



GREENS CREEK

# 2009 Annual Report

**Hecla**  
MINING COMPANY

Site 23/D



Site 23/D

June 8, 2010

# Presentation Outline

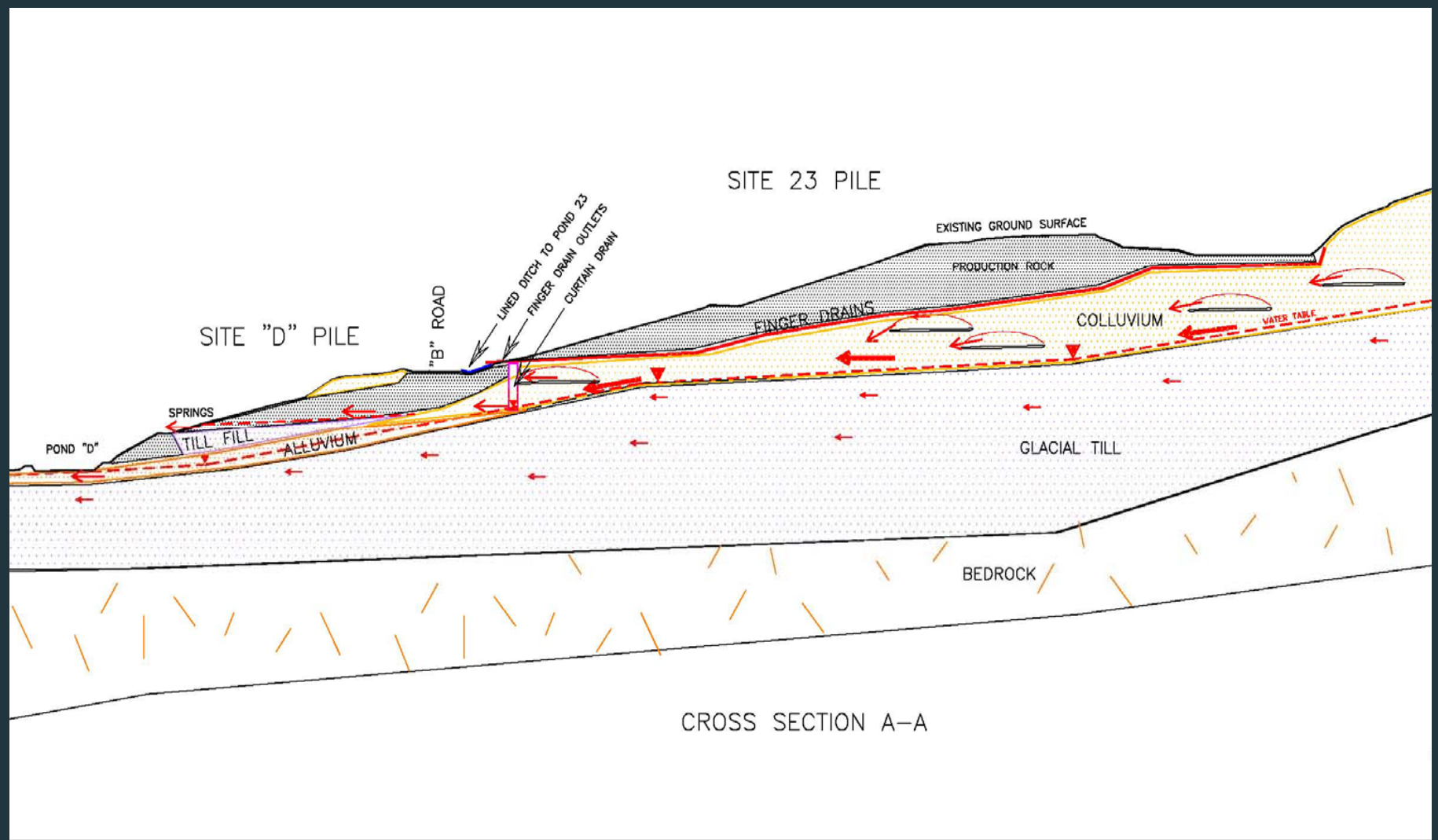
- Placement data
- Stability
  - Compaction
  - Inspections
  - Slope monitoring
- Water level data
- Precipitation and flow data
- Water quality at internal monitoring sites
- ABA data
- General site management

# 2009 Satellite Photograph Site 23/D, Mill Site and 1350

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# Appendix 2 Site 23/D Conceptual Cross Section



CROSS SECTION A-A

# Table 3.1 Site 23 Placement Data

PRODUCTION ROCK PLACED AT SITE 23					ADDITIONAL PRODUCTION ROCK HAULED					
2009	Surveyed (cy)		Surveyed (tons)		Hauled To Tails from Site 23 (tons)		From UG Truck Counts (tons)			
Date	Monthly	Cumulative	Monthly	Cumulative	Monthly	Cumulative	Class 1	Class 2	Class 3	Total
*1/31/2009	0	0	0	0	938	938	2,040	0	1,200	3,240
*2/28/2009	0	0	0	0	1,135	2,073	1,740	0	1,350	3,090
3/31/2009	2,564	2,564	4,340	4,340	4,019	6,092	1,890	0	3,900	5,790
4/30/2009	1,086	3,650	1,838	6,179	2,380	8,472	990	630	330	1,950
5/31/2009	0	3,650	0	6,179	877	9,349	1,500	0	510	2,010
6/30/2009	1,834	5,484	3,105	9,283	170	9,519	1,680	0	120	1,800
7/30/2009	922	6,406	1,561	10,844	558	10,077	1,260	0	270	1,530
8/31/2009	2,830	9,236	4,791	15,635	262	10,339	1,530	0	0	1,530
9/30/2009	1,668	10,904	2,824	18,458	3,009	13,348	360	1,110	1,230	2,700
10/30/2009	2,030	12,934	3,436	21,895	190	13,538	1,470	0	1,350	2,820
11/30/2009	468	13,402	792	22,687	0	13,538	510	0	0	510
12/31/2009	1,459	14,861	2,470	25,157	574	14,112	3,060	0	270	3,330
<b>TOTAL</b>	<b>14,861</b>		<b>25,157</b>		<b>14,112</b>		<b>18,030</b>	<b>1,740</b>	<b>10,530</b>	<b>30,300</b>

\* No survey taken due to equipment failure or excessive snow Remaining capacity ~558,000 cy

**Slide 6**

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**b1**

were does class 1 placed and "less tails haul" come from?

ballouc, 4/28/2008

# Site 23/D Stability

- Compaction
  - Method specification includes spreading in less than 24" lifts with at least one pass with bulldozer and four passes with vibratory compactor
- Inspections
  - Results of operator, engineering, environmental and regulatory inspections revealed no visible signs of instability
  - No issues of non-compliance were noted in 12 USFS and 5 ADEC/ADNR inspections
- Slope monitoring
  - 12 survey hubs monitored with GPS
    - No large movements were identified
  - Inclinator readings
    - Minor creep at 85' (~3mm/yr)



# Figure 3.30 Inclinerometer Incremental Displacement

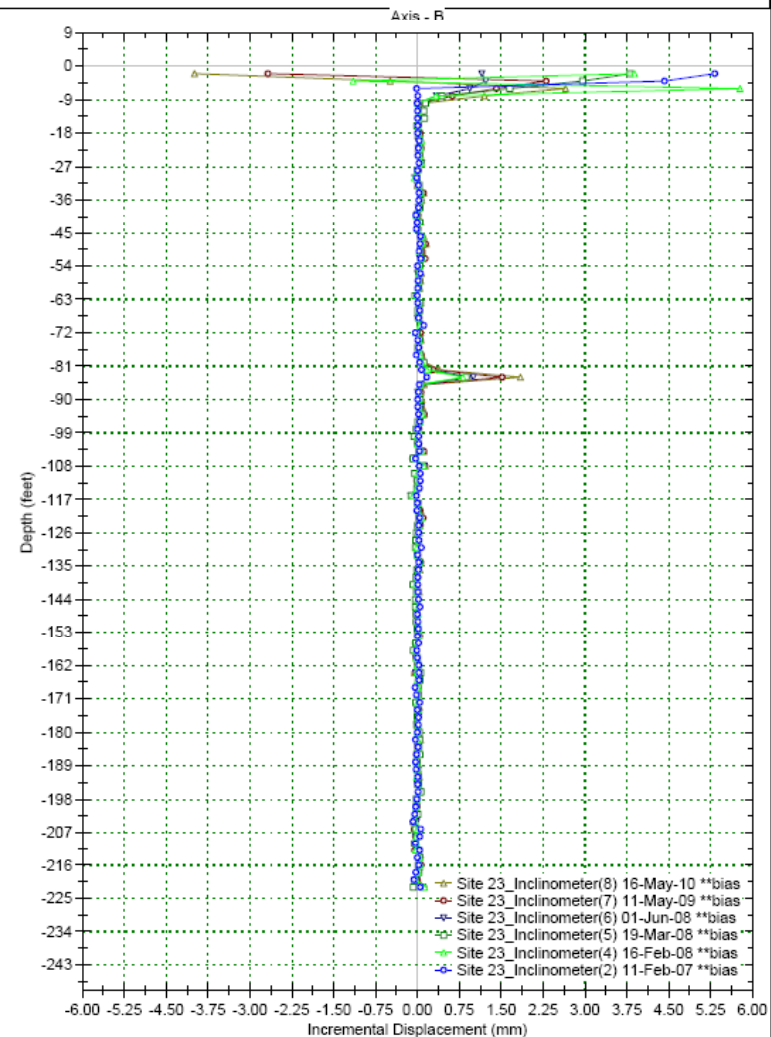
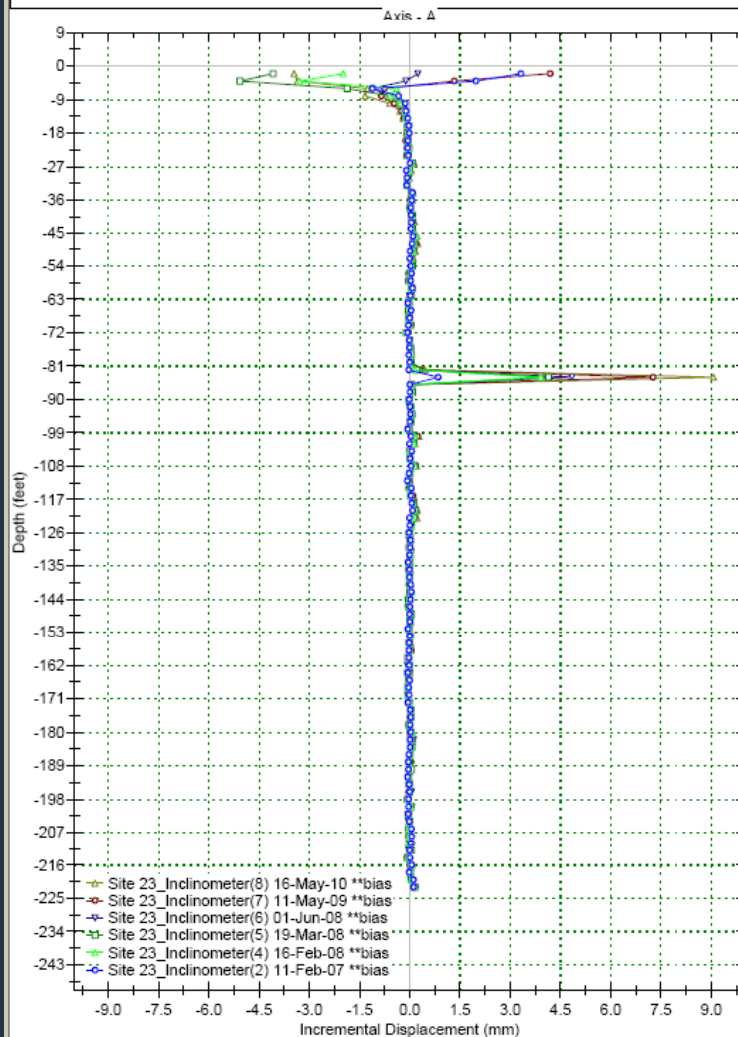
RST Instruments Ltd.

INCREMENTAL DISPLACEMENT

Inclinanalysis

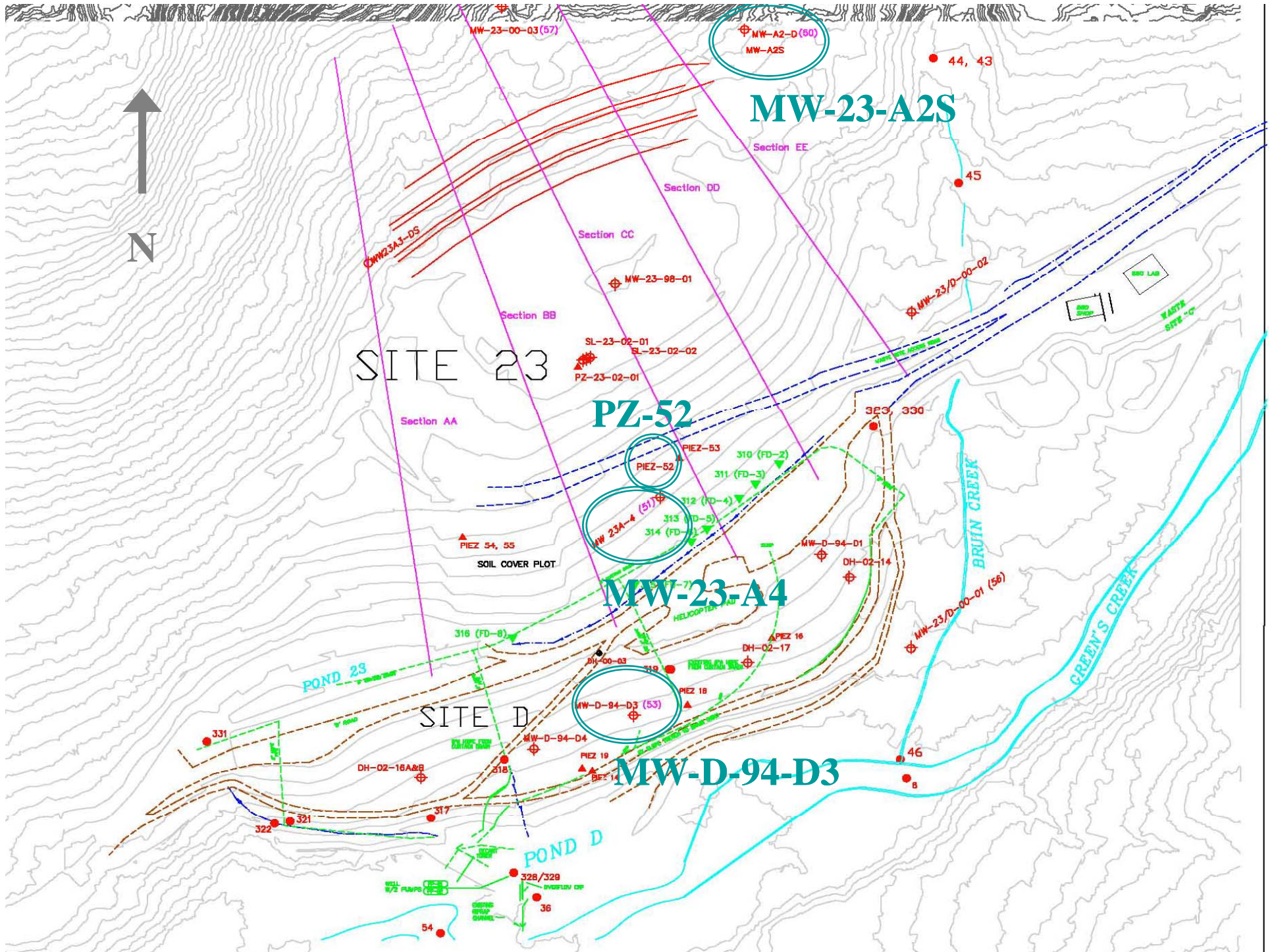
Borehole : Inclinerometer  
Project : Site 23  
Location :  
Northing :  
Easting :

Spiral Correction : N/A  
Collar Elevation :  
Borehole Total Depth : 222.0 feet  
North Groove Azimuth :  
Base Reading : 2006 Oct 07 10:28

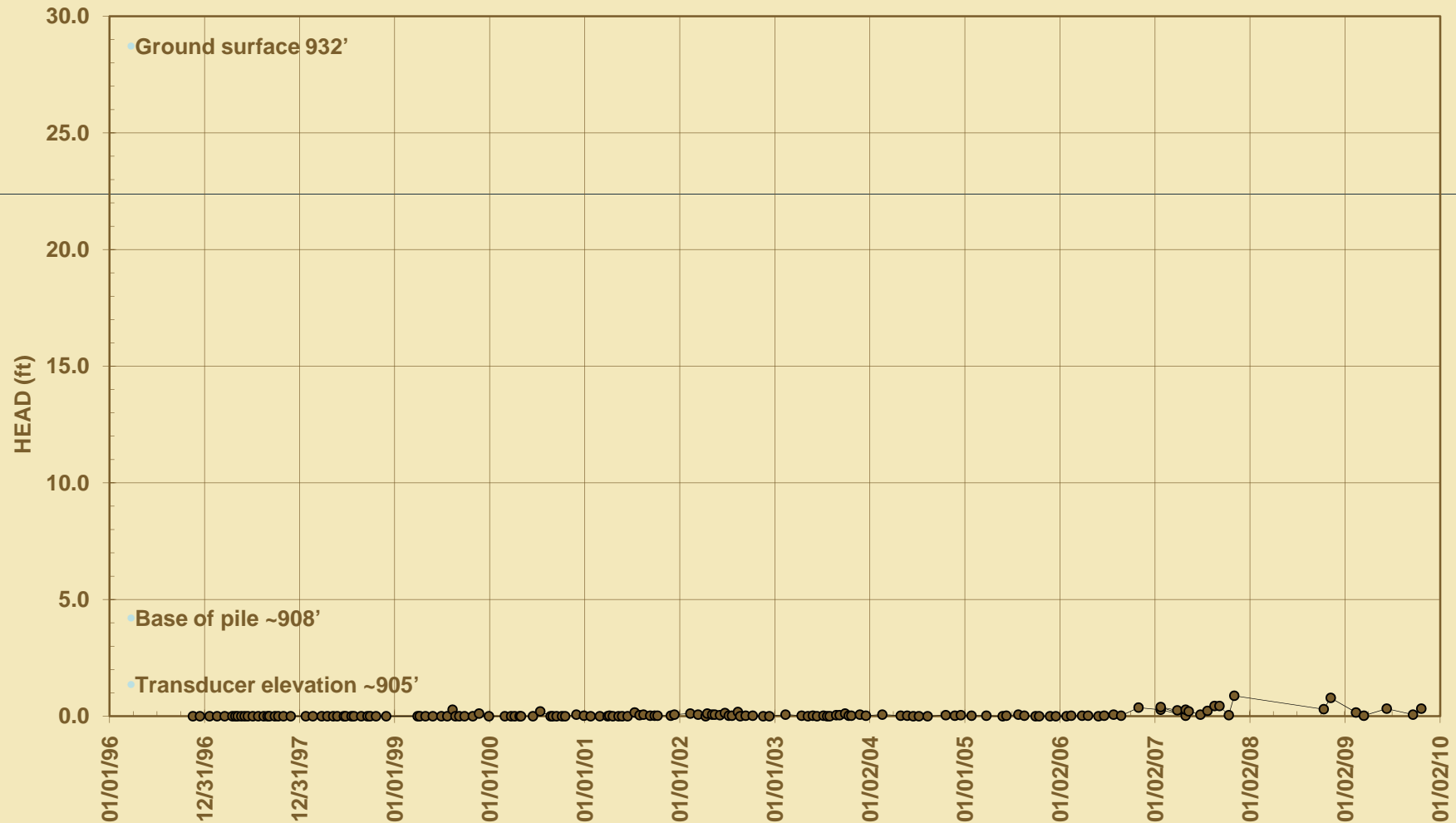


# Site 23/D Water Level Data

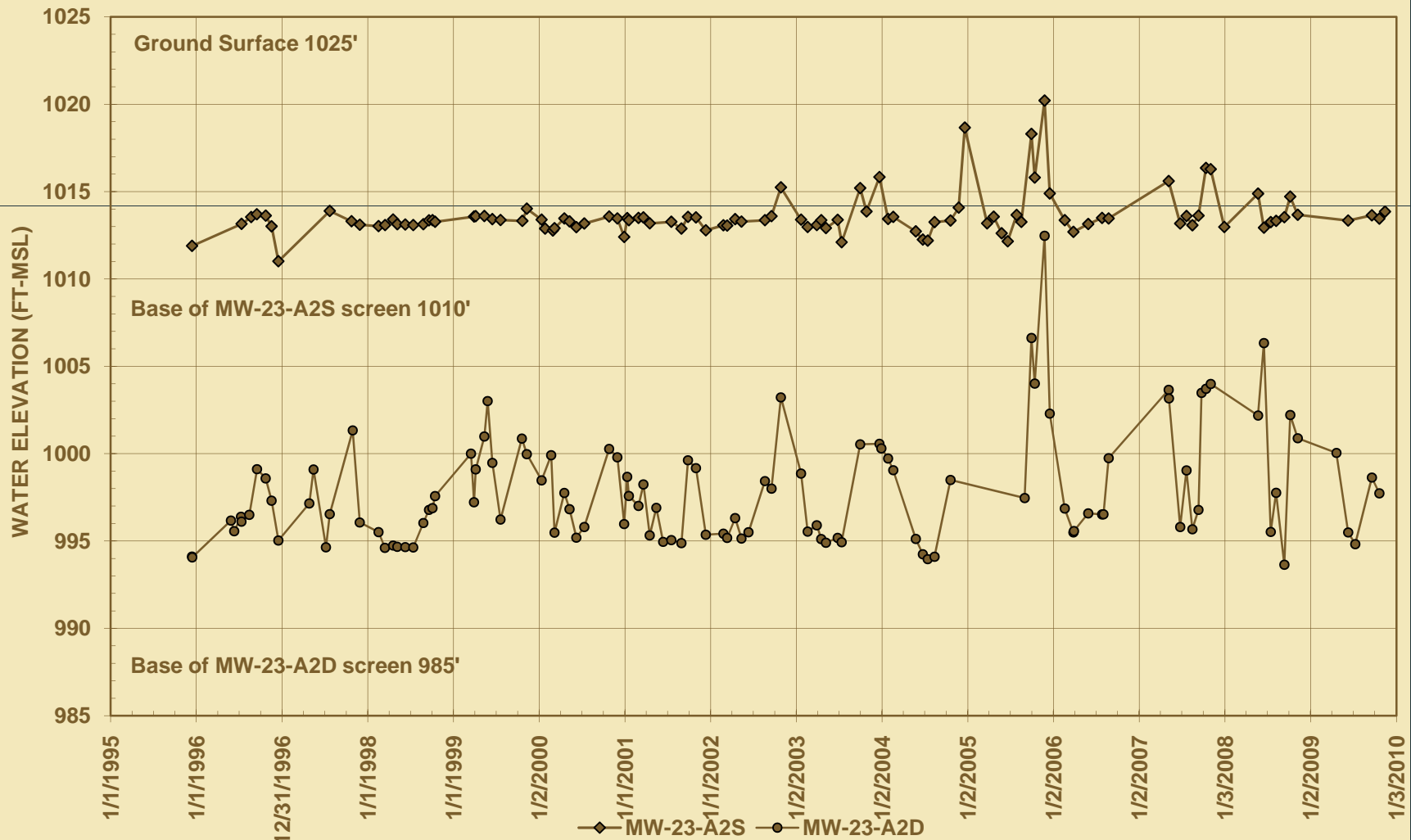
- Water table is below base of pile
- Well-drained pile and foundation indicate pile stability is maximized
- Perched water tables in colluvial wedge and alluvial sands
- Braided flow paths
- Distinct seasonal pattern, especially in alluvial sands
- Silt/clay till below colluvial wedge inhibits downward water movement



# Figure 3.1 Pressure Data for Piezometer 52



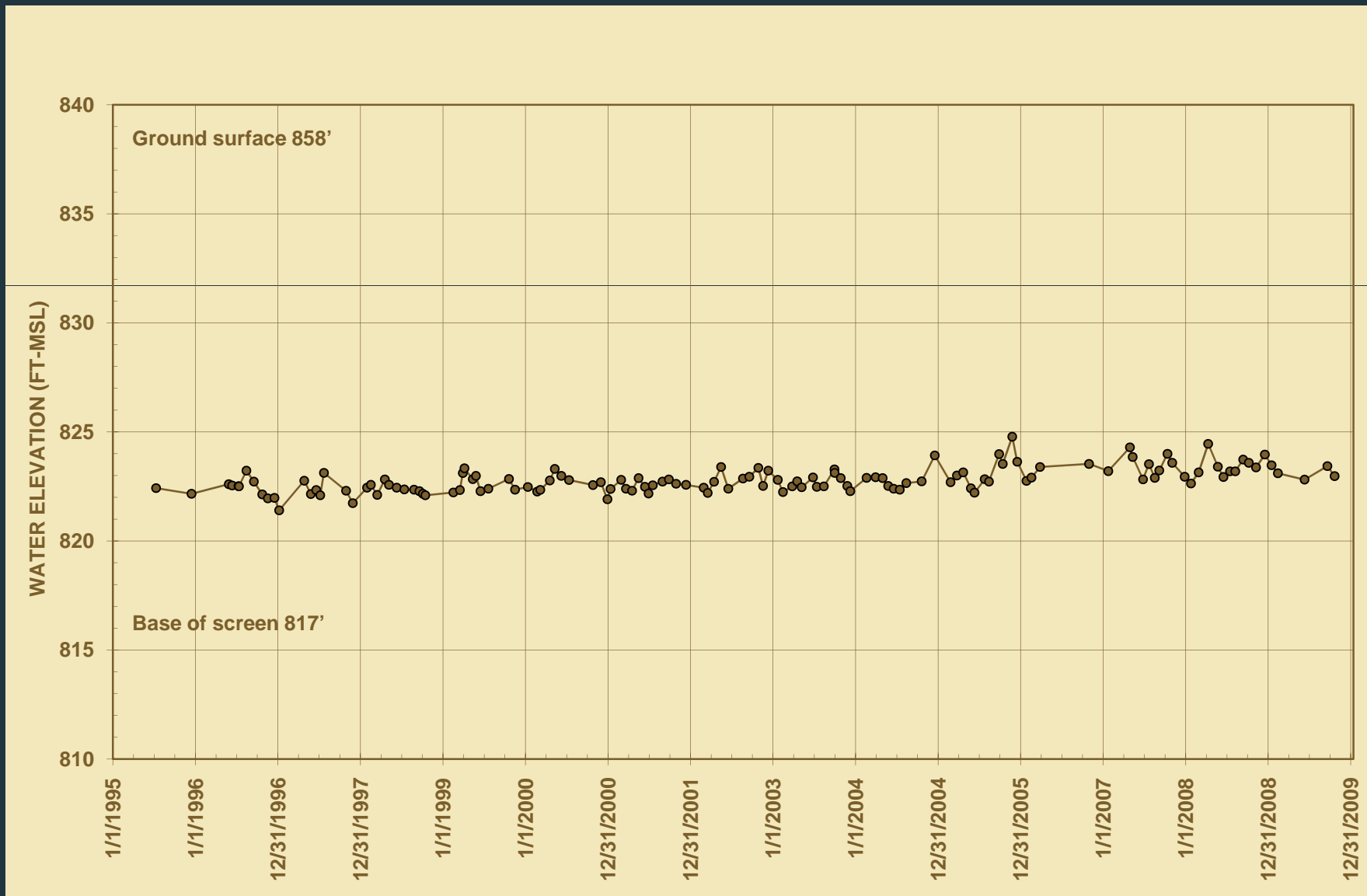
# Figure 3.6/7 Water Levels MW-23-A2S/D



# Figure 3.9 Water Level Data for Well MW-23-A4



# Figure 3.11 Water Level Data for Well MW-94-D3



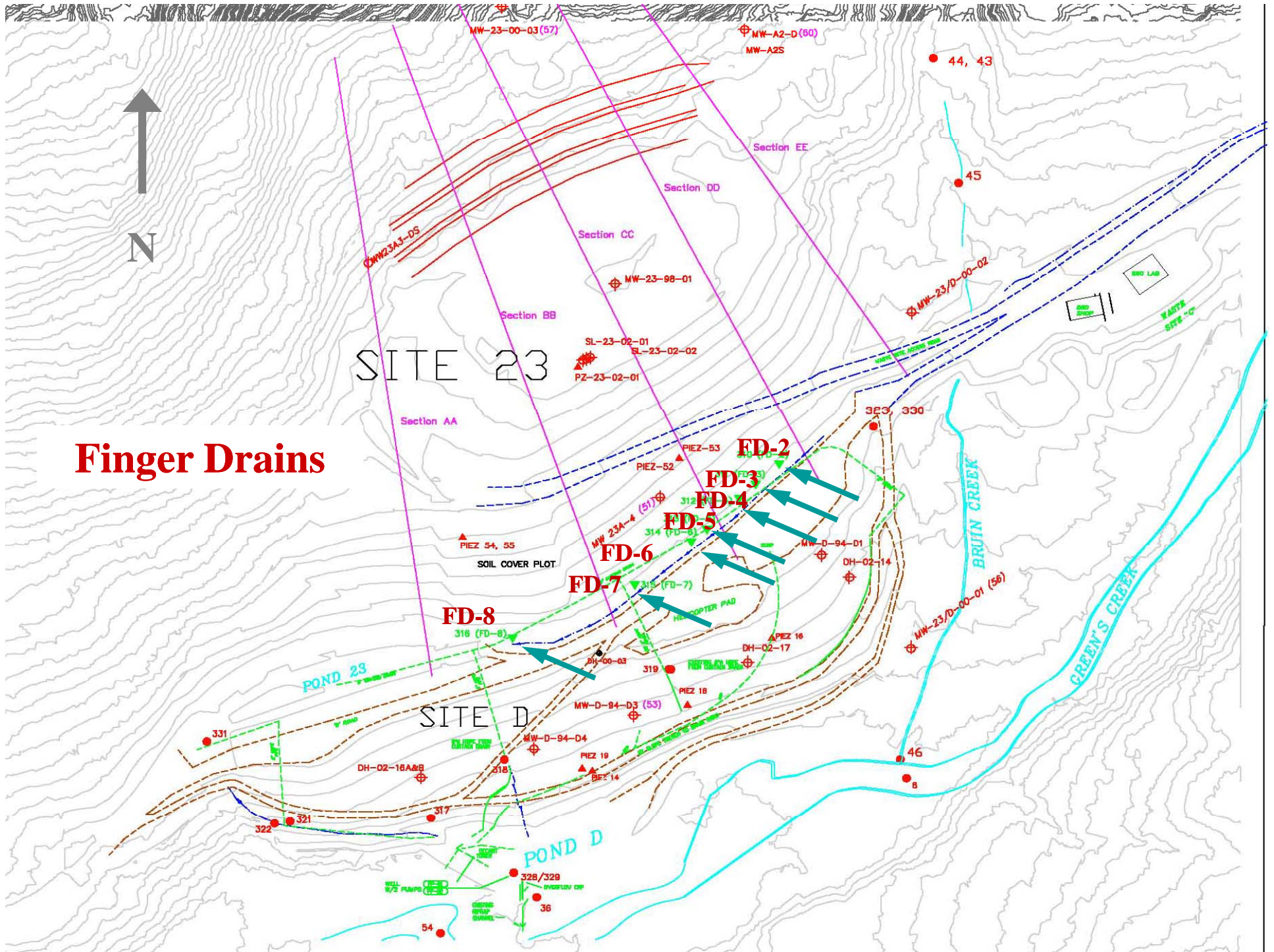
# Table 3.2 Monthly Summary of Site 23/D Climate Data

<b>Month</b>	<b>Avg Temp ( °C )</b>	<b>Precipitation (in)</b>
January	-4.4	6.7
February	-3.5	2.0
March	-2.6	2.2
April	2.4	1.5
May	7.2	2.1
June	11.0	3.1
July	14.7	1.3
August	12.3	6.9
September	8.9	9.1
October	4.8	6.2
November	0.0	7.7
December	-3.1	3.7
<b>2009</b>	<b>4.0</b>	<b>52.3</b>



# Site 23/D Internal Monitoring Sites: Water Quality Data

- Internal site waters are captured, treated and discharged per HGCMC's NPDES permit
- pH values are between 6.0 and 8.5 (high buffering capacity)
- Conductivities are between 200 and 5000 umho/cm
- Variations in conductivity reflect differences in contributions of groundwater and infiltration, seasonal fluctuations
- Zinc concentrations are variable (typically less than 5 mg/l)
- Precipitation, mixing and sorption mechanisms determine metals concentrations



# Finger Drains

SITE 23

SITE D

POND 23

POND D

BRUIN CREEK

GREEN'S CREEK

BIO LAB

BIO LAB

WASTE SITE 'C'

SOIL COVER PLOT

HELI COPTER PAD

WASTE STORAGE

WASTE STORAGE

WASTE STORAGE

WASTE STORAGE

WASTE STORAGE

WASTE STORAGE

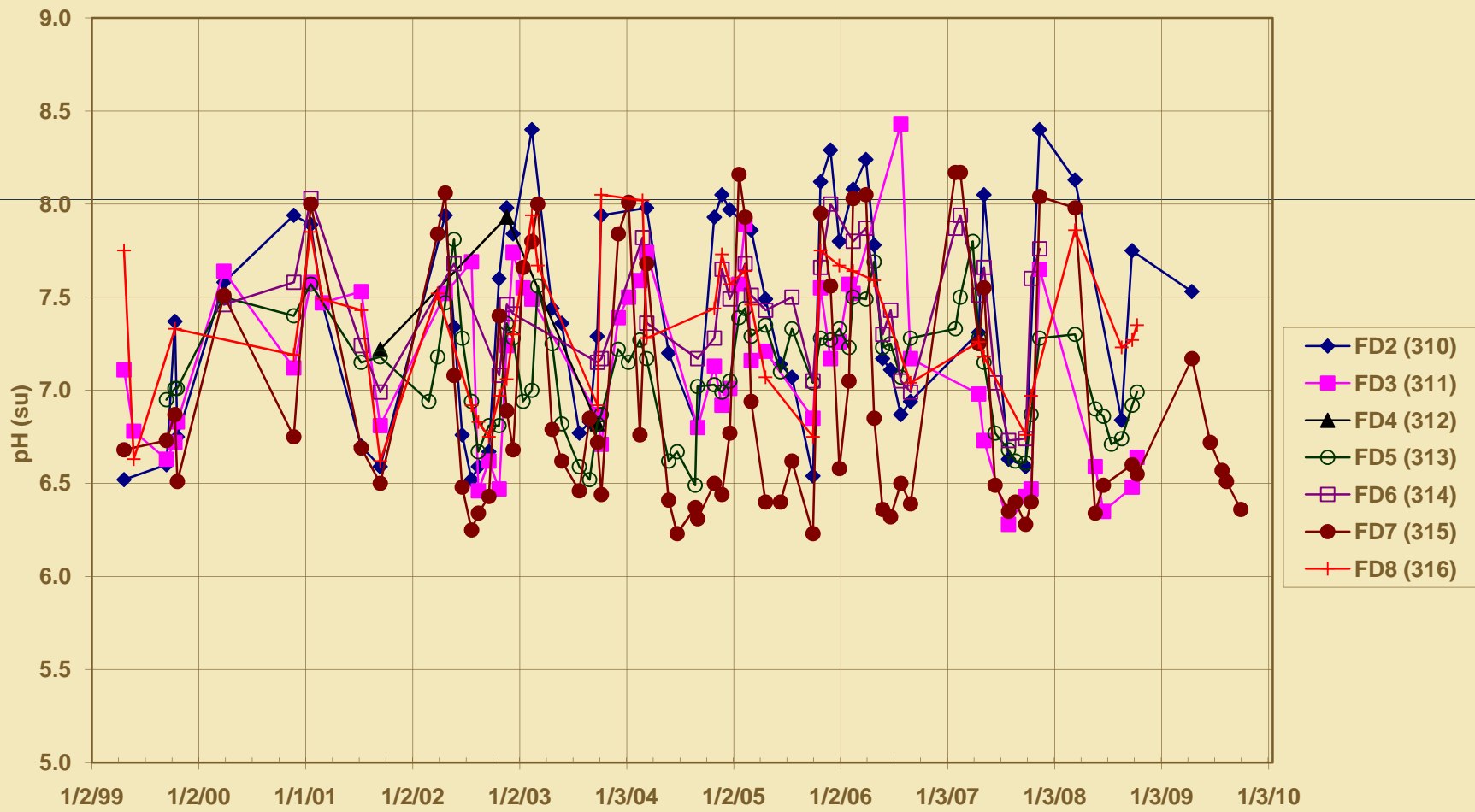
WASTE STORAGE

WASTE STORAGE

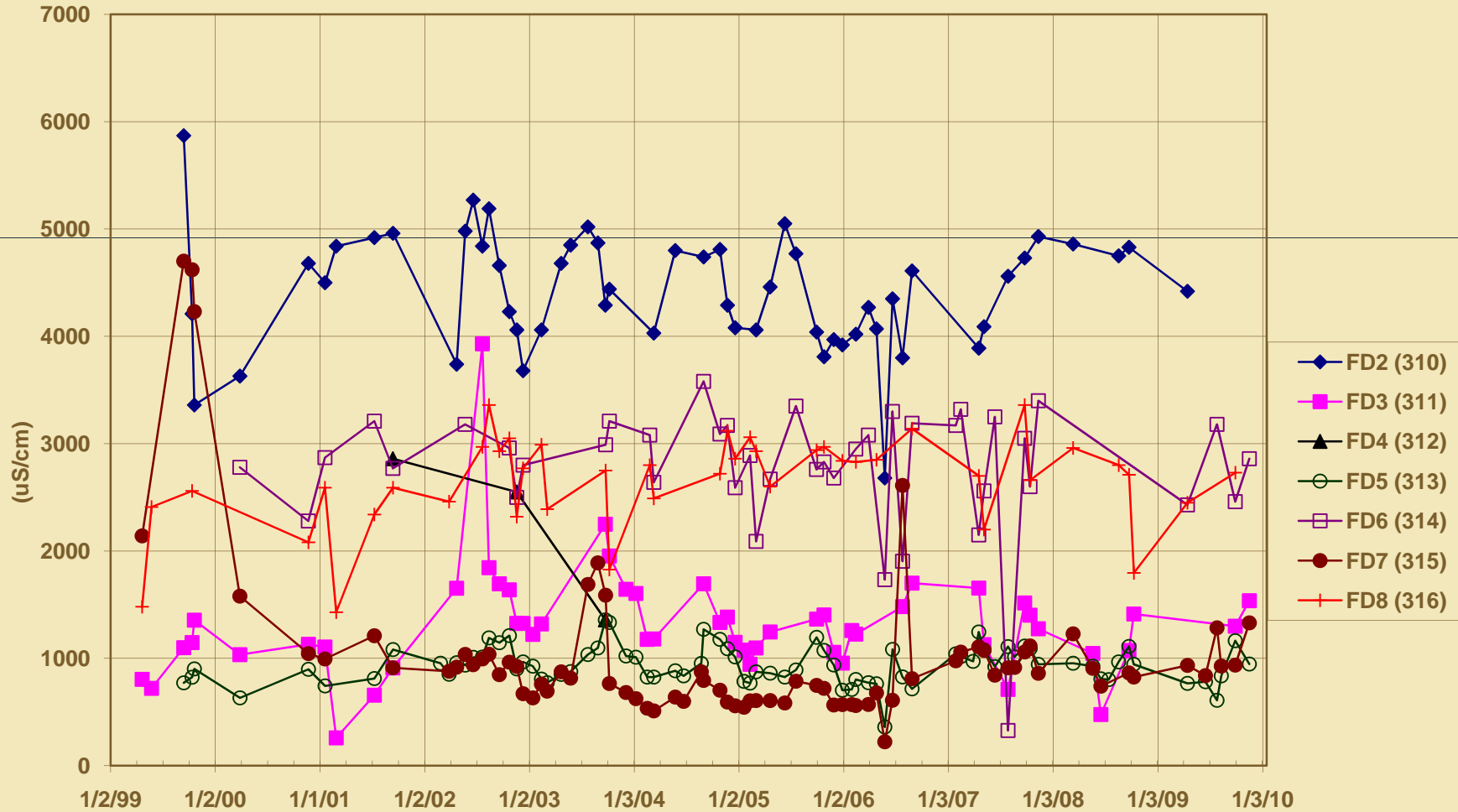
WASTE STORAGE

WASTE STORAGE

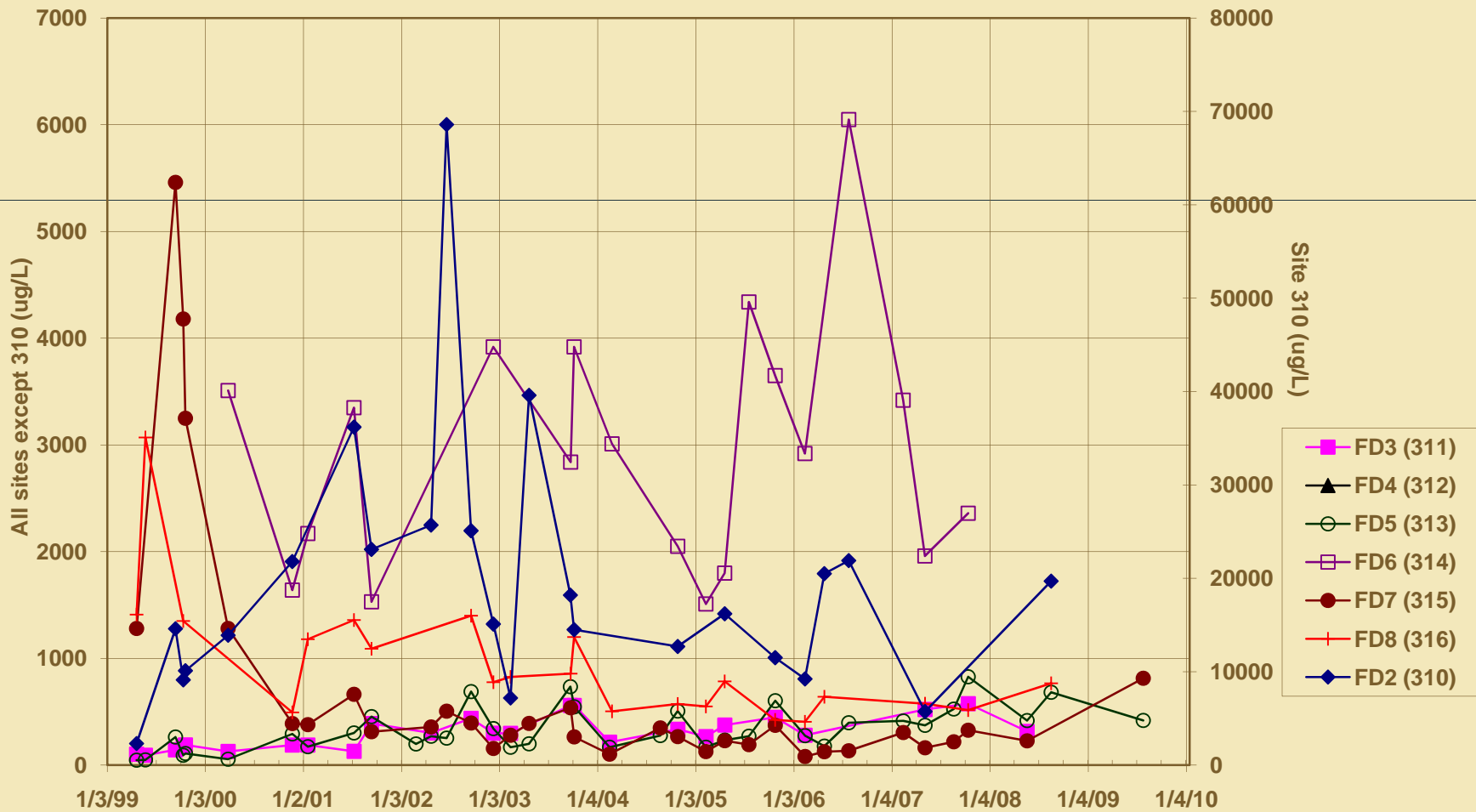
# Figure 3.14a Site 23 Finger Drains pH

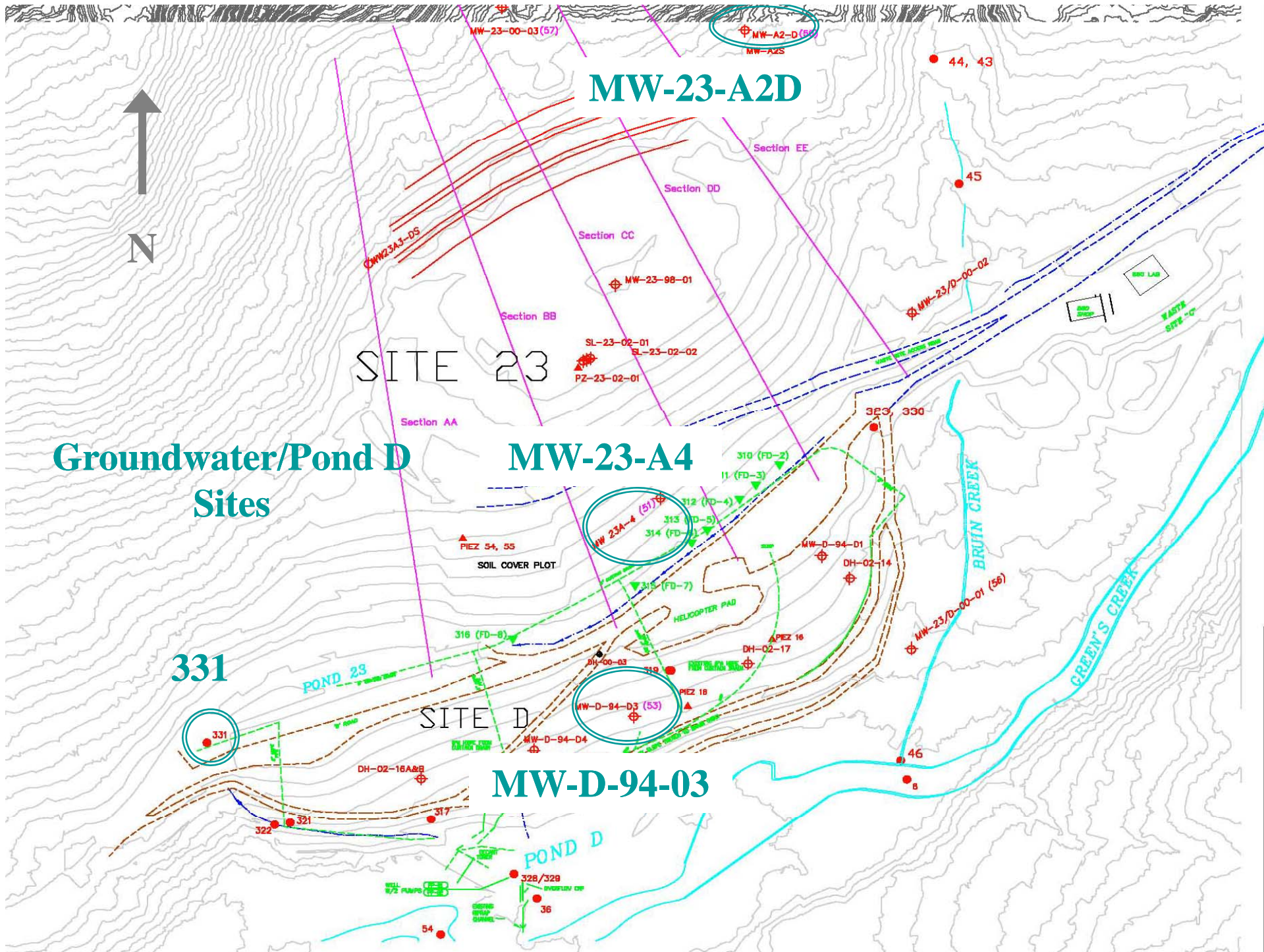


# Figure 3.17a Site 23 Finger Drains Conductivity



# Figure 3.20a Site 23 Finger Drains Dissolved Zinc





**Groundwater/Pond D Sites**

**MW-23-A2D**

**SITE 23**

**MW-23-A4**

**331**

**SITE D**

**MW-D-94-03**

**POND 23**

**POND D**

**BRUIN CREEK**

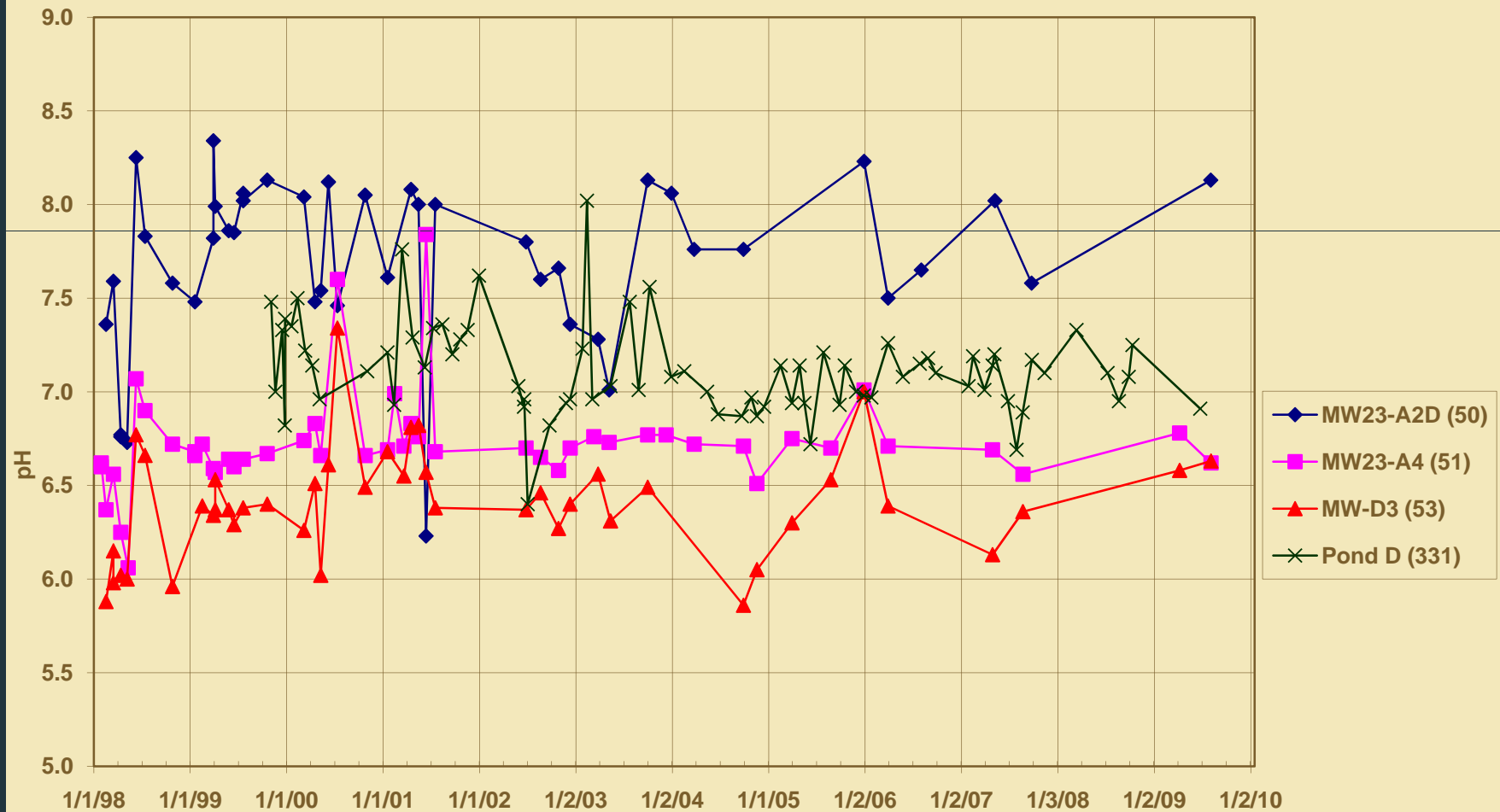
**GREEN'S CREEK**

**BRU LAB**

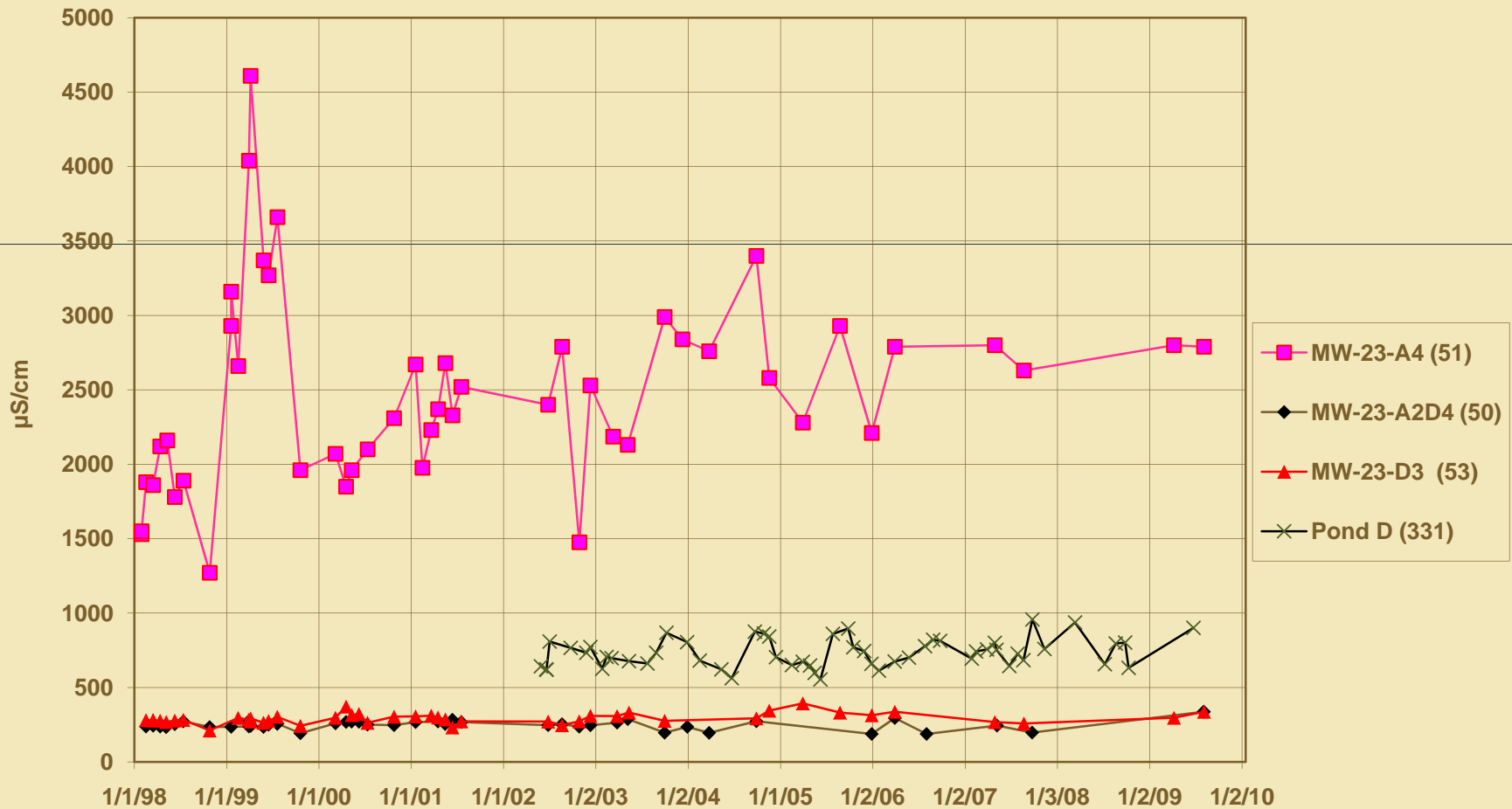
**WASTE SITE - C**



# Site 23/D Wells and D Pond Figure 3.14b pH



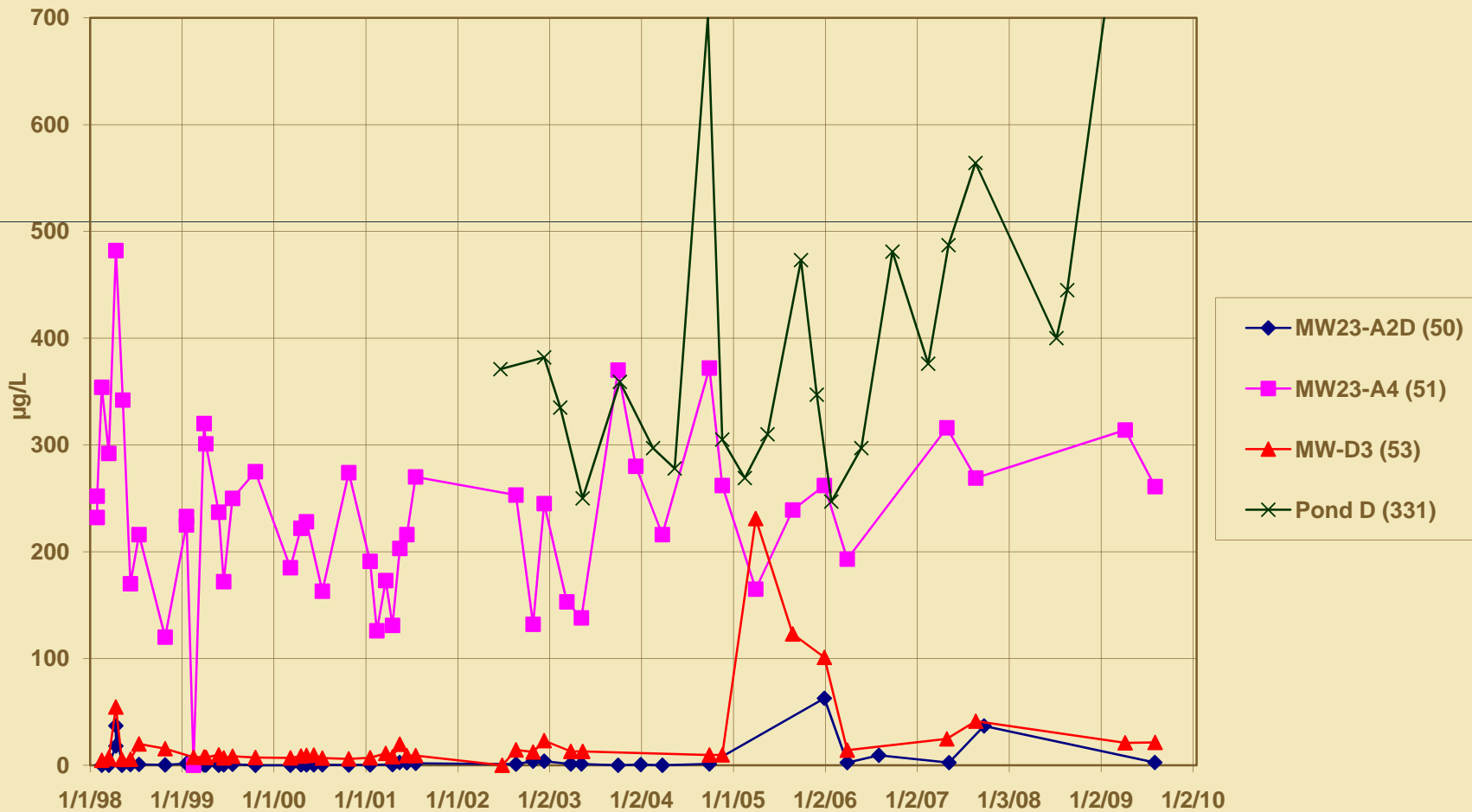
# Site 23/D Wells and D Pond Figure 3.17b Conductivity



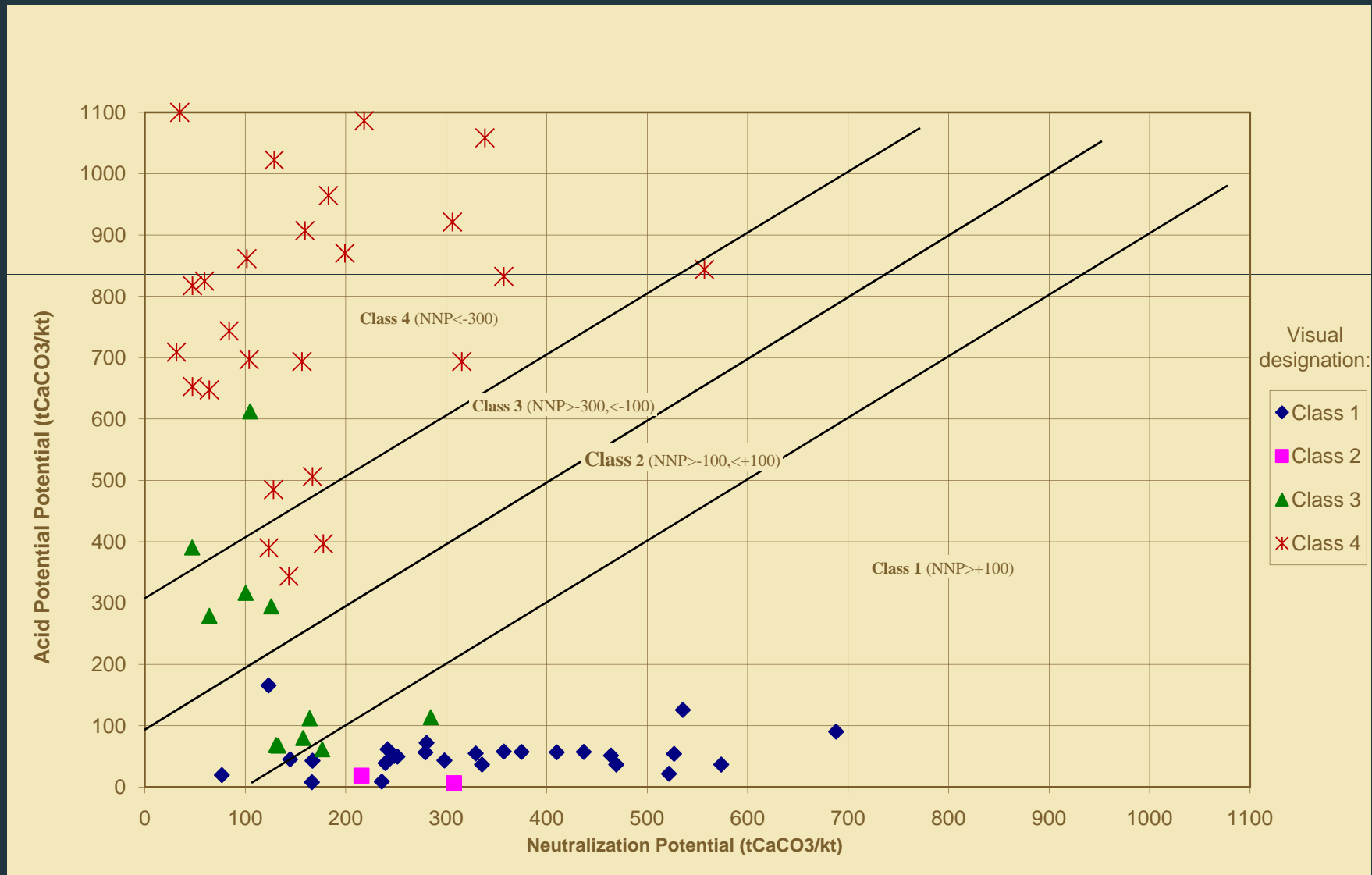


# Site 23/D Wells and D Pond Figure 3.20b Dissolved Zinc

(6/25/09, 980)



# Figure 3.28 ABA Data Underground Rib Sampling



# Site 23/D General Site Management



- Designated placement zones are marked on the active lift of the site and production rock is placed according to class
- Outer surfaces have at least two feet of Class 1 rock
- Class 2 and 3 rock are blended and placed in the center of the pile
- Use of interim storage area for reclamation activities
  - 1350
  - B Pond berm
  - Pipeline excavation
  - D Pond berm

# Cover Design



Growth Medium

Capillary Break

Barrier Layer

Capillary Break

2 meters

# Site 23 Cover Excavation

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# Site 23 Cover Excavation

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# Cover Performance Monitoring



- Greater than 85% water saturation in barrier layer minimizes oxygen ingress
- Water percolation through barrier layer 15-20% of annual precipitation
- Barrier layer does not freeze during the winter
- About 85% of the water collected in the chalet trench system reported via the upper capillary break, 15% from growth medium.
- The lag time between peak precipitation and peak trench flow is about 6 hours for dry conditions and 2 hours for wet conditions
- Modeling with Hydrus-2D/3D software compares favorably with field results
- Numerical modeling of alternative cover designs indicates that the upper capillary break is necessary to maximize lateral flow and prevent buildup of head pressures in the growth medium and barrier layer
- OSU vegetation assessment expected 2010

# D Pond Berm Replacement 2009

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# Site E Removal Activities 2009

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# 960 Site Waste Rock Removal

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# 960 Site Waste Rock Removal



<b>Site 347</b>		<b>Before Removal</b>	<b>After Removal</b>	<b>After Removal</b>
<b>Parameter</b>	<b>Unit</b>	<b>9/12/95</b>	<b>9/28/06</b>	<b>8/17/09</b>
<b>pH</b>	s.u	6.1	7.6	7.5
<b>Sulfate</b>	mg/l (tot)	1300	161	230
<b>Calcium</b>	mg/l (diss)	412	64	102
<b>Magnesium</b>	mg/l (diss)	164	21	28
<b>Iron</b>	mg/l (diss)	5.5	0.2	<.027
<b>Manganese</b>	mg/l (diss)	7.1	0.4	0.272
<b>Zinc</b>	mg/l (diss)	11	0.1	0.054
<b>Lead</b>	mg/l (diss)	0.004	<0.0001	.00008
<b>Nickel</b>	mg/l (diss)	0.3	0.005	0.007