,958.70E

CLIENT: Kennecott
 PROJECT: Baseline G.W. Monitoring
 SCOPE I.D.: 87K10-7
 BY: BJS



Foth & Van Dyke

Geosciences & Environmental Management Division

MONITORING WELL DEVELOPMENT

WELL NUMBER MW-1000 CLIENT Kennecott
 WELL DIAMETER 2" PROJECT Baseline G.W. Monitoring
 TOTAL DEPTH OF WELL 19' SCOPE I.D. 87K10-7
 DEPTH TO WATER TIME OF MEASUREMENT BY K.M. Luisier Well Drilling
 BEFORE _____ DATE 10-5-87
 AFTER 19' (Dry)

DESCRIPTION OF DEVELOPMENT METHOD

Well was alternately surged and bailed using a foot valve installed on a 3/4" flexible PVC pipe. The pipe and foot valve were moved up and down in the well by a motor-driven pitcher-pump.

VOLUME OF WATER REMOVED FROM WELL 4 gallons
 CLARITY OF WATER IN WELL BEFORE DEVELOPMENT dark, silty, clayey
 CLARITY OF WATER IN WELL AFTER DEVELOPMENT light, silty, clayey
 PRESENCE OF SEDIMENT AT THE BOTTOM OF THE WELL _____
 VOLUME OF WATER ADDED TO WELL None
 SOURCE OF WATER ADDED TO WELL _____
 TIME SPENT FOR DEVELOPMENT 45 min.

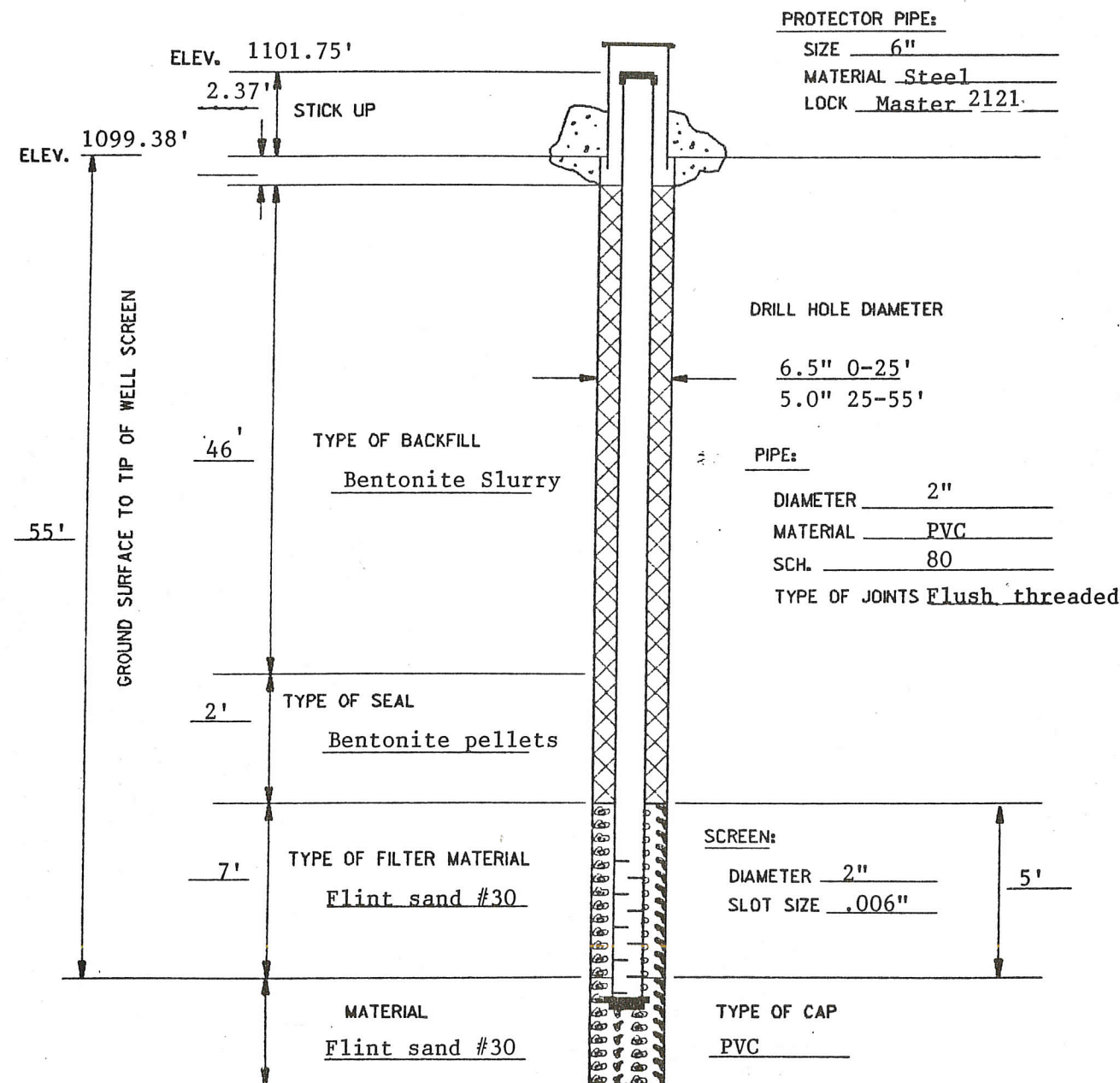
STABILIZATION READINGS

GAL. REMOVED	TIME	TEMPERATURE	FIELD	
			SPEC. COND.	pH
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

FOTH AND VAN DYKE

MONITORING WELL INSTALLATION DIAGRAM

WELL NO: MW-1000P CLIENT: Kennecott
 DATE INSTALLED: 10-01-87 PROJECT: Baseline G.W. Monitoring
 DRILLER: Luisier Well Drilling SCOPE I.D.: 87K10-7
 DRILLING METHOD: Mud rotary BY: BJS
 COORDINATES: 39,720.95N 38,950.72E



Foth & Van Dyke

Geosciences & Environmental Management Division

MONITORING WELL DEVELOPMENT

WELL NUMBER MW-1000P CLIENT Kennecott
 WELL DIAMETER 2" PROJECT Baseline G.W. Monitoring
 TOTAL DEPTH OF WELL 54.5' SCOPE I.D. 87K10-7
 DEPTH TO WATER _____ TIME OF MEASUREMENT _____
 BEFORE _____ BY K.M. Luisier Well Drilling
 AFTER 54.5' (Dry) DATE 10-5-87

DESCRIPTION OF DEVELOPMENT METHOD

Well was alternately surged and bailed using a foot valve installed on a 3/4" flexible PVC pipe. The pipe and foot valve were moved up and down in the well by a motor-driven pitcher-pump.

VOLUME OF WATER REMOVED FROM WELL 6 gallons
 CLARITY OF WATER IN WELL BEFORE DEVELOPMENT brown
 CLARITY OF WATER IN WELL AFTER DEVELOPMENT _____
 PRESENCE OF SEDIMENT AT THE BOTTOM OF THE WELL None
 VOLUME OF WATER ADDED TO WELL None
 SOURCE OF WATER ADDED TO WELL _____
 TIME SPENT FOR DEVELOPMENT 1 hour

STABILIZATION READINGS

GAL. REMOVED	TIME	TEMPERATURE	FIELD SPEC. COND.	pH

FOOTH AND VAN DYKE

LOG OF TEST BORING NO.: MW-1001, 1001G							SURFACE ELEVATION: 1141.0			
CLIENT: Kennecott PROJECT: Flambeau-Baseline Ground Water Monitoring PROJECT NUMBER: 87K10-7 LOCATION: South of southwest end of pit COORDINATES: 39537 N 39560 E (APPROX)							BORING DEPTH: 53.5			
							DATE: 09/24/87			
MSL ELEV	DEPTH FR LND SURF	SAMP DEPTH INTERVAL	TYPE	#	N	REC (ft)	DESCRIPTION OF MATERIAL	CLASS	LABORATORY TESTS	DRILLING AND SAMPLE NOTES
1141.0	--0.0						Surface-Yel brn (10YR 5/8) prly graded SAND w/silt, fn, loose. (Aeolian v fn s)	SP-SM		
		3.0-4.5	ss	1	35	0.0	As above to 4', vy fn sand, loose, dry 4-5' w/fn gvl, hard drilling (till as below)			
1136.0	--5.0	5.0-6.5	ss	2	27	1.2	Dk red brn (5YR 3/4) silty SAND, fine w/med & cse sand, fn & cse gvl, dense, cohesive, brittle, vy slightly moist, diamict (till)			
1131.0	--10.0	10.0-11.5	ss	3	100	0.4	Cored bldr (greenstone). Cuttings as above, dry to slightly moist	SM		
1126.0	--15.0	15.0-16.5	ss	4	100	0.4	Core bldr (vy cse grained granite, much pink feldspar). Cutting str brn (7.5YR 5/6) clayey SAND (till), slightly moist			
1121.0	--20.0	20.0-21.5	ss	5	26	0.4	Till as above, str brn (7.5YR 4/6) silty SAND			
1116.0	--25.0	25.0-26.5	ss	6	17	1.0	As above, except wet.			
1111.0	--30.0	30.0-31.5	ss	7	15	0.8	As above except slightly more clay, massive, uniform color, slight textural variation			
1106.0	--35.0	35.0-36.5	ss	8	16	1.5	Same			
1101.0	--40.0	40.0-41.5	ss	9	26	1.5	Same, soft, cohesive w/pebble concentrations, saturated			
1096.0	--45.0	45.0-46.5	ss	10	29	0.8	Same except slightly more sandy, w/slight textural & color layering. Hard drilling at 48.5'			
1091.0	--50.0	50.0-51.5	ss	11	29	0.5	Str brn (7.5YR 5/8) poorly graded SAND w/silt, fn, loose, sticky qtz sand (weathered sandstone)	SP-SM (SS)		
		52.0-53.5	ss	12	22	0.8	White & yel brn SILT plastic, saturated at top of sample, dry brittle at tip of spoon (altered schist) (saprolite)	ML		
1086.0	--55.0						53.5'-End of Boring in saprolite	=====		
DRILLING DATA							WATER LEVEL INFORMATION			
START DATE: 09/24/87							DEPTH AT COMPLETION:			
COMPLETION DATE: 09/25/87							LATER TIME/DEPTH: 15 hr/26.4'			
LOGGED BY: BJS							LATER TIME/DEPTH:			
DRILLING METHOD: Hollow stem augers, 4 1/4" ID							CAVE IN DEPTH:			
DRILLING CONTRACTOR: Wisconsin Test Drilling, Inc.							DRILLING LOSSES:			

LOG OF TEST BORING NO.: MW-1001P

CLIENT: Kennecott
 PROJECT: Flambeau-Baseline Ground Water Monitoring
 PROJECT NUMBER: 87K10-7
 LOCATION: South of southwest end of pit
 COORDINATES: 39543.90 N 39552.90 E

SURFACE ELEVATION: 1140.78

BORING DEPTH: 95.0

DATE: 10/02/87

MSL ELEV	DEPTH FR LND SURF	SAMP DEPTH INTERVAL	TYPE	#	N	REC (ft)	DESCRIPTION OF MATERIAL	CLASS	LABORATORY TESTS	DRILLING AND SAMPLE NOTES
1140.8	--0.0						Drilled to 52' without sampling See log for MW-1001, 1001G			
1090.8	--50.0	52.0-53.5	c	1	P	1.5	Lt yel brn SILT, brittle, dry, foliated (saprolite)	ML		
1085.8	--55.0	57.0-58.5	c	2	P	1.8	Same to about 58.5'; grn gray SILT/silty CLAY at tip of spoon, slightly moist, brittle to plastic when wet	ML, CL-ML		
1080.8	--60.0	62.0-63.5	c	3	P	0.5	Green gray altered SCHIST, foliated, brittle	"ML"		
1075.8	--65.0	65.0-72.0	c	4		4.2	Lt green gray (5G 7/1 & 5BG 7/1) altered SCHIST, vy soft, brittle. Top 2' clayey schistosity more distinct in bottom 2' Core soft, sticks to core barrel; probably no natural breaks in core	"ML"	RQD = 60%	
1070.8	--70.0	72.0-84.0	c	5		2.2	White (5YR 8/1) and pink (5YR 8/4) "SILT", extr. altered schist/saprolite, much kaolinite, breaks at about 25 degrees from vertical, soft, moist Breaks at 0.4, 0.8, & 1.0 ft.	"ML"	RQD = 18% Fract freq = 2.3/ft	
1065.8	--75.0	84.0-89.5	c	6		4.0	Green gray altered SCHIST, soft, brittle to about 86' then soft clayey, white, & lt grn; bottom 0.8 ft broken qtz w/white & pink (kaolinite) clay. Qtz pieces up to 1.5" dia. Core soft, sticking to barrel, breaks near vertical & horizontal	"ML"	RQD = 58% Fract freq = 2.8/ft	
1050.8	--90.0	89.5-95.0	c	7		4.0	QTZ as above, fn & cse gvl up to 3" dia. to 91'; then lt grn gray lean CLAY/SILT altered schist, vy soft, plastic. Bottom 1' white & pink altered schist, soft, crumbly, moist. Core soft, sticking to barrel, probably no natural breaks except in quartz 95.0'-End of Boring in altered schist	"CL/ML"	RQD = 89%	P - Pushed

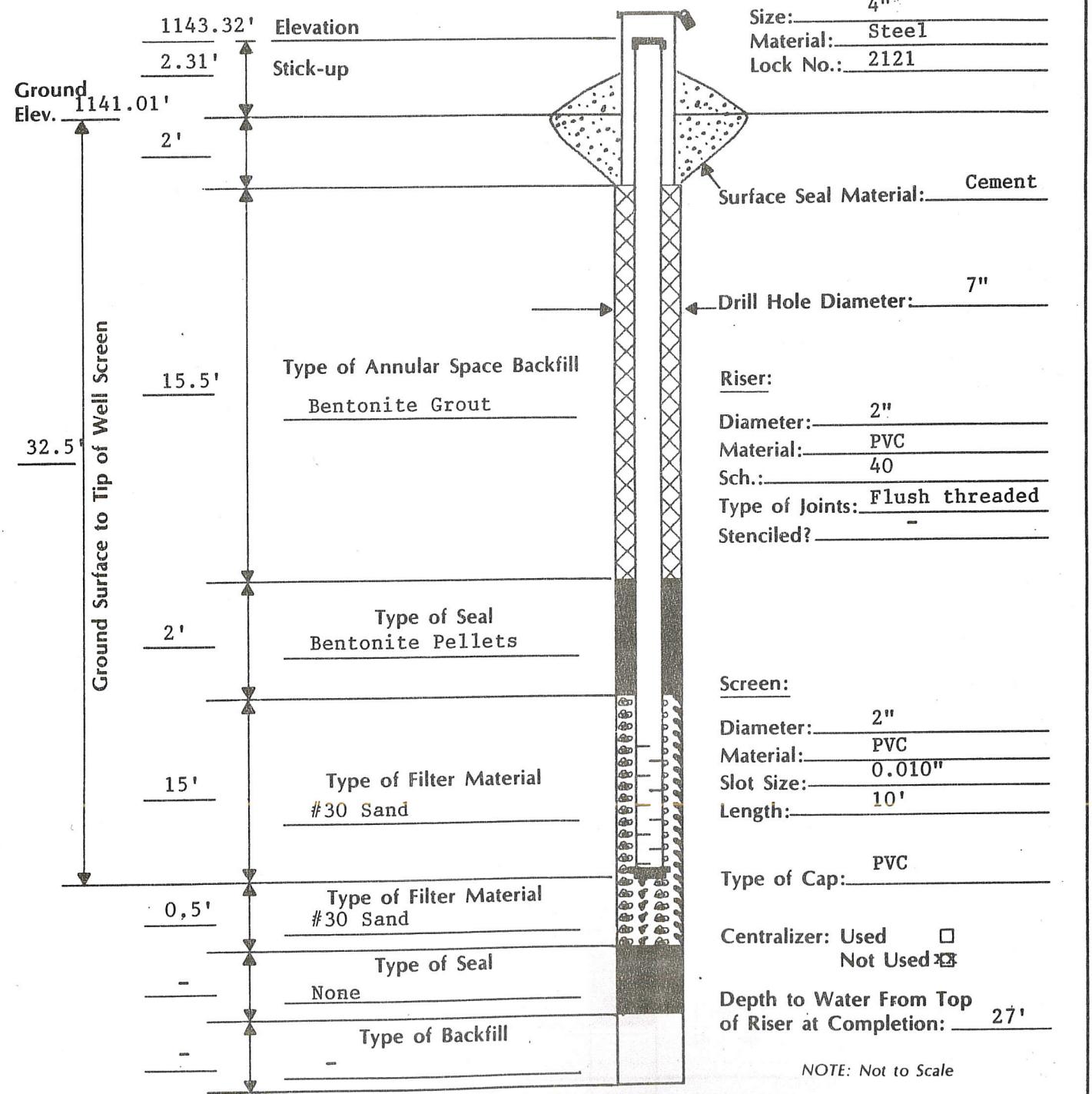
DRILLING DATA	WATER LEVEL INFORMATION
START DATE: 10/02/87	DEPTH AT COMPLETION:
COMPLETION DATE: 10/02/87	LATER TIME/DEPTH:
LOGGED BY: BJS	LATER TIME/DEPTH:
DRILLING METHOD: Mud rotary, 4 7/8" carbide bit, 3 1/4" core	CAVE IN DEPTH:
DRILLING CONTRACTOR: Luisier Drilling, Inc.	DRILLING LOSSES:

Foth & Van Dyke

Client: Kennecott Scope I.D.: 87K10
 Project: Baseline Groundwater Monitoring Page: 1
 Prepared by: BJS Date: 9-28-87
 Checked by: BJS Date: 12-14-88

MONITORING WELL CONSTRUCTION DIAGRAM

Driller: Wisconsin Test Drilling, Inc. Well No: MW-1001
 Drilling Method: Hollow Stem Augers 4.25" ID Date Installed: 9-28-87
 Coordinates: 39,537.00N 39,561.02E



MONITORING WELL DEVELOPMENT

WELL NUMBER MW-1001 CLIENT Kennecott
 WELL DIAMETER 2" PROJECT Baseline G.W. Monitoring
 TOTAL DEPTH OF WELL 32.5' SCOPE I.D. 87K10-7
 DEPTH TO WATER TIME OF MEASUREMENT BY M.M. Wisc. Test Drilling, Inc.
 BEFORE 26.0' DATE 9-30-87
 AFTER 29.25'

DESCRIPTION OF DEVELOPMENT METHOD

Well was alternately surged and bailed using a PVC hand pump.

VOLUME OF WATER REMOVED FROM WELL 5 gallons
 CLARITY OF WATER IN WELL BEFORE DEVELOPMENT brown, sandy, silty
 CLARITY OF WATER IN WELL AFTER DEVELOPMENT brown, sandy, silty
 PRESENCE OF SEDIMENT AT THE BOTTOM OF THE WELL
 VOLUME OF WATER ADDED TO WELL None
 SOURCE OF WATER ADDED TO WELL
 TIME SPENT FOR DEVELOPMENT 0.5 hours

STABILIZATION READINGS

GAL. REMOVED	TIME	TEMPERATURE	FIELD	
			SPEC. COND.	pH

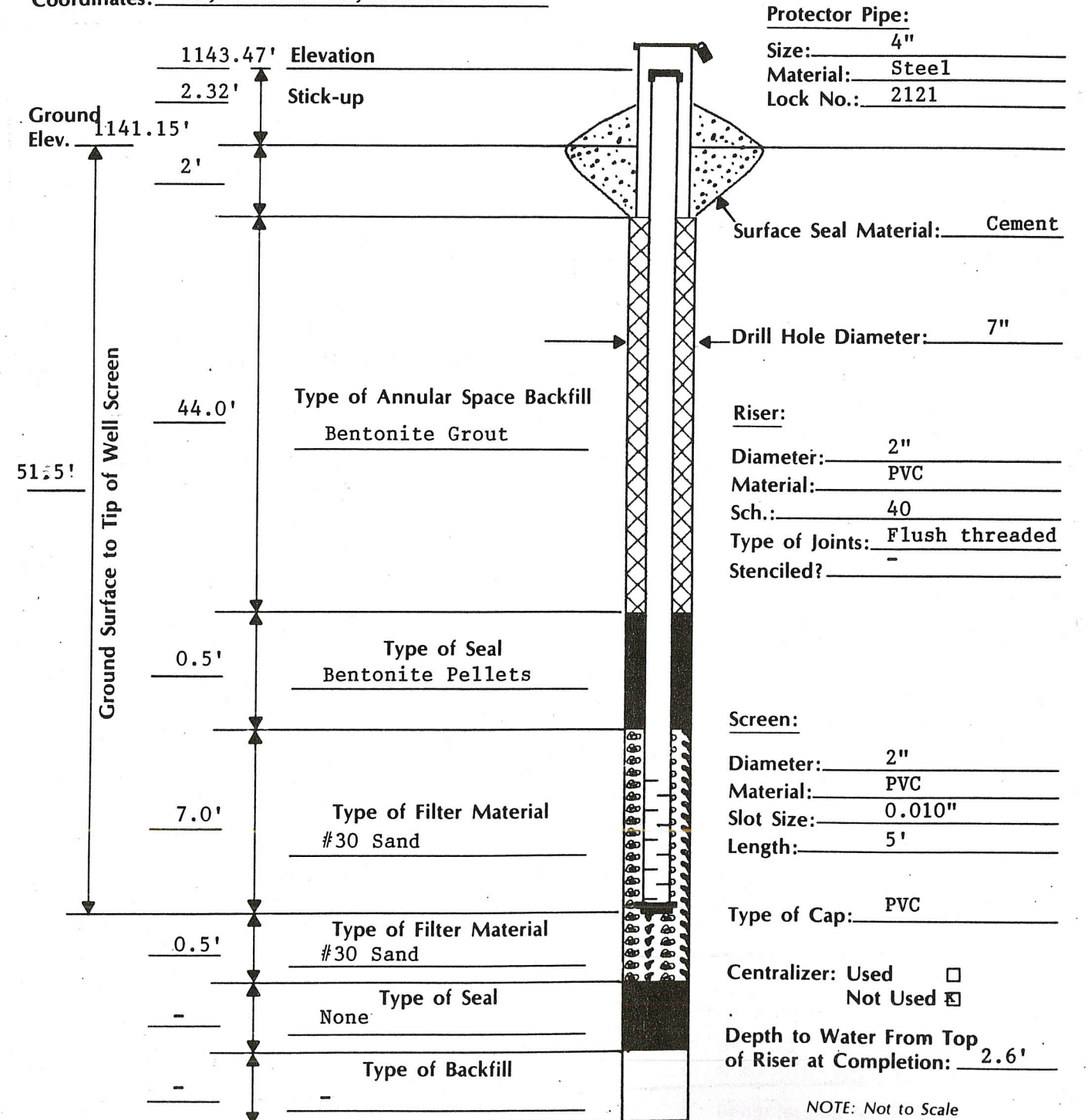
FOTH AND VAN DYKE

Foth & Van Dyke

Client: Kennecott Scope I.D.: 87K10
 Project: Baseline Groundwater Monitoring Page: 1
 Prepared by: BJS Date: 9-25-87
 Checked by: BJS Date: 12-14-88

MONITORING WELL CONSTRUCTION DIAGRAM

Driller: Wisconsin Test Drilling, Inc. Well No: MW-1001G
 Drilling Method: Hollow Stem Augers Date Installed: 9-25-87
 Coordinates: 39,534.85N 39,553.22E



MONITORING WELL DEVELOPMENT

WELL NUMBER MW-1001G CLIENT Kennecott
 WELL DIAMETER 2" PROJECT Baseline G.W. Monitoring
 TOTAL DEPTH OF WELL 51.5' SCOPE I.D. 87K10-7
 DEPTH TO WATER _____ TIME OF MEASUREMENT _____
 BEFORE 26.9' _____ BY M.M. Wisc. Test Drilling, Inc.
 AFTER 27.4' _____ DATE 9-30-87

DESCRIPTION OF DEVELOPMENT METHOD

Well was alternately surged and bailed using a PVC hand pump.

VOLUME OF WATER REMOVED FROM WELL 25 gallons
 CLARITY OF WATER IN WELL BEFORE DEVELOPMENT brown, sandy, silty
 CLARITY OF WATER IN WELL AFTER DEVELOPMENT brown, sandy
 PRESENCE OF SEDIMENT AT THE BOTTOM OF THE WELL _____
 VOLUME OF WATER ADDED TO WELL None
 SOURCE OF WATER ADDED TO WELL _____
 TIME SPENT FOR DEVELOPMENT 20 Minutes

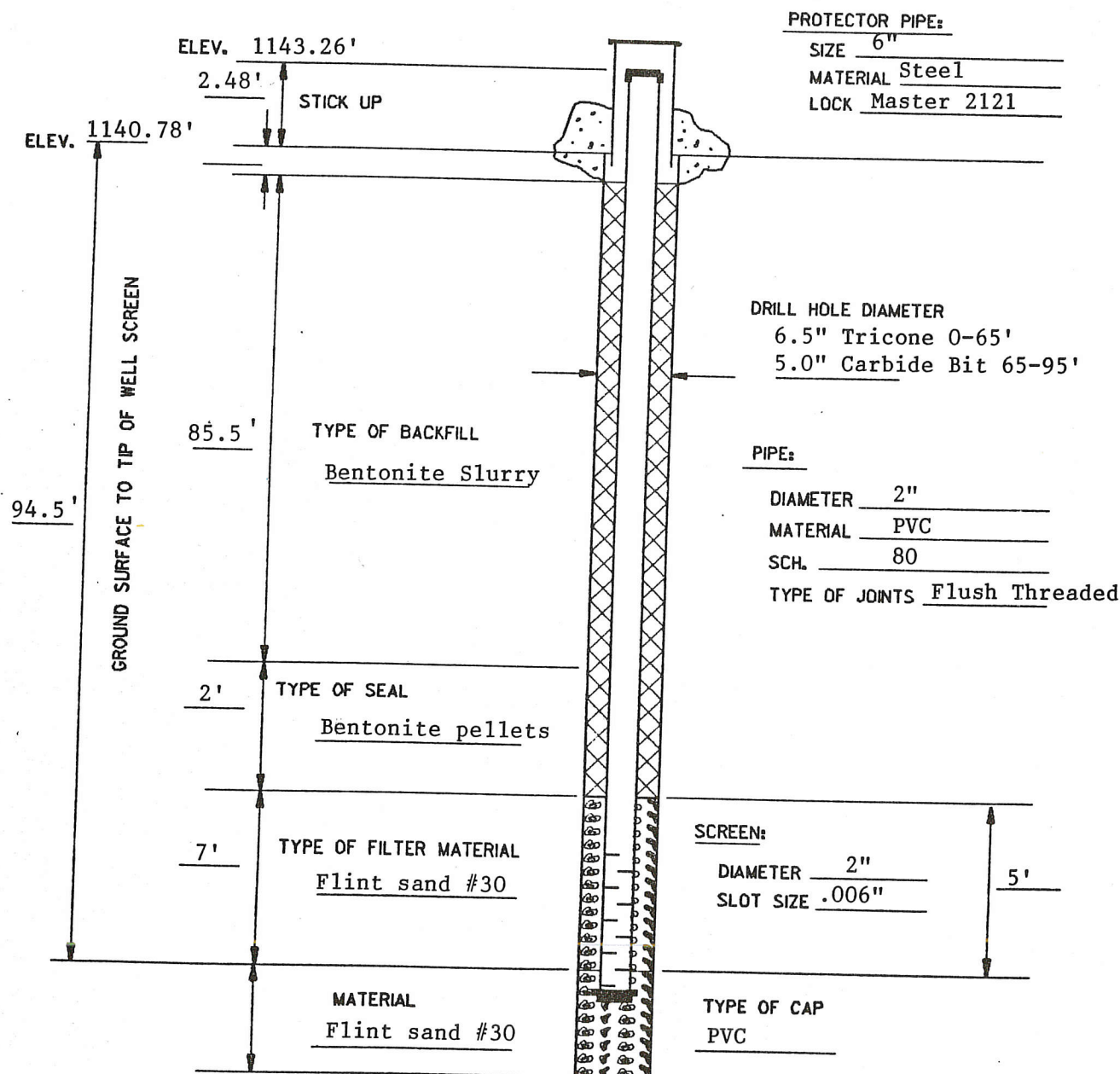
STABILIZATION READINGS

GAL. REMOVED	TIME	TEMPERATURE	FIELD	
			SPEC. COND.	pH
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

FOTH AND VAN DYKE

MONITORING WELL INSTALLATION DIAGRAM

WELL NO: MW-1001P CLIENT: Kennecott
 DATE INSTALLED: 10-02-87 PROJECT: Baseline G.W. Mon.
 DRILLER: Luisier Drilling Inc. SCOPE I.D.: 87K10-BL 7
 DRILLING METHOD: Mud rotary BY: BJS
 COORDINATES: 39,543.90N 39,552.90 E



Foth & Van Dyke

Geosciences & Environmental Management Division

MONITORING WELL DEVELOPMENT

WELL NUMBER MW-1001P CLIENT Kennecott
 WELL DIAMETER 2" PROJECT Baseline G.W. Monitoring
 TOTAL DEPTH OF WELL 94.0' SCOPE I.D. 87K10-7
 DEPTH TO WATER _____ TIME OF MEASUREMENT _____
 BEFORE _____ BY K.M. Luisier Well Drilling
 AFTER 94' (Dry) DATE 10-5-87

DESCRIPTION OF DEVELOPMENT METHOD

Well was alternately surged and bailed using a foot valve installed on a 3/4" flexible PVC pipe. The pipe and foot valve were moved up and down in the well by a motor-driven pitcher-pump.

VOLUME OF WATER REMOVED FROM WELL 7 gallons
 CLARITY OF WATER IN WELL BEFORE DEVELOPMENT brown
 CLARITY OF WATER IN WELL AFTER DEVELOPMENT _____
 PRESENCE OF SEDIMENT AT THE BOTTOM OF THE WELL None
 VOLUME OF WATER ADDED TO WELL None
 SOURCE OF WATER ADDED TO WELL _____
 TIME SPENT FOR DEVELOPMENT 1 hour

STABILIZATION READINGS

GAL. REMOVED	TIME	FIELD		
		TEMPERATURE	SPEC. COND.	pH
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

FOTH AND VAN DYKE

LOG OF TEST BORING NO.: MW-1002, 1002G							SURFACE ELEVATION: 1101.6			
CLIENT: Kennecott PROJECT: Flambeau-Baseline Ground Water Monitoring PROJECT NUMBER: 87K10-7 LOCATION: Gravel pit northwest of pit area COORDINATES: 42585 N 38750 E (APPROX)							BORING DEPTH: 52.0			
							DATE: 09/20/87			
MSL ELEV	DEPTH FR LND SURF	SAMP DEPTH INTERVAL	TYPE	#	N	REC (ft)	DESCRIPTION OF MATERIAL	CLASS	LABORATORY TESTS	DRILLING AND SAMPLE NOTES
1101.6	--0.0						Surface-Gvl pit excav., GRAVEL, cse w/fn w/fn & med sand. Lk Superior source, ig & meta & volc rocks. Much greenstone, schist, granite, qtzte, congl. Bldrs up to 8' dia			
1099.1	--2.5	2.0-3.5	ss	1	100	0.8	Brn well graded GRAVEL w/silt, broken rock in spoon, weath w/sand, fn & med loose. Cutting to 5', fn gvl 1-2" dia vy well rounded w/little sand	GW-GM		Vy difficult drilling- many cobbles bldrs from 5-10' (Fill, bldrs from gvl pit operation?) & 35-50' Lost about 500 gals drilling fluid to formation Drilled & sampled MW-1002 to 17', moved over about 10' and drilled to 20' without sampling
1096.6	--5.0	5.0-6.5	ss	2	110	0.0	Pushed rock, couldn't auger through, moved over twice. Cutting gvl, cobbles, boulders			
1091.6	--10.0	10.0-11.5	ss	3	34	1.0	Red brn (5YR 4/4) well graded SAND w/silt & gravel, fn w/med & cse sand, fn gvl, loose, dense, wet, indistinctly bedded	SW-SM		
1086.6	--15.0	15.0-16.5	ss	4	26	0.5	Same, wet			
1081.6	--20.0	20.0-21.5	ss	5	36	0.4	Cse gvl, cave, cobbles, bldrs falling in hole, rod plugging up			
1076.6	--25.0	25.0-26.5	ss	6	36	0.8	Str brn (7.5YR 4/6) poorly graded SAND w/silt, fn w/med & trace cse sand, loose, wet	SP-SM		
1071.6	--30.0	30.0-31.5	ss	7	30	1.0	Same except layered (1-3" thick), fine, med, loose			
1066.6	--35.0	35.0-36.5	ss	8	49	0.0	Drilled like sand w/cobbles			
1064.1	--37.5	37.0-38.5	ss	9	63	1.0	Str brn (7.5YR 4/6) poorly graded SAND w/silt as above, one 2" thick silt layer laminated, firm, saturated			
1061.6	--40.0									
1059.1	--42.5	42.0-43.5	ss	10	30	0.0	Drilled like sand w/gvl (cobbles, bldrs)			

DRILLING DATA START DATE: 09/20/87 COMPLETION DATE: 09/22/87 LOGGED BY: BJS DRILLING METHOD: Mud rotary, 6" tricone DRILLING CONTRACTOR: Wisconsin Test Drilling, Inc.	WATER LEVEL INFORMATION DEPTH AT COMPLETION: LATER TIME/DEPTH: LATER TIME/DEPTH: CAVE IN DEPTH: DRILLING LOSSES:
--	--

LOG OF TEST BORING NO.: MW-1002, 1002G

CLIENT: Kennecott
 PROJECT: Flambeau-Baseline Ground Water Monitoring
 PROJECT NUMBER: 87K10-7
 LOCATION: Gravel pit northwest of pit area
 COORDINATES: 42585 N 38750 E (APPROX)

SURFACE ELEVATION: 1101.6

BORING DEPTH: 52.0

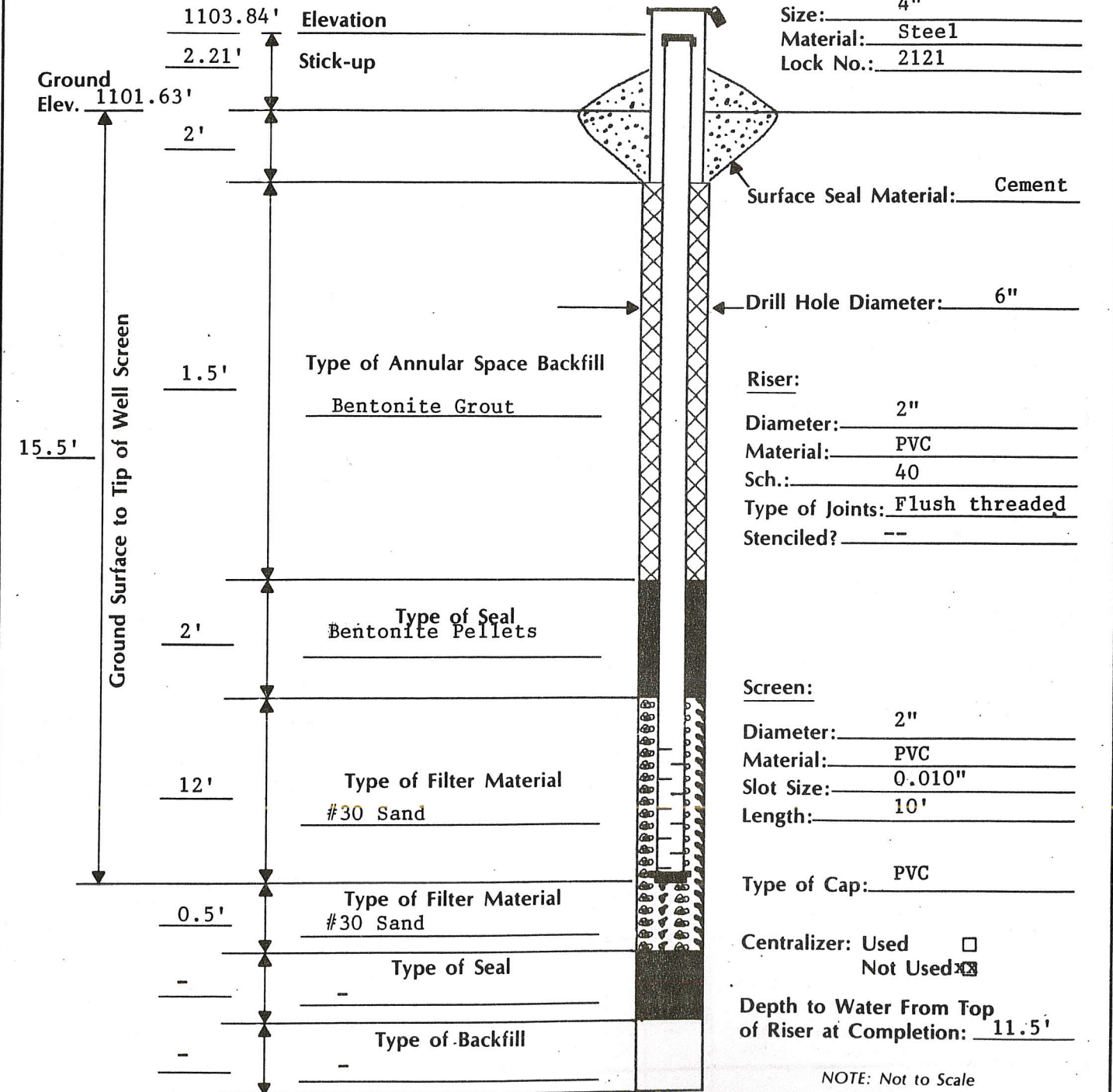
DATE: 09/20/87

MSL ELEV	DEPTH FR LND SURF	SAMP DEPTH INTERVAL	TYPE	#	N	REC (ft)	DESCRIPTION OF MATERIAL	CLASS	LABORATORY TESTS	DRILLING AND SAMPLE NOTES
1059.1	--42.5									
1056.6	--45.0							SP-SM		
1054.1	--47.5	47.0-48.5	ss	11	28	0.5	Dk yel brn (10YR 4/4) w/yel brn (10YR 5/6) silty SAND/SILT, fn (vy fn sand w/silt), soft, cohesive w/fn gvl, trace black organics, saturated, (weathered, oxidized)	SM/ML	27	
1051.6	--50.0	49.0-50.5	ss	12	70	0.0	No recovery	SW-SM		
1049.1	--52.5	51.0-52.5	ss	13	144	1.2	(Mixed new mud, pounded ss at 51' through about 1.5' of cave) Yel brn & dk yel brn well graded SAND w/silt & gvl, fn w/med & cse sand, fn & cse gvl (weathered, oxidized) 52'-End of Boring in Sand & Gravel	=====	2	
1046.6	--55.0									
1044.1	--57.5									
1041.6	--60.0									
1039.1	--62.5									
1036.6	--65.0									
1034.1	--67.5									
1031.6	--70.0									

MONITORING WELL CONSTRUCTION DIAGRAM

Driller: Wisconsin Test Drilling, Inc. Well No: MW-1002
 Drilling Method: Mud Rotary 6" Tricone Date Installed: 9-21-88
 Coordinates: 42,582.14N 38,743.56E

Protector Pipe:
 Size: 4"
 Material: Steel
 Lock No.: 2121



Surface Seal Material: Cement

Drill Hole Diameter: 6"

Riser:
 Diameter: 2"
 Material: PVC
 Sch.: 40
 Type of Joints: Flush threaded
 Stenciled?: --

Screen:
 Diameter: 2"
 Material: PVC
 Slot Size: 0.010"
 Length: 10'

Type of Cap: PVC

Centralizer: Used Not Used

Depth to Water From Top of Riser at Completion: 11.5'

NOTE: Not to Scale

DRILLING DATA
 START DATE: 09/20/87
 COMPLETION DATE: 09/22/87
 LOGGED BY: BJS
 DRILLING METHOD: Mud rotary, 6" tricone
 DRILLING CONTRACTOR: Wisconsin Test Drilling, Inc.

WATER LEVEL INFORMATION
 DEPTH AT COMPLETION:
 LATER TIME/DEPTH:
 LATER TIME/DEPTH:
 CAVE IN DEPTH:
 DRILLING LOSSES:

MONITORING WELL DEVELOPMENT

WELL NUMBER MW-1002 CLIENT Kennecott
 WELL DIAMETER 2" PROJECT Baseline G.W. Monitoring
 TOTAL DEPTH OF WELL 16.0' SCOPE I.D. 87K10-7
 DEPTH TO WATER TIME OF MEASUREMENT BY M.M. Wisc. Test Drilling, Inc.
 BEFORE 11.5' DATE 9-30-87
 AFTER 15.1'

DESCRIPTION OF DEVELOPMENT METHOD

Well was alternately surged and bailed using a PVC hand pump.

VOLUME OF WATER REMOVED FROM WELL 7 gallons
 CLARITY OF WATER IN WELL BEFORE DEVELOPMENT brown, sandy, silty
 CLARITY OF WATER IN WELL AFTER DEVELOPMENT Very light brown
 PRESENCE OF SEDIMENT AT THE BOTTOM OF THE WELL _____
 VOLUME OF WATER ADDED TO WELL None
 SOURCE OF WATER ADDED TO WELL _____
 TIME SPENT FOR DEVELOPMENT 0.5 hours

STABILIZATION READINGS

GAL. REMOVED	TIME	TEMPERATURE	FIELD	
			SPEC. COND.	pH

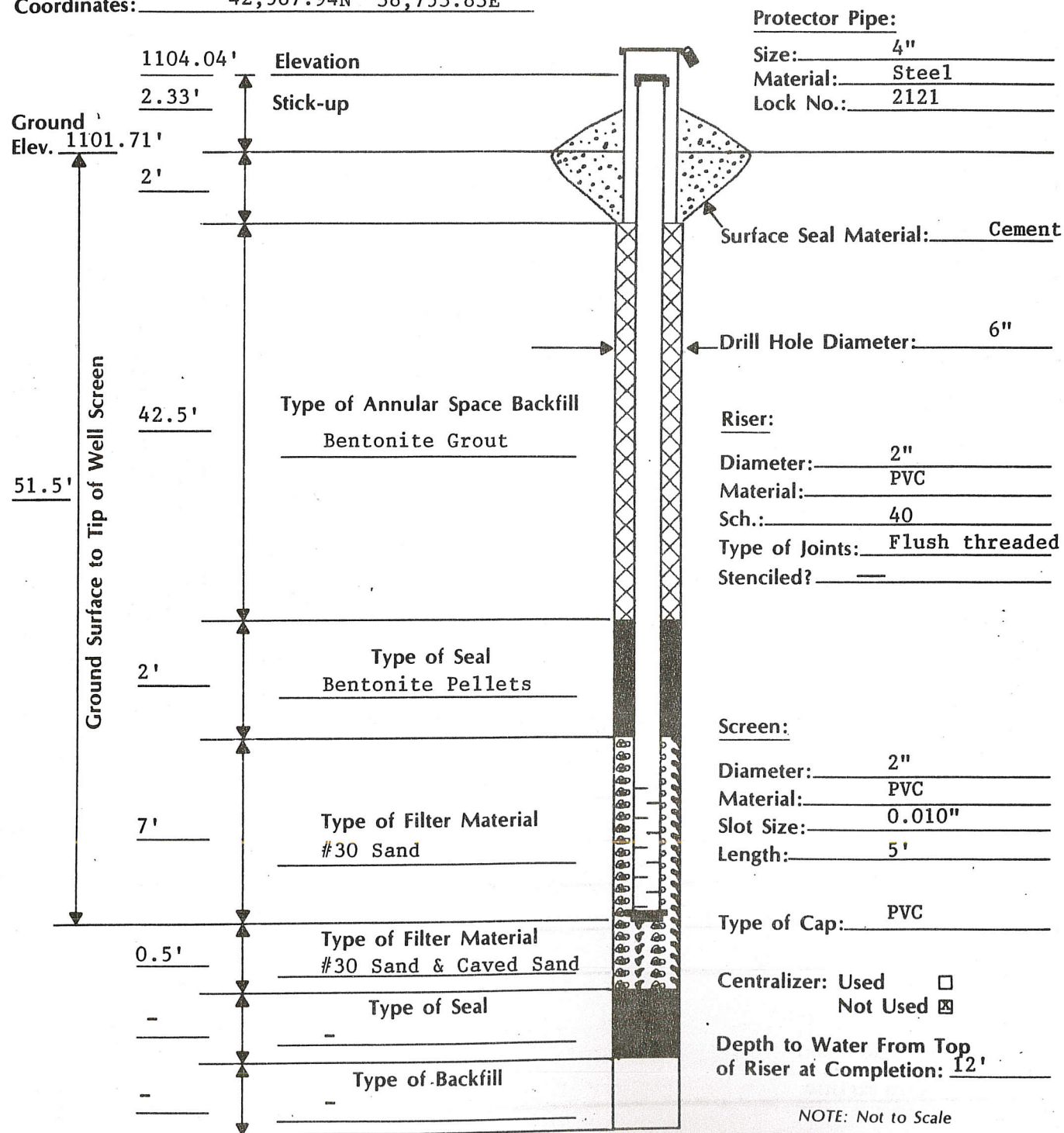
FOTH AND VAN DYKE

Foth & Van Dyke

Client: Kennecott Scope I.D.: 87K10
 Project: Baseline Groundwater Monitoring Page: 1
 Prepared by: BJS Date: 9-22-87
 Checked by: BJS Date: 12-14-88

MONITORING WELL CONSTRUCTION DIAGRAM

Driller: Wisconsin Test Drilling, Inc. Well No.: MW-1002G
 Drilling Method: Mud Rotary 6" Tricone Date Installed: 9-22-88
 Coordinates: 42,587.94N 38,753.83E



MONITORING WELL DEVELOPMENT

WELL NUMBER MW-1002G CLIENT Kennecott
 WELL DIAMETER 2" PROJECT Baseline G.W. Monitoring
 TOTAL DEPTH OF WELL 51.5' SCOPE I.D. 87K10-7
 DEPTH TO WATER _____ TIME OF MEASUREMENT _____
 BEFORE 11.8' DATE 9-30-87
 AFTER 12.1'

DESCRIPTION OF DEVELOPMENT METHOD

Well was alternately surged and bailed using a PVC hand pump.

VOLUME OF WATER REMOVED FROM WELL 25 gallons
 CLARITY OF WATER IN WELL BEFORE DEVELOPMENT brown, sandy, silty
 CLARITY OF WATER IN WELL AFTER DEVELOPMENT light brown
 PRESENCE OF SEDIMENT AT THE BOTTOM OF THE WELL _____
 VOLUME OF WATER ADDED TO WELL None
 SOURCE OF WATER ADDED TO WELL _____
 TIME SPENT FOR DEVELOPMENT _____

STABILIZATION READINGS

GAL. REMOVED	TIME	FIELD		
		TEMPERATURE	SPEC. COND.	pH
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

FOTH AND VAN DYKE

Foth & Van Dyke & Associates, Inc.

LOG OF TEST BORING NO.: MW-1003							SURFACE ELEVATION: 1143.41			
CLIENT: Kennecott PROJECT: Flambeau-Baseline Ground Water Monitoring PROJECT NUMBER: 87K10-7 LOCATION: North of NE end of pit COORDINATES: 41318.95 N 39915.14 E							BORING DEPTH: 40.8			
							DATE: 09/16/87			
MSL ELEV	DEPTH FR LND SURF	SAMP DEPTH INTERVAL	TYPE	#	N	REC (ft)	DESCRIPTION OF MATERIAL	CLASS	LABORATORY TESTS	DRILLING AND SAMPLE NOTES
1143.4	--0.0									
		2.0-3.5	ss	1	15	1.5	Str brn (7.5YR 5/6) poorly graded SAND, fn, loose, slightly moist (Aeolian sand)	SP		
1138.4	--5.0	5.0-6.5	ss	2	18	1.5	Same			
							Cutting at about 8', poorly graded SAND w/fn & cse, well rounded gvl			
1133.4	--10.0	10.0-11.5	ss	3	51	1.2	Dk brn silty SAND, layered w/poorly graded SAND, fn, loose, dry Cobbles at about 12 ft.	SM, SP		
1128.4	--15.0	15.0-16.5	ss	4	48	1.4	Red brn (5YR 4/4) silty SAND, fn w/med & cse sand, fn gvl, diamict (till) 4" purple volc. rock at approx. 16' then till as above except yel red (5Yr 4/6)	SM		
1123.4	--20.0	20.0-21.5	ss	5	50	1.0	Red brn & yel red (5YR 4/4 & 4/6) till as above			
1118.4	--25.0	25.0-26.5	ss	6	212	0.0	Pounded rock. Cutting 25-27 ft, silty SAND as above w/much fn angular gravel, cobbles, dry (till) Vy slightly moist at 27'			
1113.4	--30.0	30.0-31.5	ss	7	40	1.5	Silty SAND, as above, layered (1-2" thick) red brn & yel brn diamict, distinctly laminated w/few clayey, plastic layers			
1108.4	--35.0	35.0-36.5	ss	8	100	0.6	Brn yel (10YR 6/6) poorly graded SAND w/silt, fn, dense. Few silty layers (1" thick) (sandstone)	SP-SM (SS)	N - 100/0.6'	Cuttings saturated at about 34 ft.
1103.4	--40.0	40.0-41.5	ss	9	91	0.8	Lt gray (2.5Y 7/2) poorly graded SAND w/silt, fn w/med & cse w/few yel brn silty layers (sandstone)	=====		
							40.8'-End of Boring in Sandstone			
1098.4	--45.0									
1093.4	--50.0									
1088.4	--55.0									
DRILLING DATA							WATER LEVEL INFORMATION			
START DATE: 09/16/87							DEPTH AT COMPLETION: 33.5'			
COMPLETION DATE: 09/16/87							LATER TIME/DEPTH: 9 days/32 ft			
LOGGED BY: BJS							LATER TIME/DEPTH:			
DRILLING METHOD: Hollow stem augers, 4 1/4" ID							CAVE IN DEPTH: 38.5'-blowup			
DRILLING CONTRACTOR: Wisconsin Test Drilling, Inc.							DRILLING LOSSES:			

LOG OF TEST BORING NO.: MW-1003P

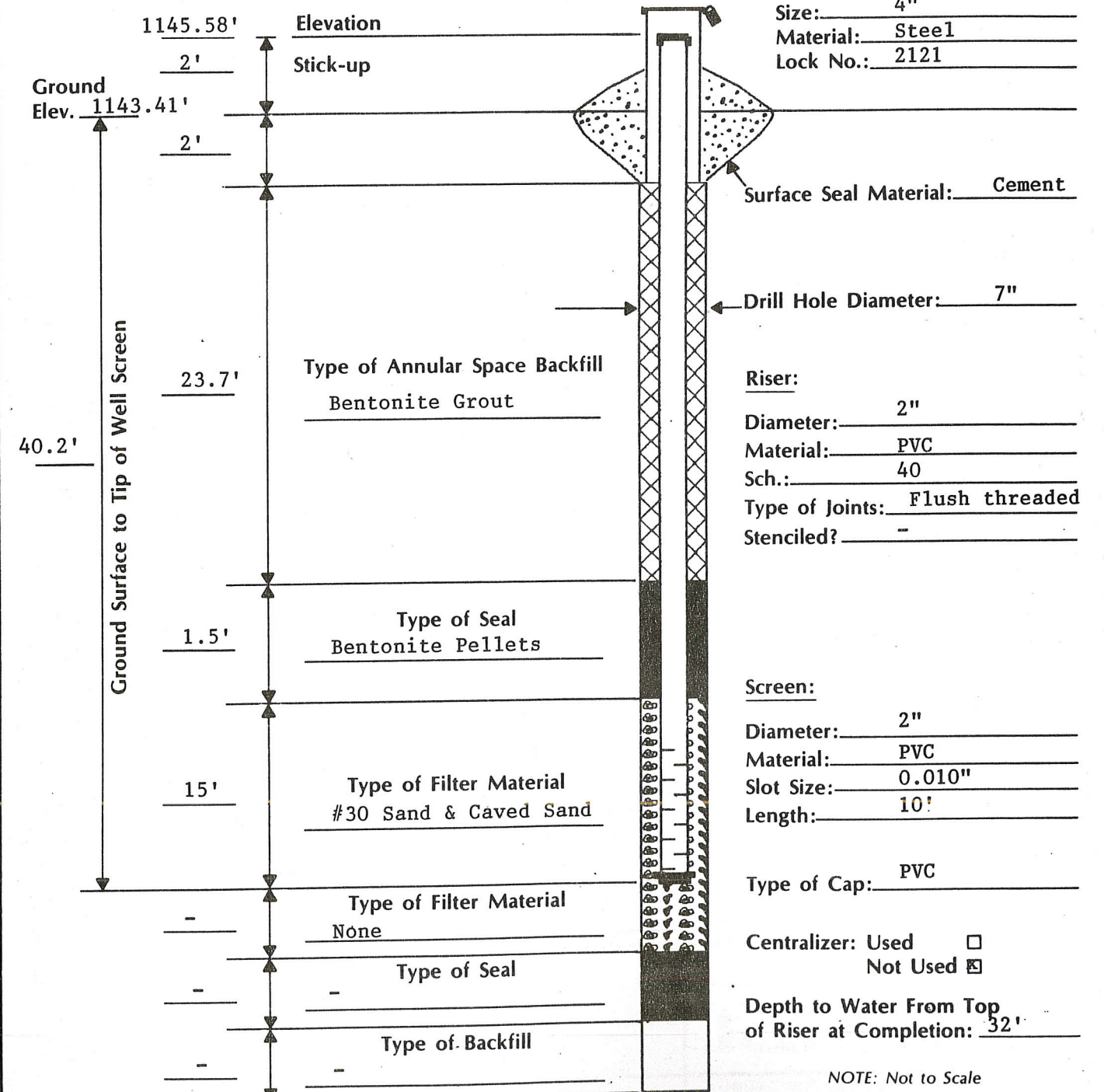
CLIENT: Kennecott
 PROJECT: Flambeau-Baseline Ground Water Monitoring
 PROJECT NUMBER: 87K10-7
 LOCATION: North of NE end of pit
 COORDINATES: 41328.21 N 39919.45 E

SURFACE ELEVATION: 1143.16
 BORING DEPTH: 86.5
 DATE: 10/03/87

MONITORING WELL CONSTRUCTION DIAGRAM

Driller: Wisconsin Test Drilling, Inc. Well No: MW-1003
 Drilling Method: Hollow Stem Augers 4.25" ID Date Installed: 9-16-87
 Coordinates: 41,318.95N 39,915.14E

Protector Pipe:
 Size: 4"
 Material: Steel
 Lock No.: 2121



MSL ELEV	DEPTH FR LND SURF	SAMP DEPTH INTERVAL	TYPE	#	N	REC (ft)	DESCRIPTION OF MATERIAL	CLASS	LABORATORY TESTS	DRILLING AND SAMPLE NOTES
1143.2	--0.0						Drilled to 45' w/o sampling See log for MW-1003			
1098.2	--45.0	45.0-45.5	ss	1		0.5	Lt brn gray poorly graded SAND, fine, loose, qtz, vy dense (sandstone)	=====	Drove - 10 sec	No recovery w/3 attempts to push spoon @ 45'
1093.2	--50.0	50.0-52.0	w	2			Cuttings, cemented sandstone, no attempt to sample w/spoon Lt brn SANDSTONE, cse, w/cemented fn sandstone pieces, vy well rounded, qtz. @ 52' white & pink soft clay (Kaolinite)	SS		
1090.7	--52.5	52.0-53.5	ss	3		1.2	Yel (10YR 8/6) & yel red (5YR 6/8) sandy SILT, soft, brittle w/qty laminae, altered mica, cohesive (saproliite)		Pushed	
1085.7	--57.5	57.0-57.6	ss	4		0.6	Same except last 0.3 ft, much harder, brittle	"ML"	Drove - 40 sec	
1083.2	--60.0	57.6-62.0	c	5		4.6	Same to 60', then lt grn gray (5GY 7/1) SILT, soft, brittle, schistosity appar., talcy. At 61.5' lt gray (5Y 7/1) silty CLAY, ext. altered (kaolinite) massive to indist. foliated, soft, brittle, powdery, vy slightly moist		RQD = 100%	No breaks in core barrel
1078.2	--65.0	62.0-69.0	c	6		0.0	Drilled vy fast, soft, cuttings w/lt grn med sand size tabular crystals		RQD = 0%	
1073.2	--70.0	69.0-75.0	c	7		2.7	2'- grn gray altered SCHIST, soft, very brittle w/qty lam., lt grn crystalline laminae, dk dusky red (hematite) 0.7'- Lt grn gray "silty CLAY" w/fn sand brittle, powdery, vy slightly moist		RQD = 45% Fract freq = 1.8/ft	
1068.2	--75.0	75.0-81.0	c	8		5.8	Green gray altered SCHIST w/dk red (hematite) & qtz laminae, soft to firm, brittle, wet, qtz laminae up to 1" thick at 80-81'		RQD = 97%	No breaks in core in core barrel
1063.2	--80.0	81.0-86.5	c	9		3.5	Broken qtz, white w/lt red (iron) stain, qtz in cse gvl size pieces up 2" dia to 82'. Bottom 2.5'- gray grn altrd schist, w/much dk red (hematite) laminae, breaks along near vertical schistosity planes, firm, brittle w/much qtz laminae	Qtz RK 3a	RQD = 42% Fract freq = 1.2/ft	
1058.2	--85.0						86.5'-End of Boring in altered schist	=====		
1053.2	--90.0						(Quartz-Augen Schist)			

DRILLING DATA	WATER LEVEL INFORMATION
START DATE: 10/03/87 COMPLETION DATE: 10/03/87 LOGGED BY: BJS DRILLING METHOD: Mud rotary, 6.5" tricone 0-45', 4 7/8" carbide bit, 3 1/4" core DRILLING CONTRACTOR: Luisier Drilling, Inc.	DEPTH AT COMPLETION: LATER TIME/DEPTH: LATER TIME/DEPTH: CAVE IN DEPTH: DRILLING LOSSES:

MONITORING WELL DEVELOPMENT

WELL NUMBER MW-1003 CLIENT Kennecott
 WELL DIAMETER 2" PROJECT Baseline G.W. Monitoring
 TOTAL DEPTH OF WELL 40.2' SCOPE I.D. 87K10-7
 DEPTH TO WATER TIME OF MEASUREMENT BY M.M. Wisc. Test Drilling, Inc.
 BEFORE 32.0' DATE 9-30-87
 AFTER 38.6'

DESCRIPTION OF DEVELOPMENT METHOD

Well was alternately surged and bailed using a PVC hand pump.
 10-04-87
 Well was bailed and surged with a PVC hand bailer by BJS, Foth & Van Dyke
 Depth to water at 8:15 a.m. - 32.4'
 Depth to water at 8:30 a.m. - 39.2' after removing 3 gallons, yellow brown,
 silty water.

VOLUME OF WATER REMOVED FROM WELL 6 gallons
 CLARITY OF WATER IN WELL BEFORE DEVELOPMENT brown, sandy, silty
 CLARITY OF WATER IN WELL AFTER DEVELOPMENT brown, sandy, silty
 PRESENCE OF SEDIMENT AT THE BOTTOM OF THE WELL _____
 VOLUME OF WATER ADDED TO WELL None
 SOURCE OF WATER ADDED TO WELL _____
 TIME SPENT FOR DEVELOPMENT 0.5 hours

STABILIZATION READINGS

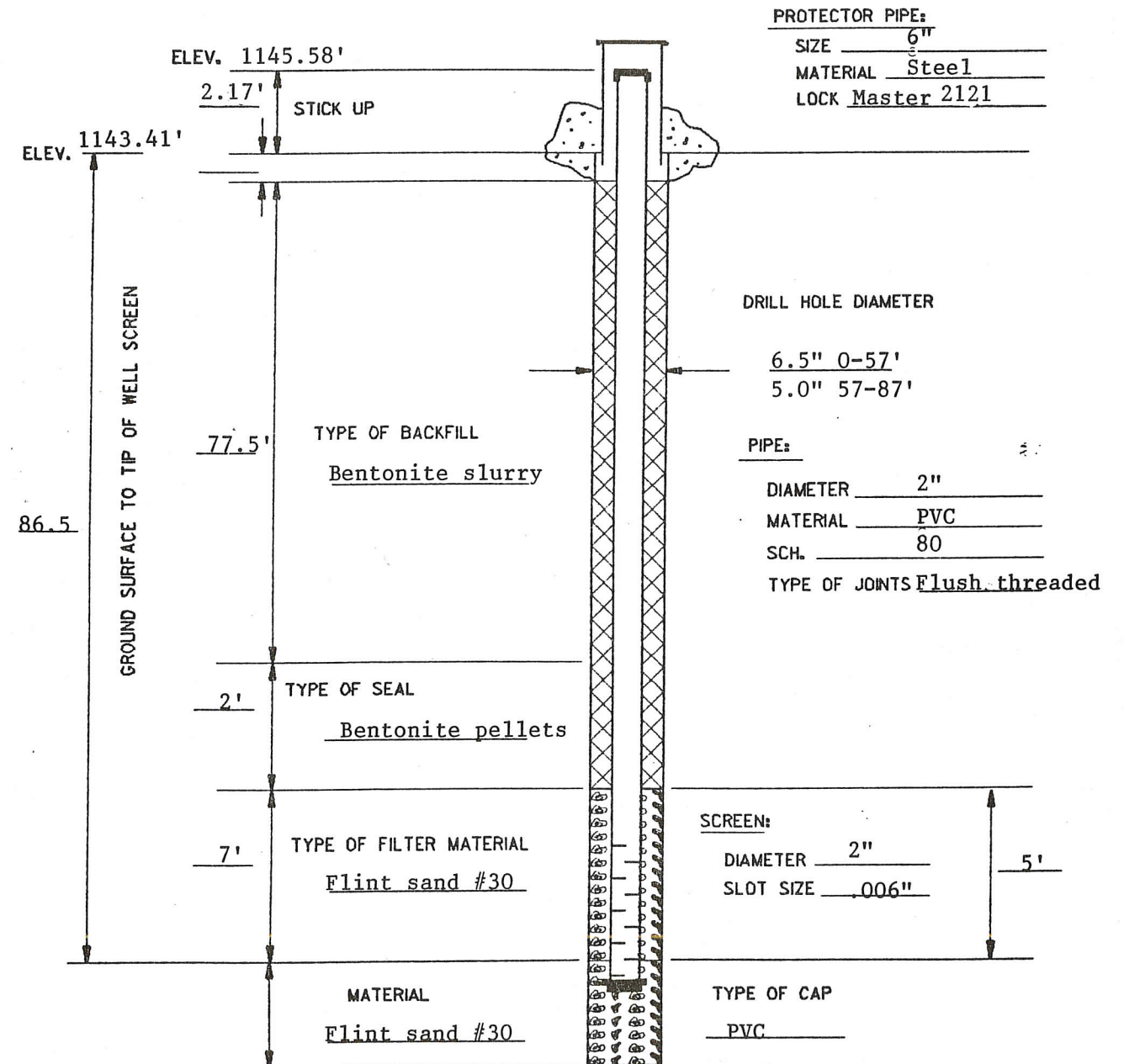
GAL. REMOVED	TIME	TEMPERATURE	FIELD	
			SPEC. COND.	pH
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

FOTH AND VAN DYKE

MONITORING WELL INSTALLATION DIAGRAM

WELL NO: MW-1003P
 DATE INSTALLED: 10-03-87
 DRILLER: Luisier Well Drilling
 DRILLING METHOD: Mud rotary
 COORDINATES: 41,328.21N 39,919.45E

CLIENT: Kennecott
 PROJECT: Baseline G.W. Monitoring
 SCOPE I.D.: 87K10-7
 BY: BJS



Foth & Van Dyke

Geosciences & Environmental
 Management Division

MONITORING WELL DEVELOPMENT

WELL NUMBER MW-1003P CLIENT Kennecott
 WELL DIAMETER 2" PROJECT Baseline G.W. Monitoring
 TOTAL DEPTH OF WELL 86' SCOPE I.D. 87K10-7
 DEPTH TO WATER _____ TIME OF MEASUREMENT _____
 BEFORE _____ DATE 10-5-87
 AFTER 86' (Dry)

DESCRIPTION OF DEVELOPMENT METHOD

Well was alternately surged and bailed using a foot valve installed on a 3/4" flexible PVC pipe. The pipe and foot valve were moved up and down in the well by a motor-driven pitcher-pump.

VOLUME OF WATER REMOVED FROM WELL 7 gallons
 CLARITY OF WATER IN WELL BEFORE DEVELOPMENT light brown
 CLARITY OF WATER IN WELL AFTER DEVELOPMENT _____
 PRESENCE OF SEDIMENT AT THE BOTTOM OF THE WELL None
 VOLUME OF WATER ADDED TO WELL None
 SOURCE OF WATER ADDED TO WELL _____
 TIME SPENT FOR DEVELOPMENT 0.5 hours

STABILIZATION READINGS

GAL. REMOVED	TIME	FIELD		
		TEMPERATURE	SPEC. COND.	pH
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

FOTH AND VAN DYKE

LOG OF TEST BORING NO.: MW-1004, 1004S							SURFACE ELEVATION: 1123.8			
CLIENT: Kennecott PROJECT: Flambeau-Baseline Ground Water Monitoring PROJECT NUMBER: 87K10-7 LOCATION: North side of SW end of pit COORDINATES: 40700 N 39123 E (APPROX)							BORING DEPTH: 38.5			
							DATE: 09/17/87			
MSL ELEV	DEPTH FR LND SURF	SAMP DEPTH INTERVAL	TYPE	#	N	REC (ft)	DESCRIPTION OF MATERIAL	CLASS	LABORATORY TESTS	DRILLING AND SAMPLE NOTES
1123.8	--0.0						Surface-brn (7.5YR 5/4) silty SAND, fn & cse gvl, well graded, dry, loose (Fluvial)	SM		
1121.3	--2.5	2.0-3.5	ss	1	86	1.0	Brn poorly graded SAND w/silt, fine, w/much fn & cse gvl, loose, dry. Cuttings 2-5', cse gvl, rounded 2-3" dia (Fluvial)	SP-SM		Drilled & sampled MW-1004 to 23.5'; moved over about 10' & drilled to 25' wo/samp. Many bldrs @ 10-20' in MW-1004s, hrd drilling
1118.8	--5.0	5.0-6.5	ss	2	81	0.8	Poorly graded GRAVEL, cse, cored rocks, purple, red volc, rhyolite, little sand, dry, loose. Cuttings 5-8', fn gvl up to 1" dia grades to 5 w/cse gvl at 10'	GP		
1113.8	--10.0	10.0-11.5	ss	3	29	1.2	Brn well graded SAND, med w/fn & cse sand, fn gvl, indistinctly bedded, loose slightly moist	SW		
1108.8	--15.0	15.0-16.5	ss	4	12	0.8	Same except cse sand w/few silty sand layers, saturated			
1103.8	--20.0	20.0-21.5	ss	5	45	1.5	Brn poorly graded SAND, med & cse layers w/poorly graded GRAVEL, fn & cse, beds up to 6" thick, loose, saturated (About 2' of blow-up in augers)	SP, GP		
1101.3	--22.5	22.0-23.5	ss	6	37	1.2	Brn poorly graded SAND w/silt, cse, w/gvl to 22.5' then red brn, fn, loose, saturated	SP-SM		
1098.8	--25.0	25.0-26.5	ss	7	47	0.0	Pounded rock			
1096.3	--27.5	27.0-28.5	ss	8	57	0.8	Lt gray (2.5Y 7/2) poorly graded SAND, fn w/med & cse sand, loose, dense, saturated, qtz (sandstone)	SP (SS)		
1091.3	--32.5	32.0-33.5	ss	9	77	1.0	Yel brn (10YR 5/4) poorly & well graded SAND, layered, fn, med, cse, qtz, dense, loose, soft, saturated (sandstone)	SP, SW (SS)		
1086.3	--37.5	37.0-38.5	ss	10	43	1.0	Yel brn (10YR 5/6) varigated w/red layers SILT, laminated, soft, brittle, micaceous, vly slightly moist (saprolite/ altered schist)	ML		
1083.8	--40.0						38.5'-End of Boring in saprolite/ altered schist	=====		
DRILLING DATA							WATER LEVEL INFORMATION			
START DATE: 09/17/87 COMPLETION DATE: 09/18/87 LOGGED BY: BJS DRILLING METHOD: HSA (4 1/4" ID) 0-25', Mud rotary w/6" tricone 25-38.5' DRILLING CONTRACTOR: Wisconsin Test Drilling, Inc.							DEPTH AT COMPLETION: 15.9' @ 19' LATER TIME/DEPTH: LATER TIME/DEPTH: CAVE IN DEPTH: DRILLING LOSSES:			

LOG OF TEST BORING NO.: MW-1004P

CLIENT: Kennecott
 PROJECT: Flambeau-Baseline Ground Water Monitoring
 PROJECT NUMBER: 87K10-7
 LOCATION: North side of SW end of pit
 COORDINATES: 40686.78 N 39123.60 E

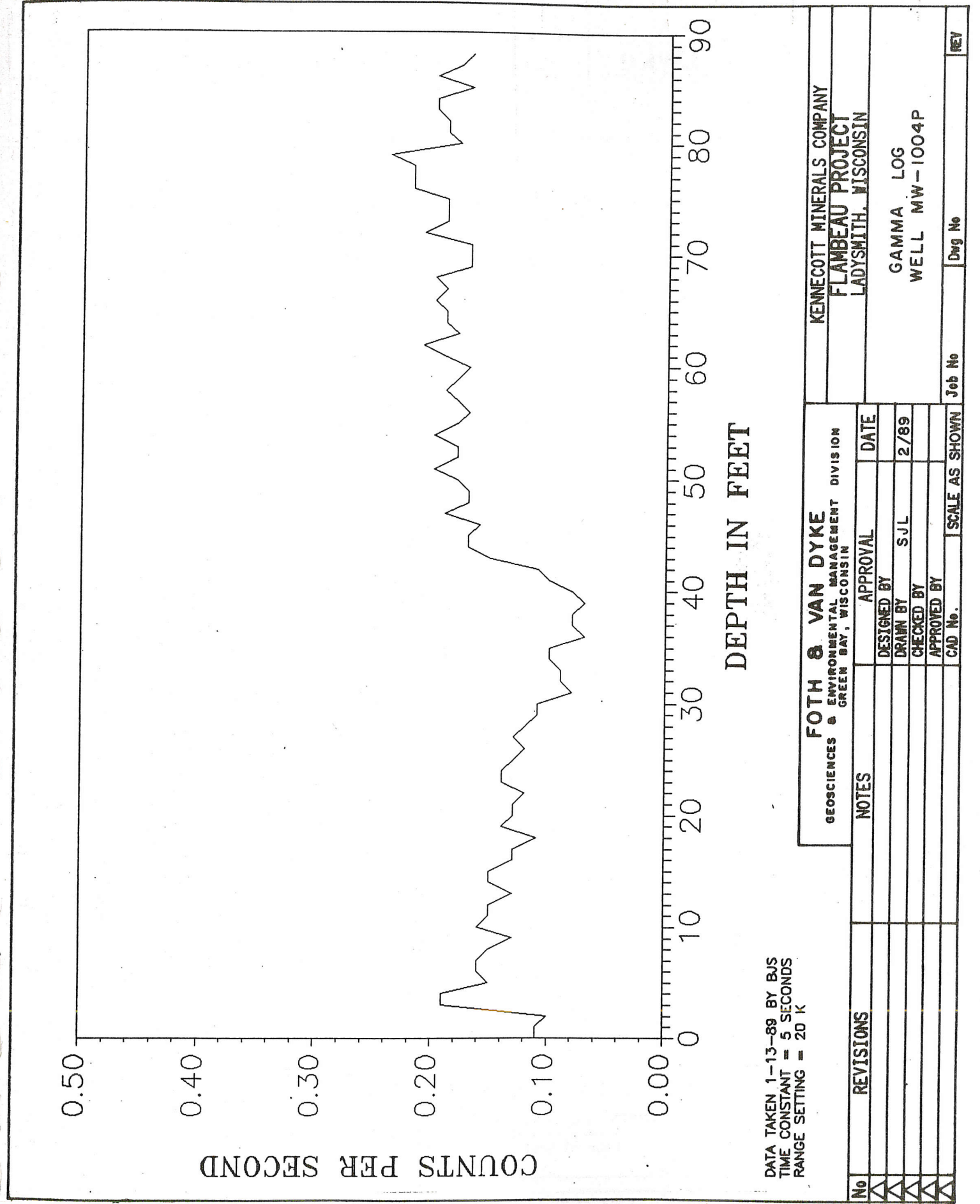
SURFACE ELEVATION: 1123.91

BORING DEPTH: 87.5

DATE: 09/29/87

MSL ELEV	DEPTH FR LND SURF	SAMP DEPTH INTERVAL	TYPE	#	N	REC (ft)	DESCRIPTION OF MATERIAL	CLASS	LABORATORY TESTS	DRILLING AND SAMPLE NOTES
1123.9	--0.0						Drilled to 37' w/sampling. See log for MW-1004, 1004S. Cuttings at 37' w/saprolite			
1088.9	--35.0	37.0-40.0	ss	1		0.2	Drove sampler 3.5' (sample slid out) White, pink, gray silty CLAY, vy soft, slightly micaceous (saprolite) Cuttings to 40' lt red, white, laminated lean CLAY/SILT vy soft	CL-ML ML	Drove 60 secs	
1083.9	--40.0	42.0-43.5	ss	2		0.0	Split sampler, lost down hole. Cuttings to 45.5', gray w/dk red laminated silty CLAY		Drove 60 secs	
1078.9	--45.0	45.5-47.0	ss	3		1.2	Dk grn & dusky red (10YR 3/2) "SILT", foliated, hard to soft, brittle, flaky, saturated (altered schist)		Drove 55 secs	
1073.9	--50.0	50.0-51.5	ss	4		1.5	Same w/much dk red (hematite), lt yel green alteration		Drove 40 secs	
1068.9	--55.0	54.0-68.0	c	5		9.0	Grn gray (5GY 5/1) & dusky red & dk red (10R 3/3, 3/4, 3/6) layered "SILT", altered schist, soft to hard, broken, crumbly, sticking to core barrel, few clayey layers Length of core pieces from 54'- 0.6, 0.5, 1.1, 0.4, 0.25, 0.8, 0.3, 0.35, 0.6.	"ML"	RQD = 33% Fract freq = 1.8/ft	
1053.9	--70.0	68.0-74.0	c	6		5.1	Same as above except firmer, more cohesive. Breaks in core in barrel at 70.6, 71.2. Soft clayey layers at 71.6 & 72.2 ft.	RK 5	RQD = 85% Fract freq = 0.4/ft	
1048.9	--75.0	74.0-87.5	c	7		12.5	Same to 83.5 ft, then firmer. Breaks at 74.7, 75.4, 78.6, 80.5, 81.0, 82.0, 82.4, 83.9, & 86.7		RQD = 91% Fact freq = 0.7/ft	
1043.9	--80.0						87.5'- End of Boring in altered schist (Metadacite)			

DRILLING DATA	WATER LEVEL INFORMATION
START DATE: 09/20/87	DEPTH AT COMPLETION:
COMPLETION DATE: 09/22/87	LATER TIME/DEPTH:
LOGGED BY: BJS	LATER TIME/DEPTH:
DRILLING METHOD: Mud rotary, 6" tricone	CAVE IN DEPTH:
DRILLING CONTRACTOR: Luisier Drilling, Inc.	DRILLING LOSSES:



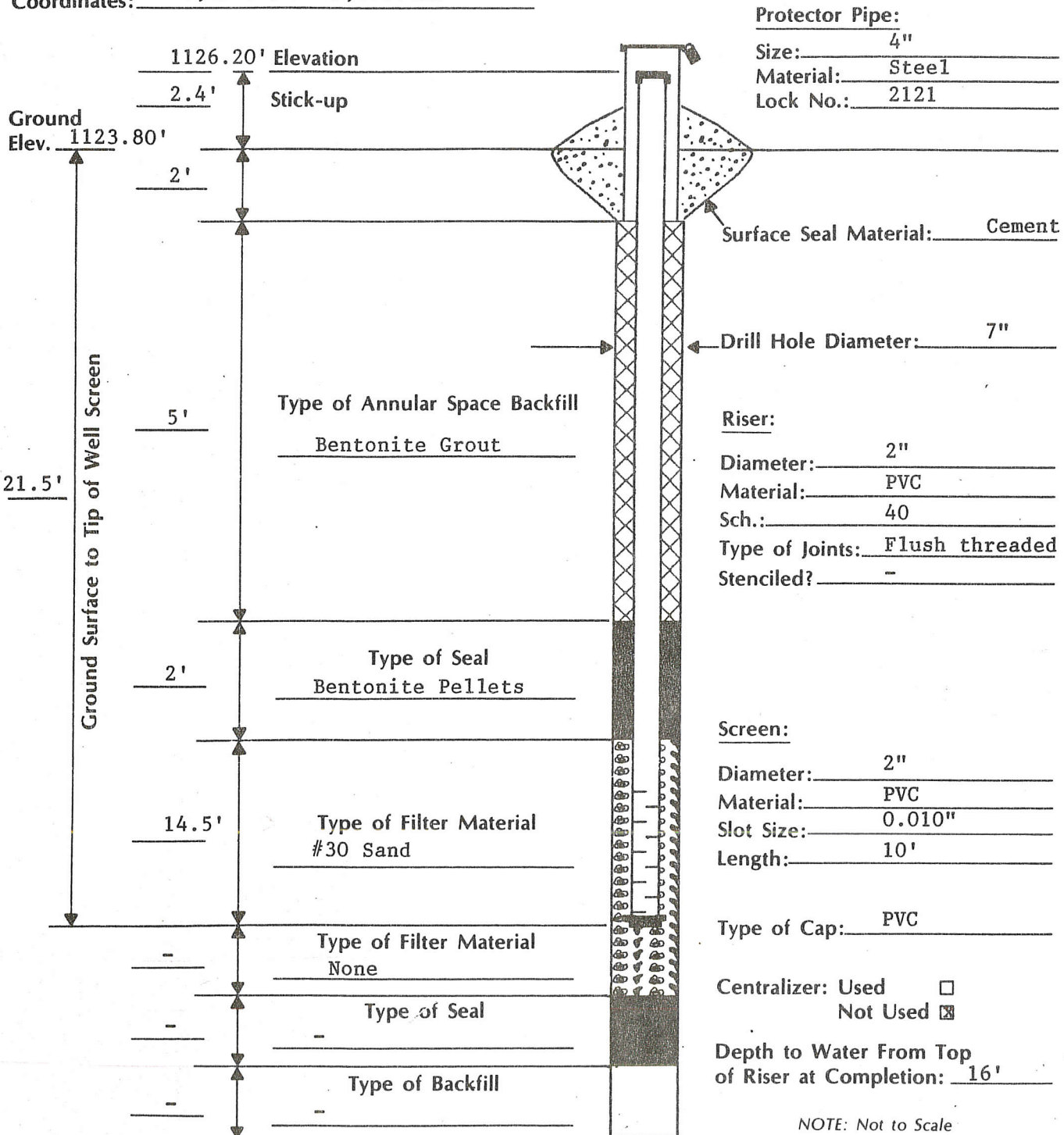
DATA TAKEN 1-13-89 BY BJS
 TIME CONSTANT = 5 SECONDS
 RANGE SETTING = 20 K

KENNECOTT MINERALS COMPANY		GAMMA LOG	
FLAMBEAU PROJECT		WELL MW-1004P	
LADYSMITH, WISCONSIN			
FOTH & VAN DYKE		DIVISION	
GEOSCIENCES & ENVIRONMENTAL MANAGEMENT		SCALE AS SHOWN	
GREEN BAY, WISCONSIN		Job No	
NOTES	APPROVAL	DATE	REV
	DESIGNED BY	2/89	
	DRAWN BY		
	CHECKED BY		
	APPROVED BY		
	CAD No.		
REVISIONS			
No			
1			
2			
3			
4			
5			

Client: Kennecott Scope I.D.: 87K10
 Project: Baseline Groundwater Monitoring Page: 1
 Prepared by: BJS Date: 9-17-87
 Checked by: BJS Date: 12-14-88

MONITORING WELL CONSTRUCTION DIAGRAM

Driller: Wisconsin Test Drilling, Inc. Well No: MW-1004
 Drilling Method: Hollow Stem Augers 4.25" ID Date Installed: 9-17-87
 Coordinates: 40,694.39N 39,123.41E



NOTE: Not to Scale

MONITORING WELL DEVELOPMENT

WELL NUMBER MW-1004 CLIENT Kennecott
 WELL DIAMETER 2" PROJECT Baseline G.W. Monitoring
 TOTAL DEPTH OF WELL 21.5' SCOPE I.D. 87K10-7
 DEPTH TO WATER 15.8' TIME OF MEASUREMENT BY M.M. Wisc. Test Drilling, Inc.
 BEFORE 15.8' DATE 9-30-87
 AFTER 18.3'

DESCRIPTION OF DEVELOPMENT METHOD

Well was alternately surged and bailed using a PVC hand pump.

VOLUME OF WATER REMOVED FROM WELL 25 gallons
 CLARITY OF WATER IN WELL BEFORE DEVELOPMENT dark brown, sandy
 CLARITY OF WATER IN WELL AFTER DEVELOPMENT light brown
 PRESENCE OF SEDIMENT AT THE BOTTOM OF THE WELL _____
 VOLUME OF WATER ADDED TO WELL None
 SOURCE OF WATER ADDED TO WELL _____
 TIME SPENT FOR DEVELOPMENT 15 Minutes

STABILIZATION READINGS

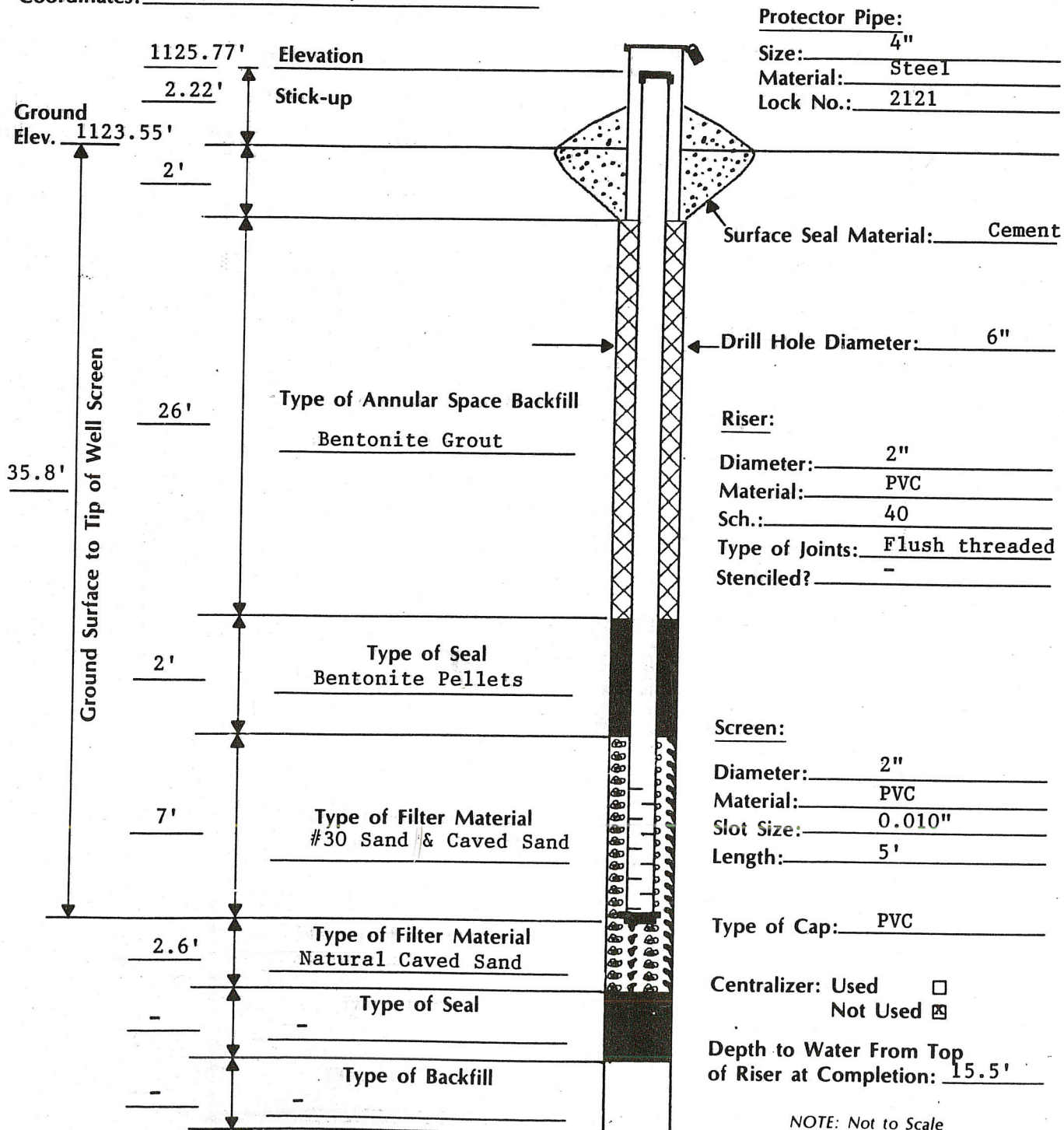
GAL. REMOVED	TIME	TEMPERATURE	SPEC. COND.	pH
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

FOTH AND VAN DYKE

Client: Kennecott Scope I.D.: 87K10
 Project: Baseline Groundwater Monitoring Page: 1
 Prepared by: BJS Date: 9-18-87
 Checked by: BJS Date: 12-14-88

MONITORING WELL CONSTRUCTION DIAGRAM

Driller: Wisconsin Test Drilling, Inc. Well No: MW-1004S
 Drilling Method: Mud Rotary 6" Tricone Date Installed: 9-18-87
 Coordinates: 40,703.24N 39,122.29E



MONITORING WELL DEVELOPMENT

WELL NUMBER MW-1004S CLIENT Kennecott
 WELL DIAMETER 2" PROJECT Baseline G.W. Monitoring
 TOTAL DEPTH OF WELL 35.8' SCOPE I.D. 87K10-7
 DEPTH TO WATER 15.6' TIME OF MEASUREMENT BY M.M. Wisc. Test Drilling, Inc.
 BEFORE 15.6' DATE 9-30-87
 AFTER 17.1'

DESCRIPTION OF DEVELOPMENT METHOD

Well was alternately surged and bailed using a PVC hand pump.

VOLUME OF WATER REMOVED FROM WELL 25 gallons
 CLARITY OF WATER IN WELL BEFORE DEVELOPMENT red brown, silty
 CLARITY OF WATER IN WELL AFTER DEVELOPMENT red brown, silty
 PRESENCE OF SEDIMENT AT THE BOTTOM OF THE WELL _____
 VOLUME OF WATER ADDED TO WELL None
 SOURCE OF WATER ADDED TO WELL _____
 TIME SPENT FOR DEVELOPMENT 20 Minutes

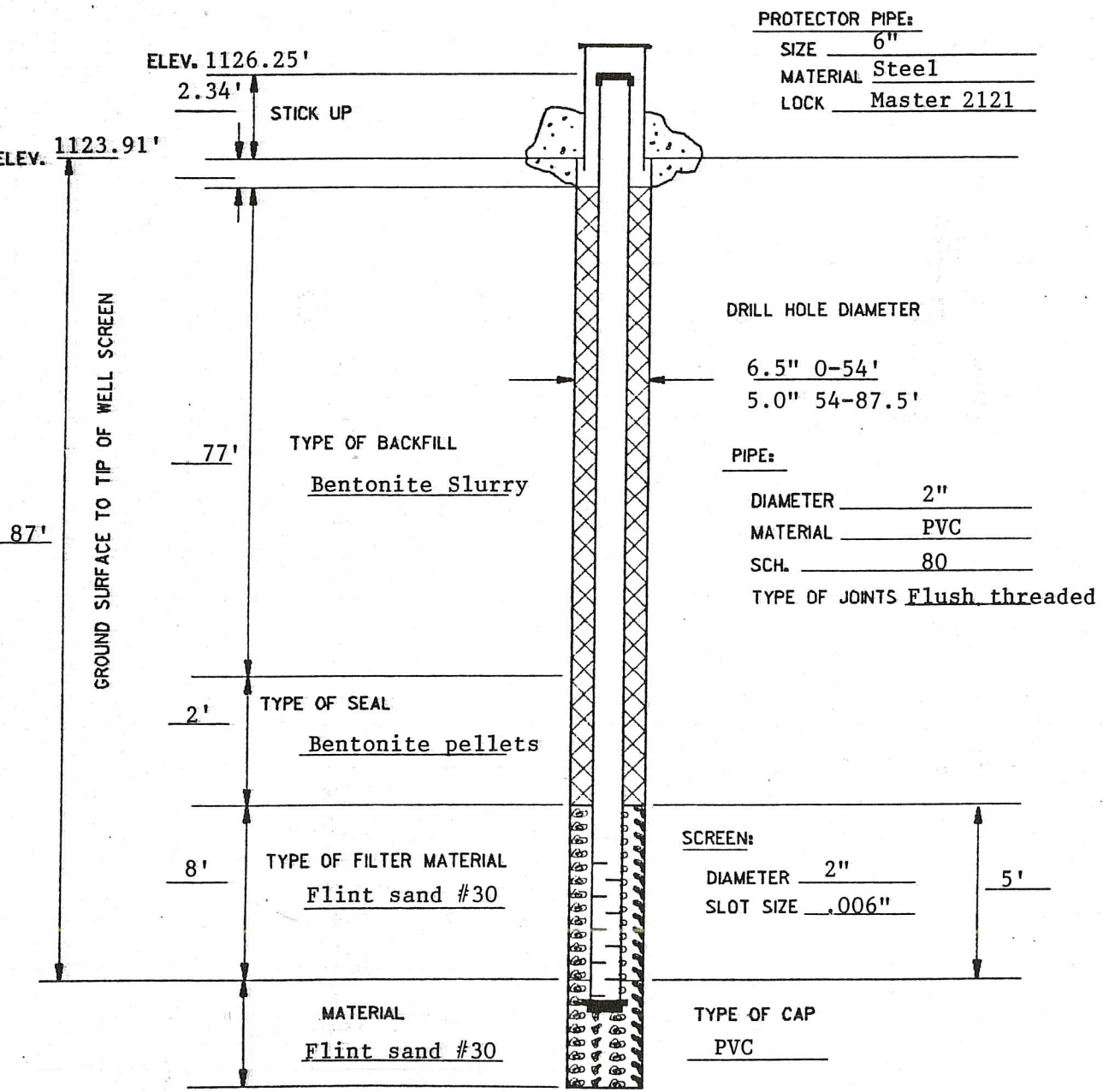
STABILIZATION READINGS.

GAL. REMOVED	TIME	TEMPERATURE	FIELD	
			SPEC. COND.	pH
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

MONITORING WELL INSTALLATION DIAGRAM

WELL NO: MW-1004P
 DATE INSTALLED: 9-30-87
 DRILLER: Luisier Well Drilling
 DRILLING METHOD: Mud rotary
 COORDINATES: 40,686.78N 39,123.60E

CLIENT: Kennecott
 PROJECT: Baseline G.W. Monitoring
 SCOPE I.D.: 87K10-7
 BY: BJS



Foth & Van Dyke

Geosciences & Environmental
 Management Division

MONITORING WELL DEVELOPMENT

WELL NUMBER MW-1004P CLIENT Kennecott
 WELL DIAMETER 2" PROJECT Baseline G.W. Monitoring
 TOTAL DEPTH OF WELL 87' SCOPE I.D. 87K10-7
 DEPTH TO WATER _____ TIME OF MEASUREMENT _____ BY K.M. Luisier Well Drilling
 BEFORE _____ DATE 10-5-87
 AFTER 87' (Dry)

DESCRIPTION OF DEVELOPMENT METHOD

Well was alternately surged and bailed using a foot valve installed on a 3/4" flexible PVC pipe. The pipe and foot valve were moved up and down in the well by a motor-driven pitcher-pump.

VOLUME OF WATER REMOVED FROM WELL 8 gallons
 CLARITY OF WATER IN WELL BEFORE DEVELOPMENT light brown
 CLARITY OF WATER IN WELL AFTER DEVELOPMENT _____
 PRESENCE OF SEDIMENT AT THE BOTTOM OF THE WELL None
 VOLUME OF WATER ADDED TO WELL _____
 SOURCE OF WATER ADDED TO WELL _____
 TIME SPENT FOR DEVELOPMENT 0.5 hours

STABILIZATION READINGS

GAL. REMOVED	TIME	FIELD		
		TEMPERATURE	SPEC. COND.	pH
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

FOTH AND VAN DYKE

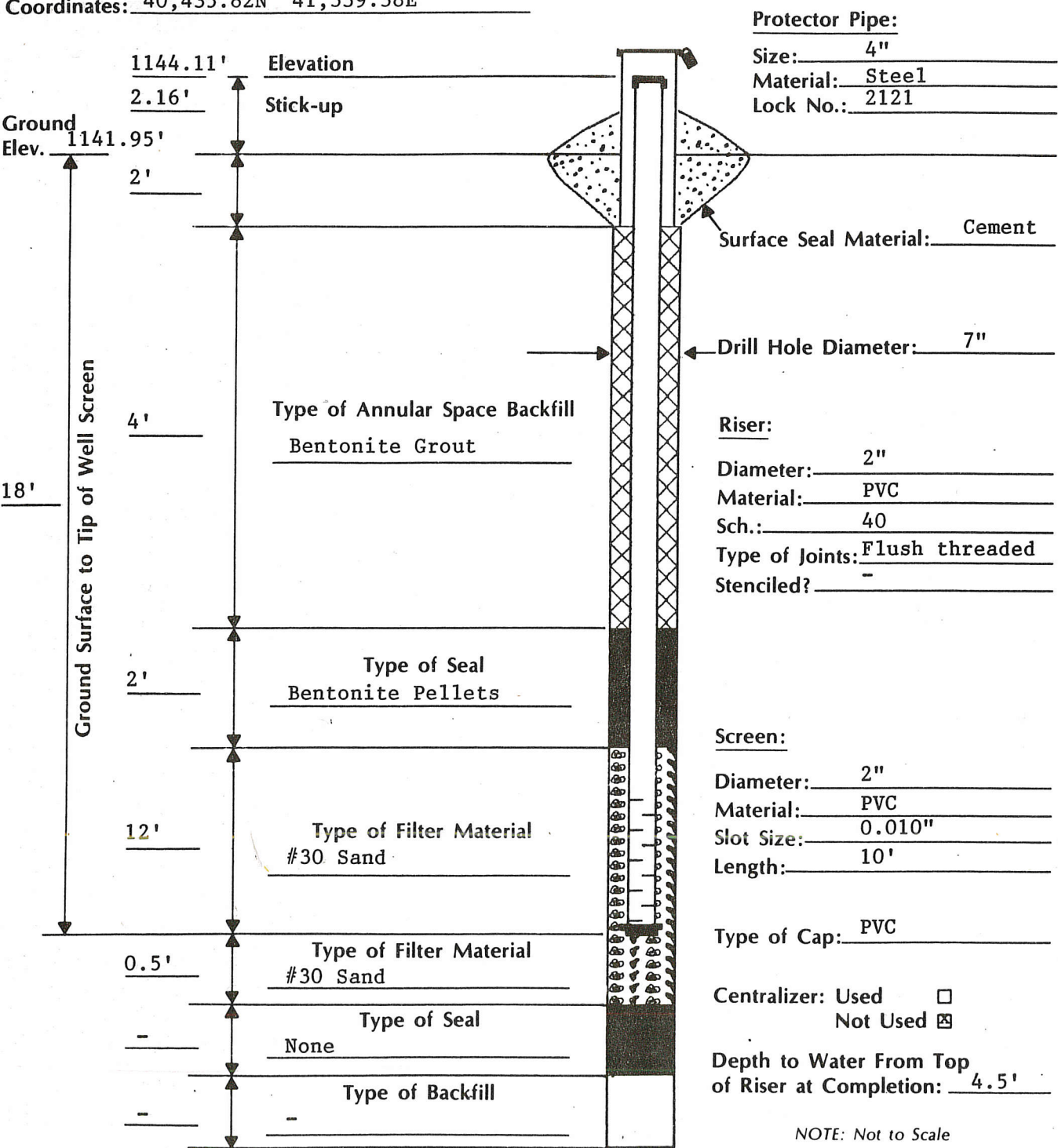
LOG OF TEST BORING NO.: MW-1005, 1005S										SURFACE ELEVATION: 1141.9		
CLIENT: Kennecott PROJECT: Flambeau-Baseline Ground Water Monitoring PROJECT NUMBER: 87K10-7 LOCATION: Adjacent to Hwy 27, south of H & H Bldg. COORDINATES: 40434 N 41340 E (APPROX)										BORING DEPTH: 50.8		
										DATE: 09/29/87		
MSL ELEV	DEPTH FR LND SURF	SAMP DEPTH INTERVAL	TYPE	#	N	REC (ft)	DESCRIPTION OF MATERIAL	CLASS	LABORATORY TESTS	DRILLING AND SAMPLE NOTES		
1141.9	--0.0						Black SILT w/organics, moist, soft (Aeolian silt w/peat)					
1139.4	--2.5	2.0-3.5	ss	1	15	1.5	Black (10YR 2/1) SILT, moist, soft, cohesive to 2.5', then gray brn (2.5Y 5/2) poorly graded SAND w/silt, fn, moist, loose	ML, SM				
1136.9	--5.0	5.0-6.5	ss	2	13	1.0	Black & gray brn SILT, laminated, moist, few rust brn mottles, last 4" yel red (5YR 5/8, 4/6) poorly graded SAND w/silt fine			Cuttings at 7', silty sand		
1131.9	--10.0	10.0-12.0	ss	3	31	2.0	Red brn (5YR 4/4) silty SAND, fine w/med & cse sand, fn gvl, moist w/few fn sand partings, laminae, many dusky red (10YR 3/4) iron? coatings on joints, cohesive, brittle	SM				
1126.9	--15.0	15.0-16.5	ss	4	19	1.0	Dk brn (10YR 4/3) silty SAND, as above, diamict w/dk green gray (5G 4/1) stringer in diamict. Much water at 19 ft.					
1121.9	--20.0	20.0-21.5	ss	5	11	0.5	As above, vy soft, saturated. Much water at 20-25 ft.					
1116.9	--25.0	25.0-26.5	ss	6	8	0.5	As above dk brn & red brn silty SAND, vy soft					
1111.9	--30.0	30.0-31.5	ss	7	29	1.5	Dk brn clayey SAND, CLAY, laminated, w/dk green gray stringers (as above) to 30.2'. Then red brn silty SAND, diamict, laminated, w/fn angular gravel					
1106.9	--35.0	35.0-36.5	ss	8	22	2.0	Red brn till as above. 0.5' sand at 35', fn, loose, saturated					
1101.9	--40.0	40.0-42.0	ss	9	41	2.0	Yel brn poorly graded SAND, fn & med to 41', then green gray (5GY 6/1) w/few clay layers <1" thick, soft, unconsol., sandstone	SP (SS)				
1096.9	--45.0	45.0-46.5	ss	10	95	0.4	As above except lt gray (7.5YR 5/1), dense, loose to weakly consolidated			Abrupt contact between ss & saprolite		
1091.9	--50.0	50.0-50.8	ss	11	33	0.8	Same to 50.4', then lt gray green SILT, brittle, vy slightly moist (saprolite) 50.8'-End of Boring in Saprolite	ML				
DRILLING DATA START DATE: 09/28/87 COMPLETION DATE: 09/29/87 LOGGED BY: BJS DRILLING METHOD: Hollow stem augers 4 1/4" ID DRILLING CONTRACTOR: Wisconsin Test Drilling, Inc.										WATER LEVEL INFORMATION DEPTH AT COMPLETION: 11.2' at 20' LATER TIME/DEPTH: LATER TIME/DEPTH: CAVE IN DEPTH: DRILLING LOSSES:		

LOG OF TEST BORING NO.: MW-1005P										SURFACE ELEVATION: 1141.67		
CLIENT: Kennecott PROJECT: Flambeau-Baseline Ground Water Monitoring PROJECT NUMBER: 87K10-7 LOCATION: Adjacent Hwy 27, South of H & H Bldg. COORDINATES: 40439.38 N 41350.91 E										BORING DEPTH: 91.5		
										DATE: 10/04/87		
MSL ELEV	DEPTH FR LND SURF	SAMP DEPTH INTERVAL	TYPE	#	N	REC (ft)	DESCRIPTION OF MATERIAL	CLASS	LABORATORY TESTS	DRILLING AND SAMPLE NOTES		
1141.7	--0.0						Drilled to 55 ft w/sampling. See log for MW-1005, 1005S					
1086.7	--55.0	55.0-65.0	c	1		8.5	Core broken at 56, 58, 60 ft. Green gray w/white, altered breccia, "SILT", firm, brittle to 56'. At 56' red gray (10R5/1) silty CLAY (saprolitic schist), soft, cohesive, plastic, foliation distinct to indistinct to 57'. At 56.1 & 56.4', vy soft green gray (5G 6/1) layers 1-2", break at 60 degrees from vertical.	"ML" ===== CL-ML	RQD = 85% Fract freq = 0.4/ft			
1081.7	--60.0						57-58.3 - Same as above except dk gray (2.5YR 4/1), slightly moist, cohesive, firm to platy, crumbly, yel brn (limonite) along planes at 45 degrees from vert., grades to dusky red (2.5YR 3/2) saprolitic schist, soft to firm, brittle, much gray grn (5G 5/2) coatings, layers (chlorite?) on breaks	RK				
1076.7	--65.0											
1071.7	--70.0	65.0-72.5	c	2		7.5	As above except firmer, dusky red w/gray green layers, few yel brn (limonite) layer; at 71.5' hematite on fracture 35 degrees from vertical		RQD = 100% Fract freq = 0.5/ft	Core sticks to barrel		
1066.7	--75.0	72.5-79.0	c	3		6.5	Same as above w/much green coating on fractures (vert, horz, & near vert.) some yel brn (limonite) coatings		RQD = 100% Fract freq = 0.5/ft			
1061.7	--80.0	79.0-85.0	c	4		6.0	Same except harder, more hematite coatings on fractures		RQD = 100% Fract freq = 0/ft	No breaks in core in barrel		
1056.7	--85.0	85.0-91.5	c	5		6.5	Same as above, thick green coatings on fractures		RQD = 100% Fract freq = 0/ft	No breaks in core in barrel		
1051.7	--90.0						91.5'-End of Boring in altered (chlorite) schist					
1046.7	--95.0						MW-1005P installed in boring at 91'					
1041.7	--100.0											
1036.7	--105.0											
DRILLING DATA START DATE: 10/04/87 COMPLETION DATE: 10/04/87 LOGGED BY: BJS DRILLING METHOD: Mud rotary, 6" tricone, 5" carbide bit 55-91.5' DRILLING CONTRACTOR: Luisier Drilling, Inc.										WATER LEVEL INFORMATION DEPTH AT COMPLETION: LATER TIME/DEPTH: LATER TIME/DEPTH: CAVE IN DEPTH: DRILLING LOSSES:		

Client: Kennecott Scope I.D.: 87K10
 Project: Baseline Groundwater Monitoring Page: 1
 Prepared by: BJS Date: 9-29-87
 Checked by: BJS Date: 12-14-88

MONITORING WELL CONSTRUCTION DIAGRAM

Driller: Wisconsin Test Drilling, Inc. Well No: MW-1005
 Drilling Method: Hollow Stem Augers 4.25" ID Date Installed: 9-29-87
 Coordinates: 40,435.82N 41,339.38E



MONITORING WELL DEVELOPMENT

WELL NUMBER MW-1005 CLIENT Kennecott
 WELL DIAMETER 2" PROJECT Baseline G.W. Monitoring
 TOTAL DEPTH OF WELL 18.0' SCOPE I.D. 87K10-7
 DEPTH TO WATER 4.5' TIME OF MEASUREMENT BY M.M. Wisc. Test Drilling, Inc.
 BEFORE 3.8' DATE 9-30-87
 AFTER 3.8'

DESCRIPTION OF DEVELOPMENT METHOD

Well was alternately surged and bailed using a PVC hand pump.

VOLUME OF WATER REMOVED FROM WELL 25 gallons
 CLARITY OF WATER IN WELL BEFORE DEVELOPMENT brown, sandy, silty
 CLARITY OF WATER IN WELL AFTER DEVELOPMENT brown, sandy
 PRESENCE OF SEDIMENT AT THE BOTTOM OF THE WELL: -
 VOLUME OF WATER ADDED TO WELL None
 SOURCE OF WATER ADDED TO WELL -
 TIME SPENT FOR DEVELOPMENT 20 Minutes

STABILIZATION READINGS

GAL. REMOVED	TIME	TEMPERATURE	FIELD	
			SPEC. COND.	pH
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

Client: Kennecott Scope I.D.: 87K10
 Project: Baseline Groundwater Monitoring Page: 1
 Prepared by: BJS Date: 9-29-87
 Checked by: BJS Date: 12-14-88

MONITORING WELL CONSTRUCTION DIAGRAM

Driller: Wisconsin Test Drilling, Inc. Well No: MW-1005S
 Drilling Method: Hollow Stem Auger 4.25" ID Date Installed: 9-29-87
 Coordinates: 40,433.45N 41,343.04E

Protector Pipe:
 Size: 4"
 Material: Steel
 Lock No.: 2121

Surface Seal Material: Cement

Drill Hole Diameter: 7"

Riser:
 Diameter: 2"
 Material: PVC
 Sch.: 40
 Type of Joints: Flush threaded
 Stenciled? -

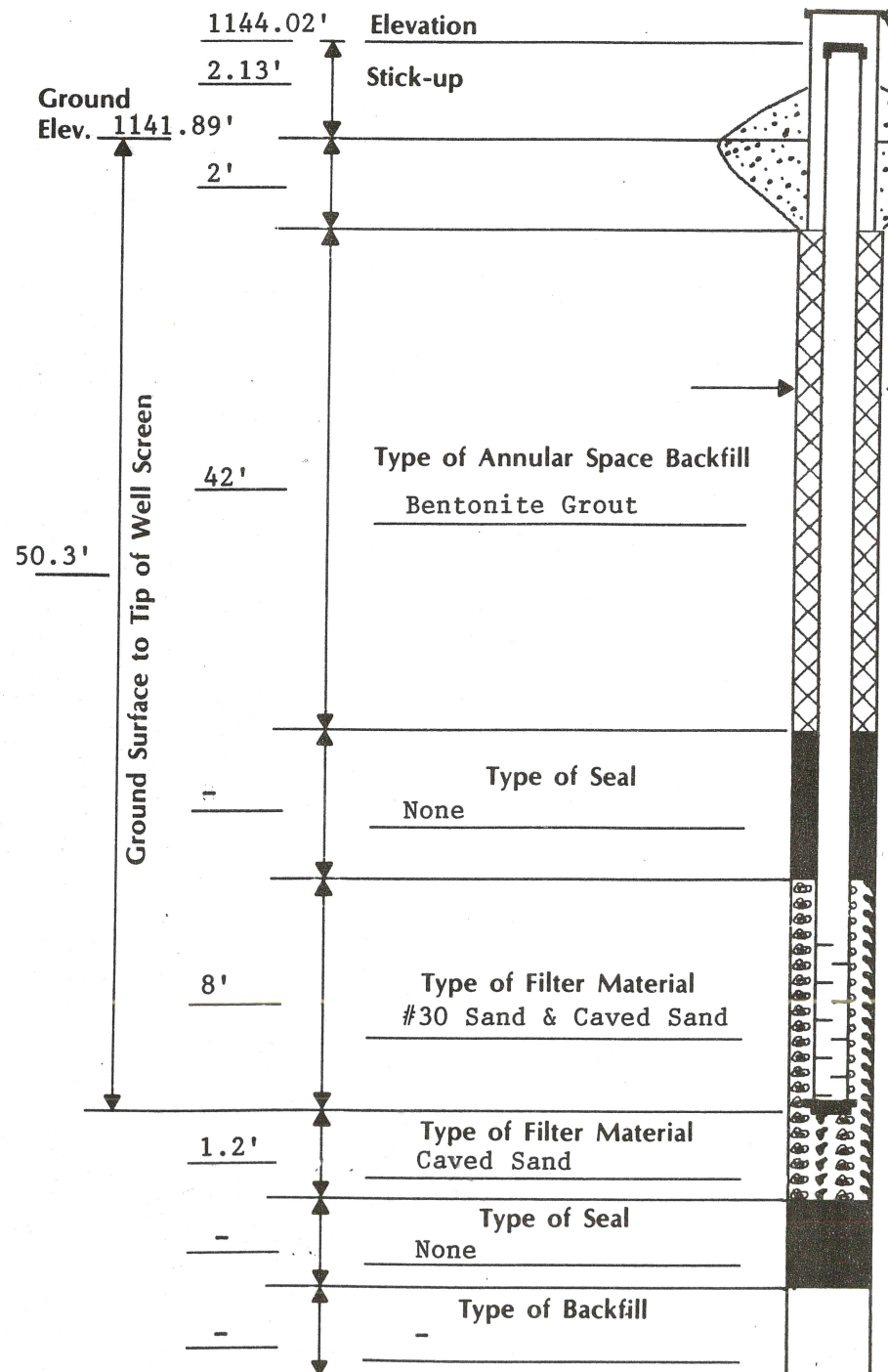
Screen:
 Diameter: 2"
 Material: PVC
 Slot Size: 0.010"
 Length: 5'

Type of Cap: PVC

Centralizer: Used Not Used

Depth to Water From Top of Riser at Completion: 4'

NOTE: Not to Scale



MONITORING WELL DEVELOPMENT

WELL NUMBER MW-1005S CLIENT Kennecott
 WELL DIAMETER 2" PROJECT Baseline G.W. Monitoring
 TOTAL DEPTH OF WELL 50.3' SCOPE I.D. 87K10-7
 DEPTH TO WATER _____ TIME OF MEASUREMENT _____ BY M.M. Wisc. Test Drilling, Inc.
 BEFORE 3.8' _____ DATE 9-30-87
 AFTER 6.2' _____

DESCRIPTION OF DEVELOPMENT METHOD

Well was alternately surged and bailed using a PVC hand pump.

VOLUME OF WATER REMOVED FROM WELL 25 gallons
 CLARITY OF WATER IN WELL BEFORE DEVELOPMENT very light brown, sandy, silty
 CLARITY OF WATER IN WELL AFTER DEVELOPMENT very light brown
 PRESENCE OF SEDIMENT AT THE BOTTOM OF THE WELL: _____
 VOLUME OF WATER ADDED TO WELL None
 SOURCE OF WATER ADDED TO WELL _____
 TIME SPENT FOR DEVELOPMENT 20 Minutes

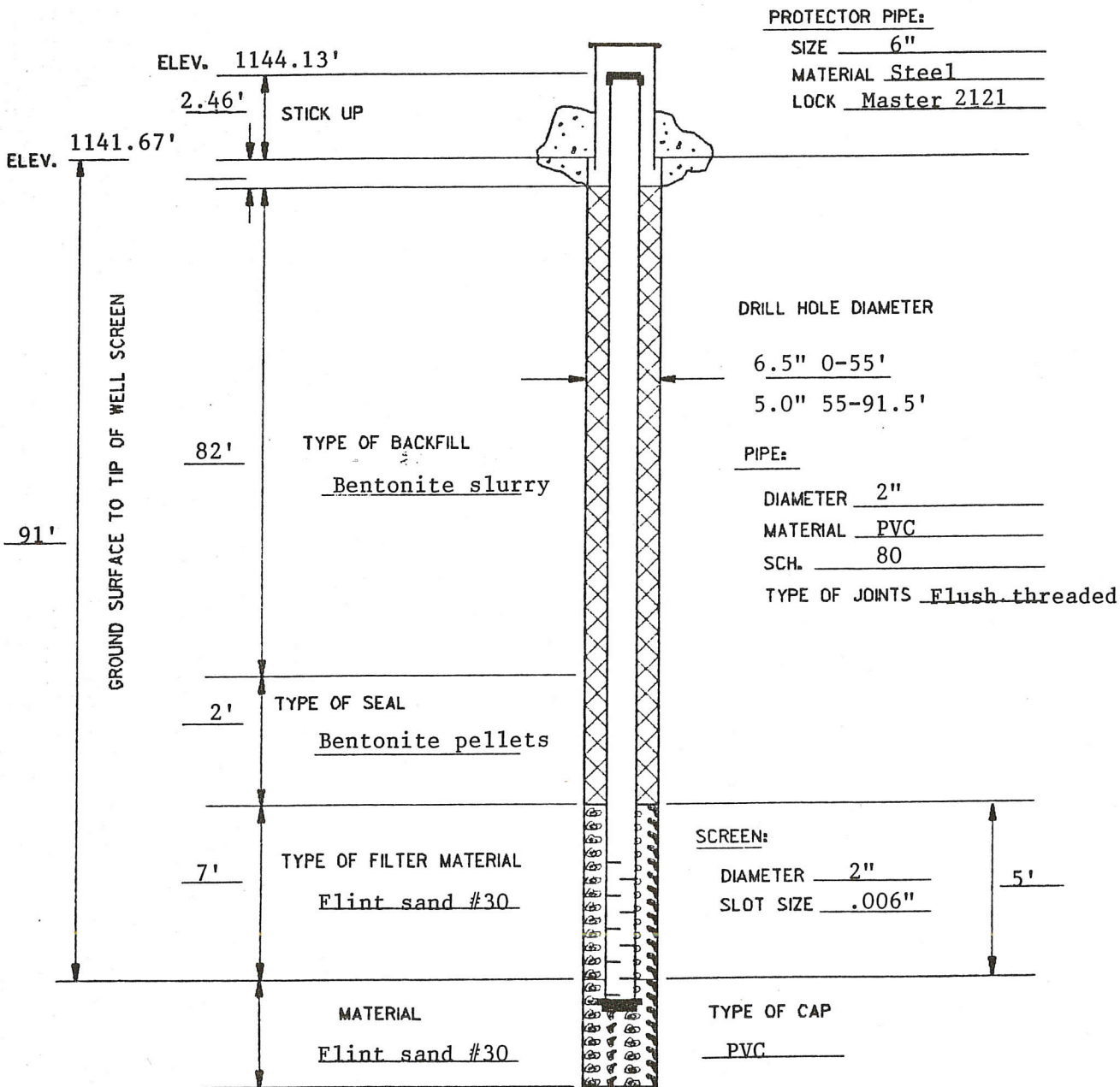
STABILIZATION READINGS

GAL. REMOVED	TIME	TEMPERATURE	FIELD	
			SPEC. COND.	pH
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

MONITORING WELL INSTALLATION DIAGRAM

WELL NO: MW-1005P
 DATE INSTALLED: 10-04-87
 DRILLER: Luisier Well Drilling
 DRILLING METHOD: Mud rotary
 COORDINATES: 40,439.38N 41,350.91E

CLIENT: Kennecott
 PROJECT: Baseline G.W. Monitoring
 SCOPE I.D.: 87K10-7
 BY: BJS



Foth & Van Dyke

Geosciences & Environmental
 Management Division

MONITORING WELL DEVELOPMENT

WELL NUMBER MW-1005P CLIENT Kennecott
 WELL DIAMETER 2" PROJECT Baseline G.W. Monitoring
 TOTAL DEPTH OF WELL 90' SCOPE I.D. 87K10-7
 DEPTH TO WATER _____ TIME OF MEASUREMENT _____ BY K.M. Luisier Well Drilling
 BEFORE _____ DATE 10-5-87
 AFTER 90' (Dry)

DESCRIPTION OF DEVELOPMENT METHOD

Well was alternately surged and bailed using a foot valve installed on a 3/4" flexible PVC pipe. The pipe and foot valve were moved up and down in the well by a motor-driven pitcher-pump.

VOLUME OF WATER REMOVED FROM WELL 7 gallons
 CLARITY OF WATER IN WELL BEFORE DEVELOPMENT light brown
 CLARITY OF WATER IN WELL AFTER DEVELOPMENT _____
 PRESENCE OF SEDIMENT AT THE BOTTOM OF THE WELL None
 VOLUME OF WATER ADDED TO WELL None
 SOURCE OF WATER ADDED TO WELL _____
 TIME SPENT FOR DEVELOPMENT 0.5 hours

STABILIZATION READINGS

GAL. REMOVED	TIME	TEMPERATURE	FIELD	
			SPEC. COND.	pH
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

FOTH AND VAN DYKE