
Hecla
GREENS CREEK

2009 Annual Tailings Report

Hecla MINING COMPANY

Presentation Outline

- Placement data
- Stability
  - Compaction
  - Inspections
- Water level data
- Precipitation data
- Water quality at internal monitoring sites
- Snow sample results
- Sulfate Reduction Monitoring Program (SRMP) update
- ABA data
- General site management

2009 Satellite Photo

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2009 Pit 5 Looking Northwest

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Table 2.1 Tailings Placement Data

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	All Materials	All Materials Cumulative	All Materials	All Materials Cumulative	Rock from Site 23	All Other Materials	Tailings
	yd^3	yd^3	tons	tons	tons	tons	tons
	survey	survey	calculated	calculated	truck count	truck count	calculated
2008	201,658	2,850,140	365,344	5,163,598	25,679	62,395	277,270
2009	227,817	3,078,657	412,736	5,577,603	16,117	90,584	306,035

Tons calculated at 134.2 pounds per cubic foot for tailings
Remaining capacity: 4 million tons

Tailings Facility Stability Compaction

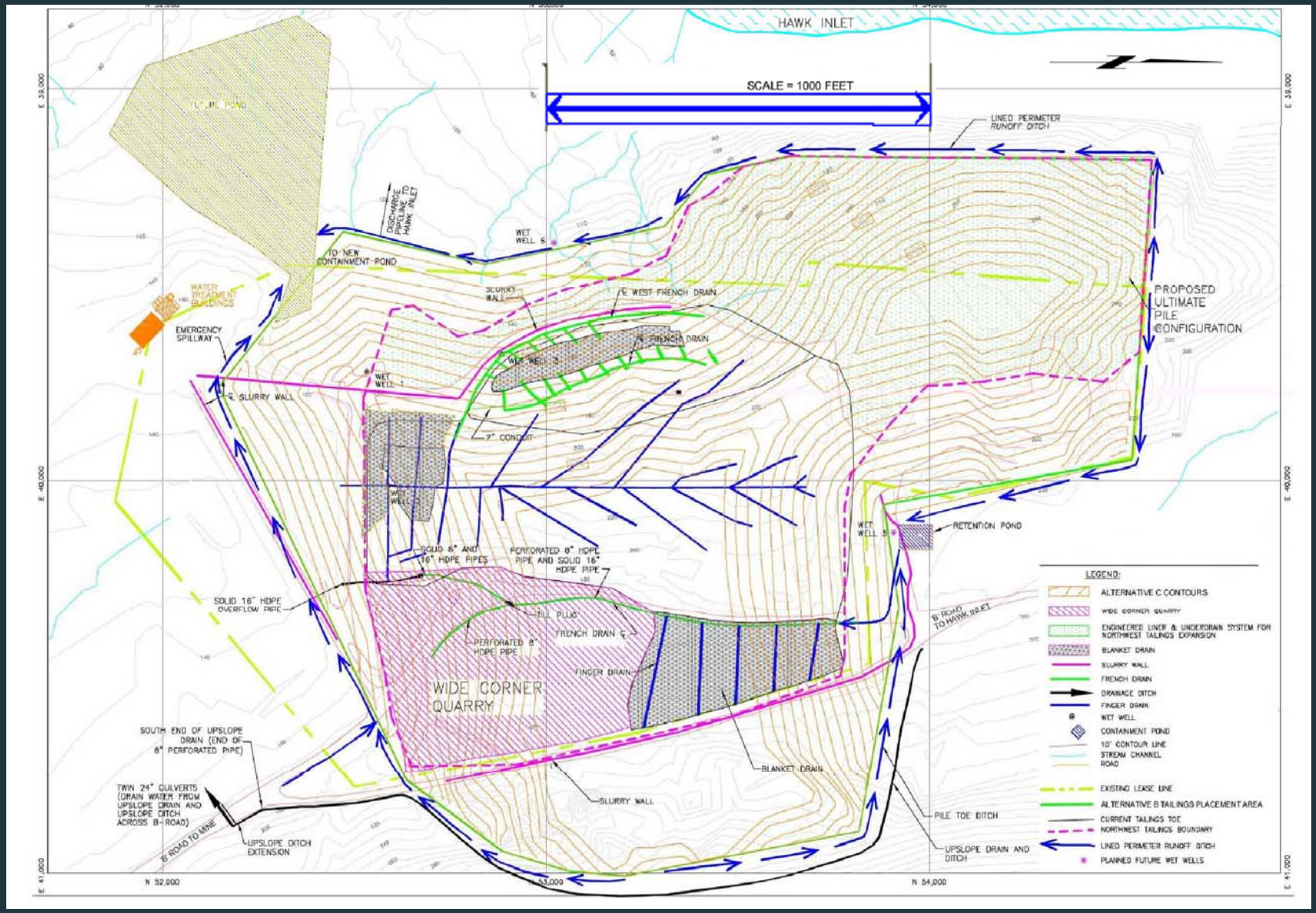
Hecla MINING COMPANY

- High degree of achieving >90% compaction
- Average dry density: 141 pcf
- Average Standard Proctor dry density: 146 pcf
- Average optimum percent moisture: 11.8%
- HGCMC on-site lab 1-point Proctors
  - Average dry density: 146 pcf
  - Average percent moisture: 11.5%

Tailings Facility Stability - Inspections

- Results of operator, engineering, environmental department and regulatory inspections revealed no signs of instability
- Agency Inspections
  - USFS - 12
  - ADEC - 5

Tailings Facility Water Controls
(2003 EIS)



Tailings Facility Monitoring Well and Piezometer Water Level Data

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- Maximum saturated thickness 35 feet
- Toe foundations are well drained
- Water perches approximately 12 feet above the unsaturated underdrains

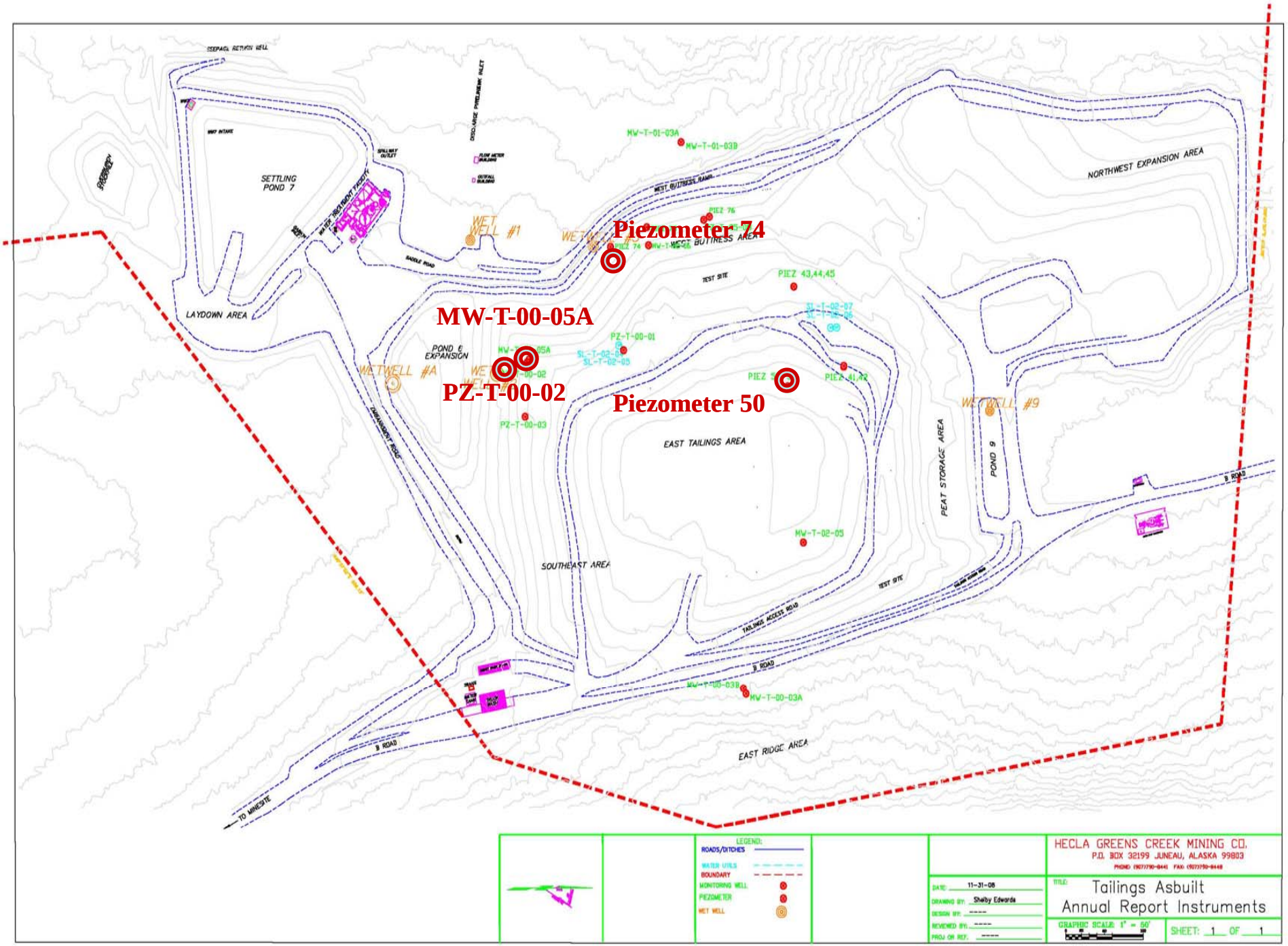
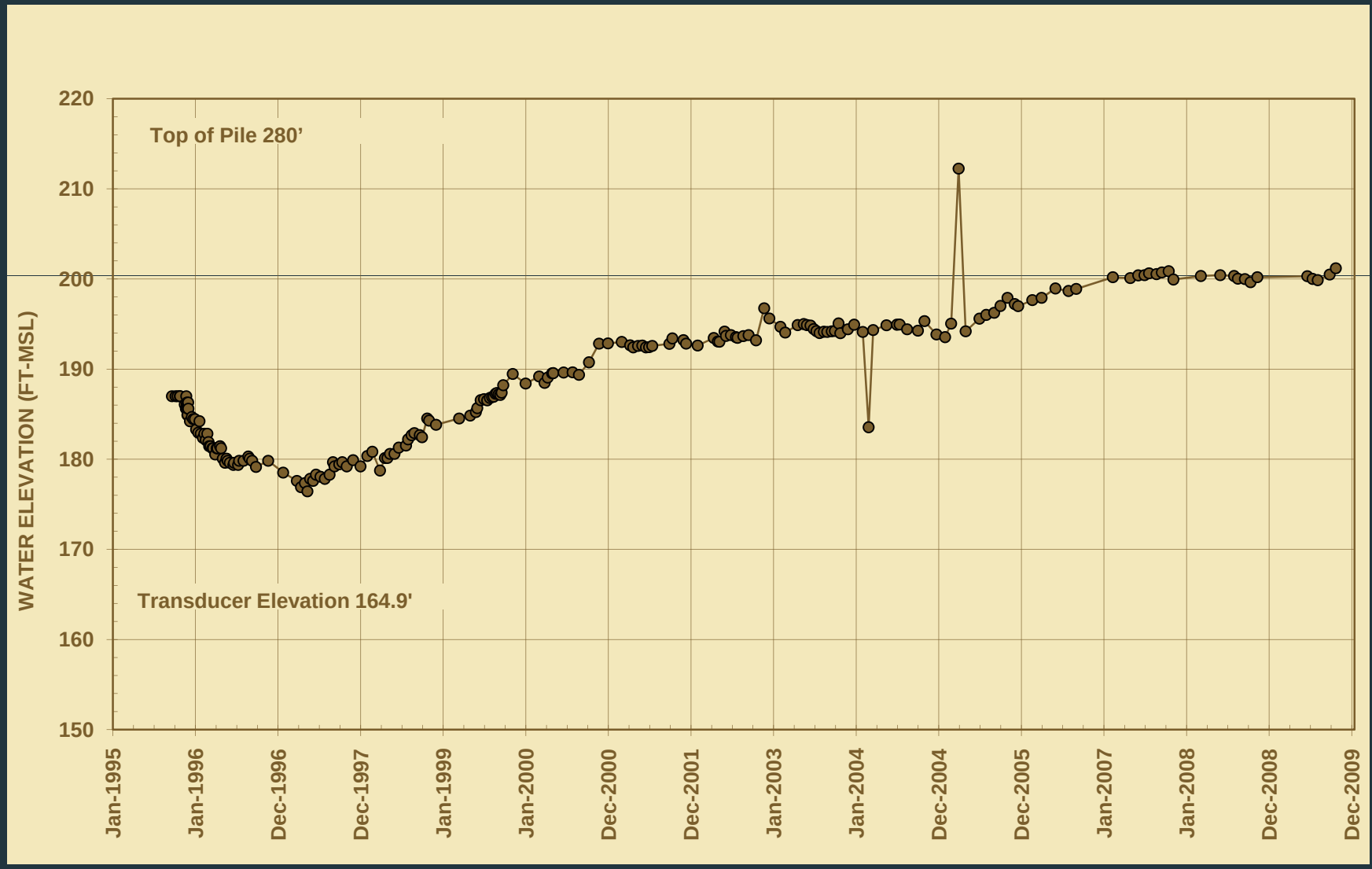

Piezometer 74
MW-T-00-05A
PZ-T-00-02
Piezometer 50
SETTLING POND 7
LAYDOWN AREA
POND 6 EXPANSION
WET WELL #1
WETWELL #A
WETWELL #9
WEST BUTTRESS AREA
NORTHWEST EXPANSION AREA
EAST TAILINGS AREA
SOUTHEAST AREA
EAST RIDGE AREA
PEAT STORAGE AREA
POND 9
B ROAD
TAILINGS ACCESS ROAD
SADDLE ROAD
TEST SITE
PIEZ 43,44,45
PIEZ 41,42
MW-T-01-03A
MW-T-01-03B
MW-T-00-03B
MW-T-00-03A
MW-T-02-05
PZ-T-00-01
PZ-T-00-03
SEEPAGE RETURN WELL
DISCHARGE PIPELINE/CREEK INLET
WWTP INTAKE
WWTP TREATMENT FACILITY
SPILLWAY OUTLET
FLOW METER BUILDING
OUTFALL BUILDING
DIVERSION DITCH
TO MINESITE
LEGEND:
ROADS/DITCHES
WATER LEVELS
BOUNDARY
MONITORING WELL
PIEZOMETER
WET WELL
HECLA GREENS CREEK MINING CO.
P.O. BOX 32199 JUNEAU, ALASKA 99803
DATE: 11-31-08
DRAWING BY: Shelby Edwards
DESIGN BY:
REVIEWED BY:
PROJ OR REF:
TITLE:
Tailings Asbuilt
Annual Report Instruments
GRAPHIC SCALE: 1" = 50'
SHEET: 1 OF 1

Figure 2.6 Water Level Data for Piezometer 50



PZ-T-00-02 and MW-T-00-05A Data Figures 2.12 and 2.14

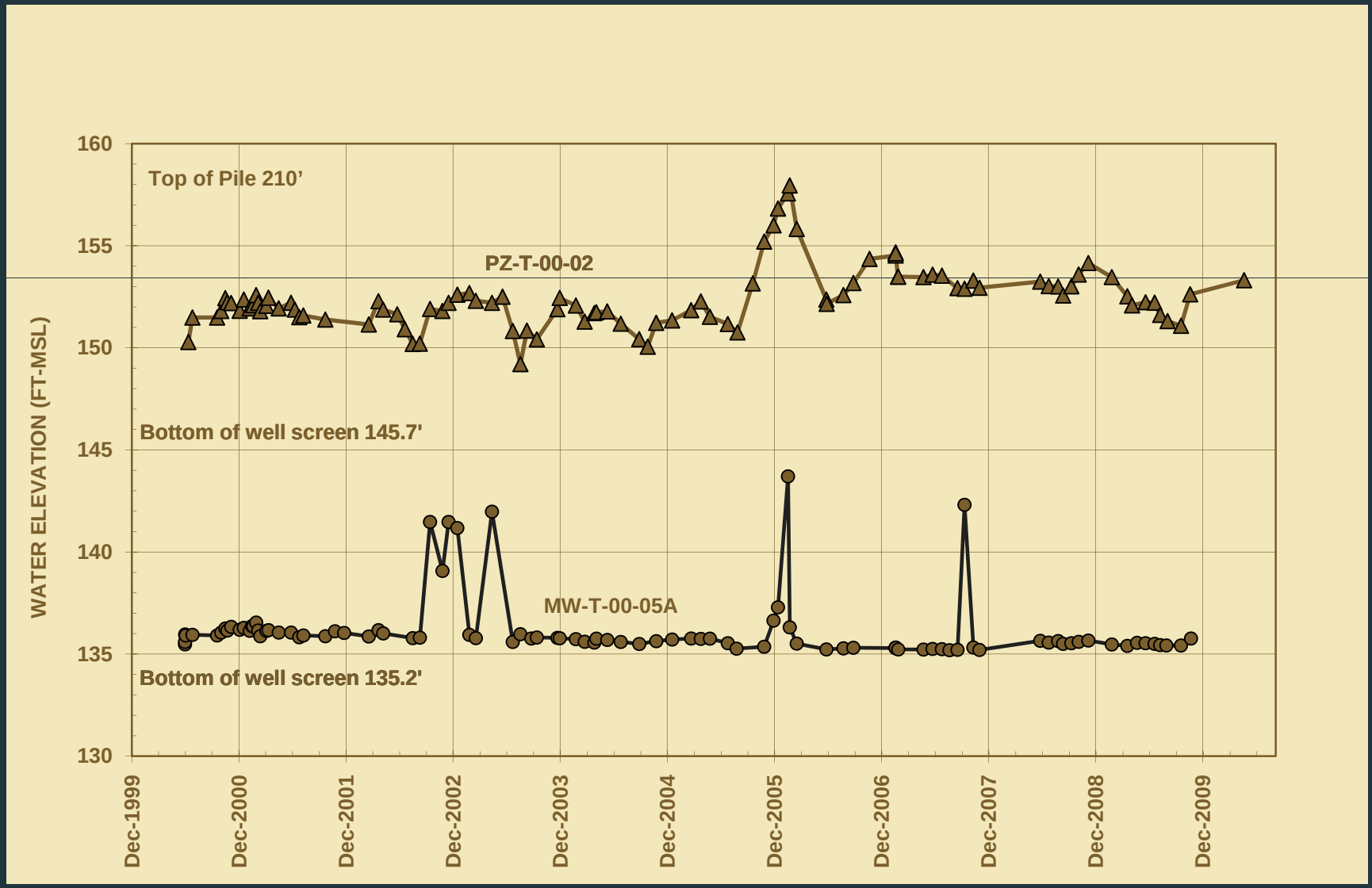


Figure 2.8 Water Level Data for Piezometer 74

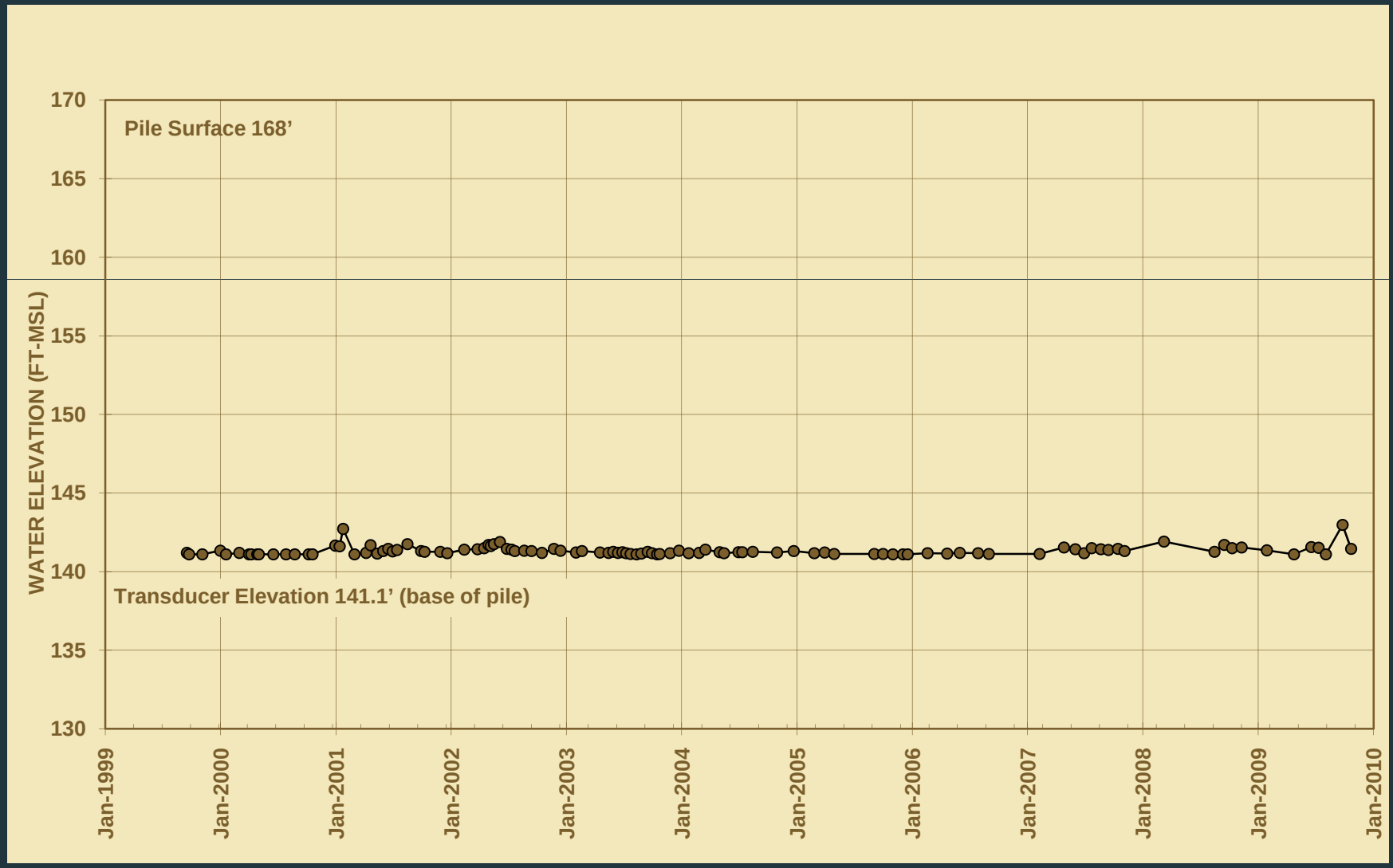


Table 2.4 Monthly Summary of Tailings Area Climate Data

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Month	Avg Temp (°C)	Precipitation (in)
January	-3.1	4.5
February	-1.3	2.2
March	-0.6	1.9
April	3.6	1.0
May	8.0	1.4
June	11.4	1.7
July	14.6	0.8
August	12.8	5.5
September	10.1	5.9
October	6.4	4.5
November	2.2	3.5
December	-0.8	2.4
2009	5.3	35.5

Tailings Facility Internal Monitoring Sites: Water Quality Data

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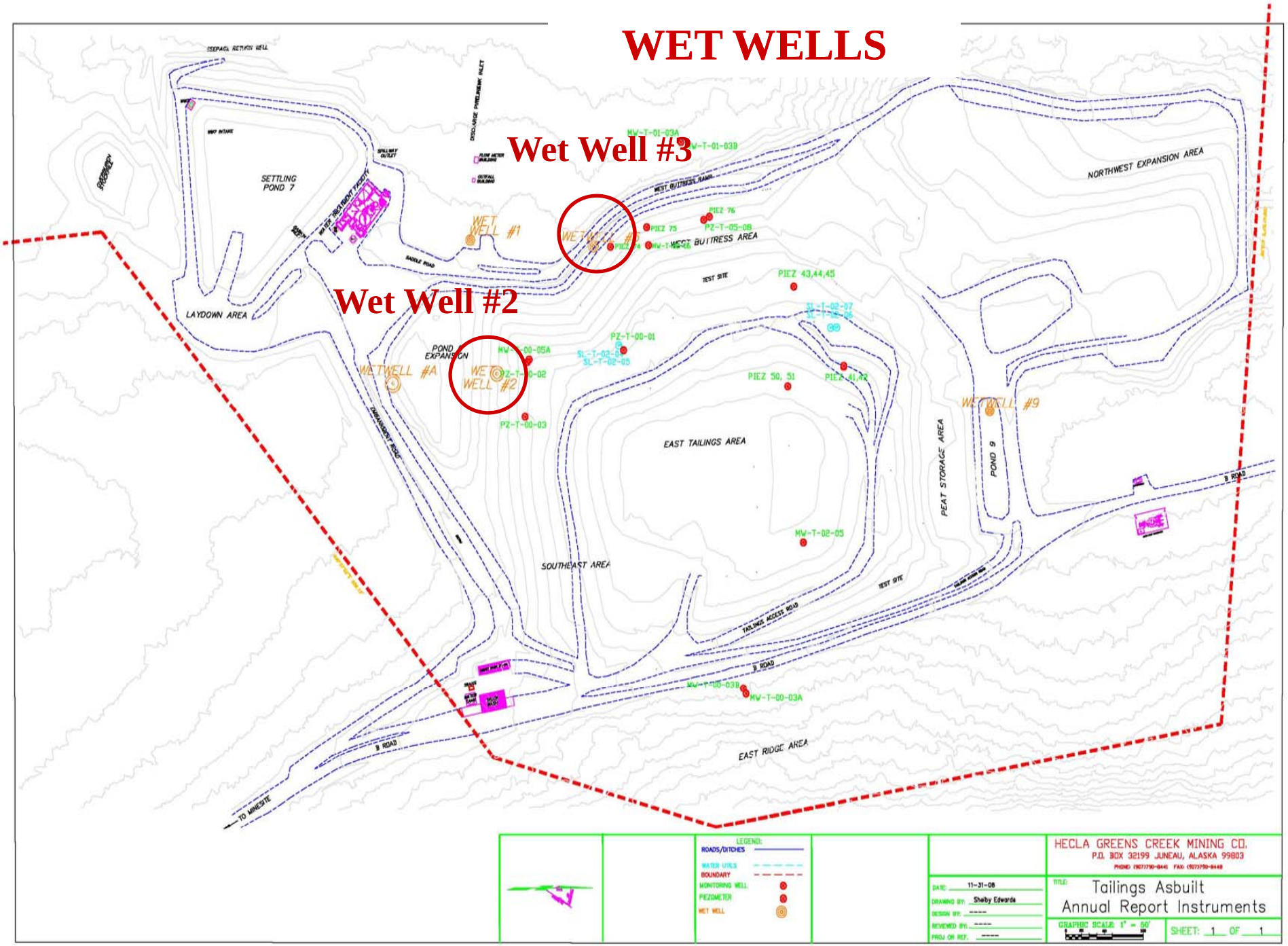
- Internal site waters captured, treated and discharged per NPDES permit
- pH between 6.0 and 8.5: Alkalinity 250 to 600 mg/L
- Conductivity in wet wells and tailings completion wells ranged from 1400 to 3700 umho/cm
- Conductivity in suction lysimeters ranged from 1400 to 6600 umho/cm
- Sulfate and hardness correlate with conductivity

Tailings Facility Internal Monitoring Sites: Water Quality Data

Hecla MINING COMPANY

- Fluctuations in saturated zone thickness and associated redox conditions influence arsenic and iron concentrations
- Zinc is considerably more mobile than other metals
- Microbial sulfate reduction and base metal sulfide precipitation produces low metal concentrations in most saturated zone wells
- Shallow unsaturated zone and WW3 have higher metal concentrations
- Iron and manganese concentrations are elevated in wet wells, groundwater, and most of the suction lysimeters due to oxidation/reduction and buffering reactions

WET WELLS


Wet Well #3
Wet Well #2
SETTLING POND 7
LAYDOWN AREA
WET WELL #1
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POND EXPANSION
WEST BUTTRESS AREA
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SOUTHEAST AREA
EAST RIDGE AREA
PEAT STORAGE AREA
POND 9
B ROAD
TAILINGS ACCESS ROAD
TEST SITE
PIEZ 43,44,45
PIEZ 50, 51
PIEZ 41,42
PIEZ 75
PIEZ 76
PZ-T-05-08
PZ-T-00-01
PZ-T-00-02
PZ-T-00-03
MW-T-00-05A
MW-T-01-03A
MW-T-01-03B
MW-T-02-05
MW-T-00-03B
MW-T-00-03A
SL-T-02-07
SL-T-02-05
TO MINESITE
LEGEND:
ROADS/DITCHES
WATER LEVELS
BOUNDARY
MONITORING WELL
PIEZOMETER
WET WELL
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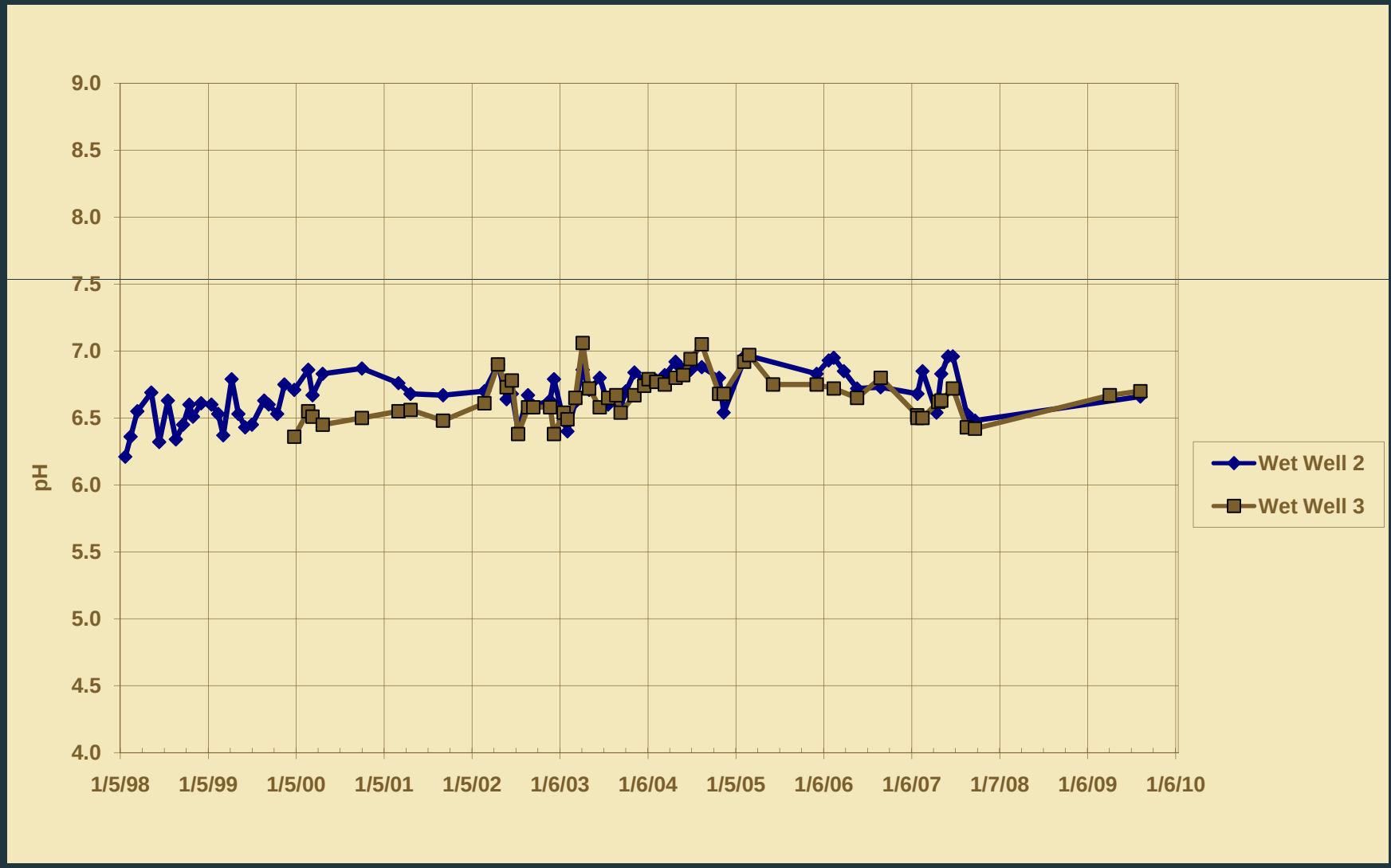
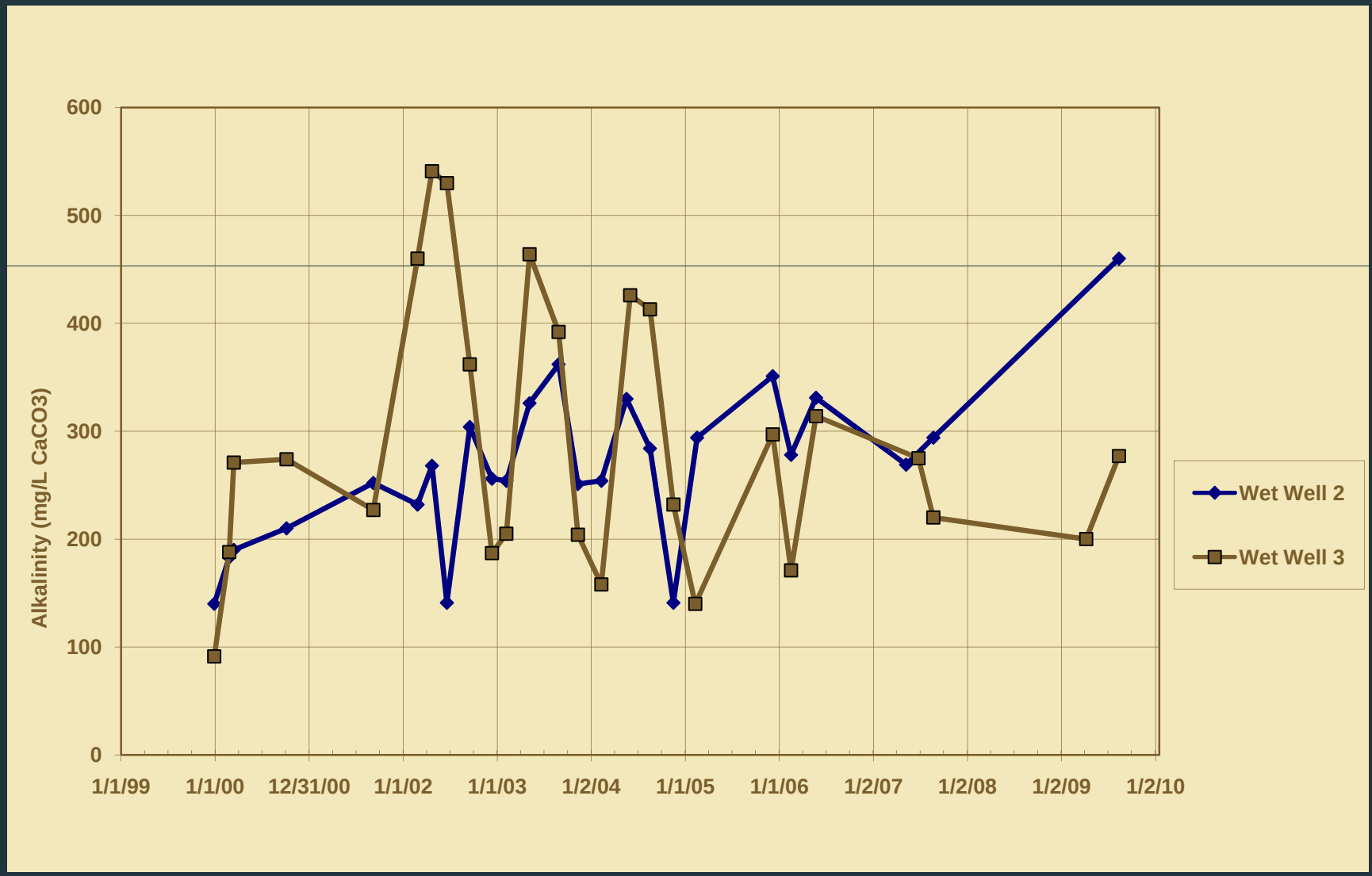
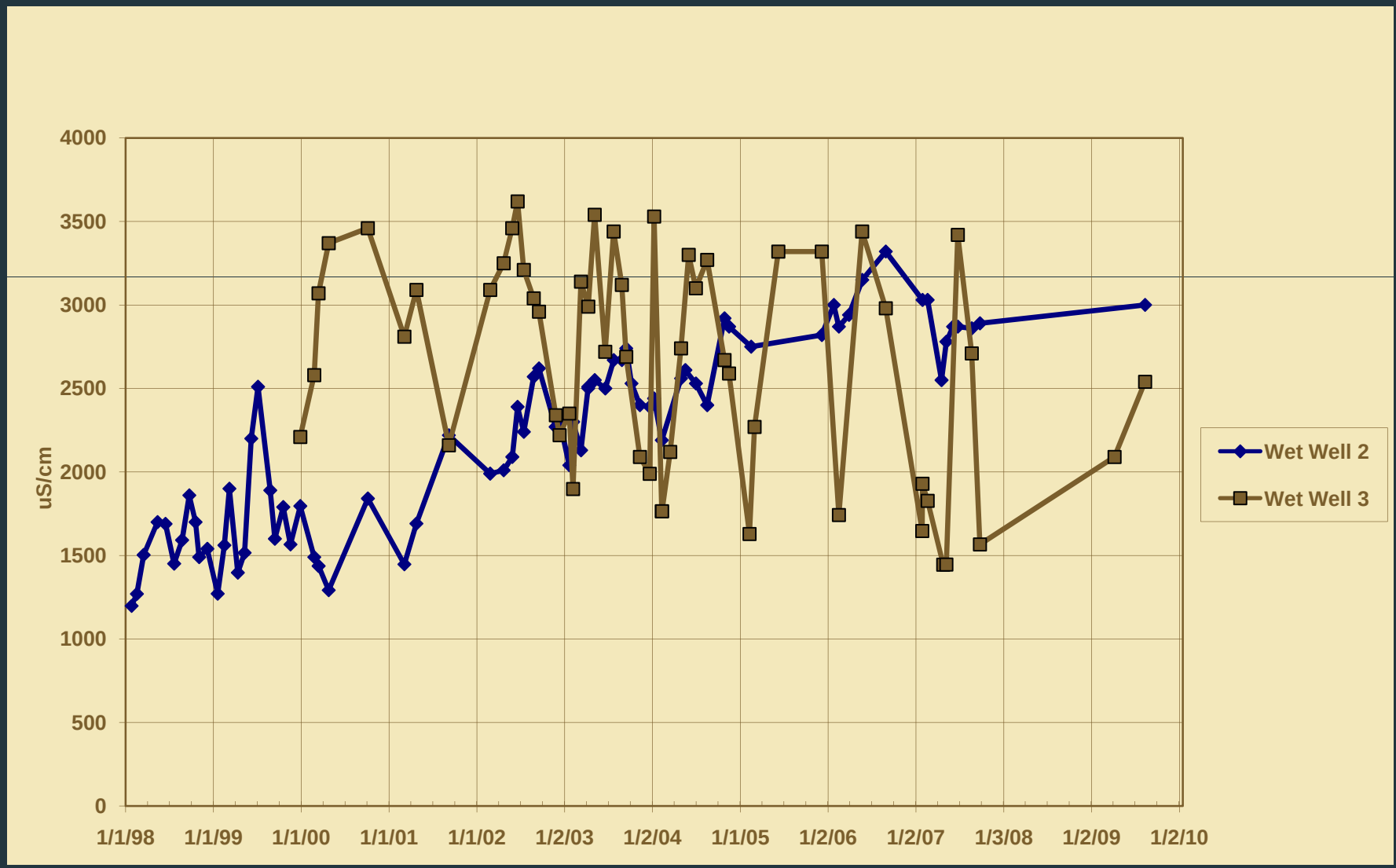
Tailings Area Internal Sites
pH - Figure 2.20a



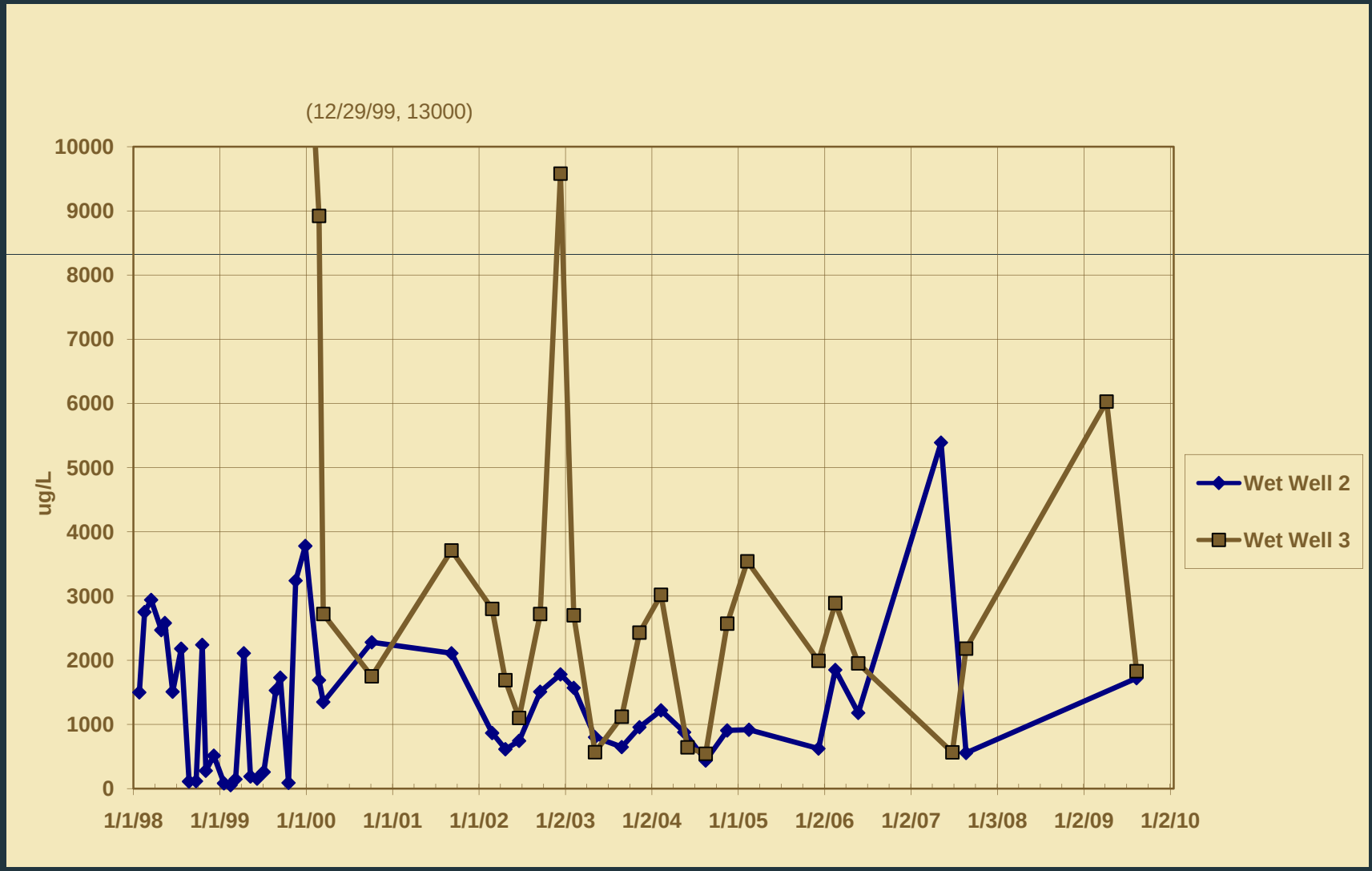
Tailings Area Internal Sites Alkalinity - Figure 2.21a



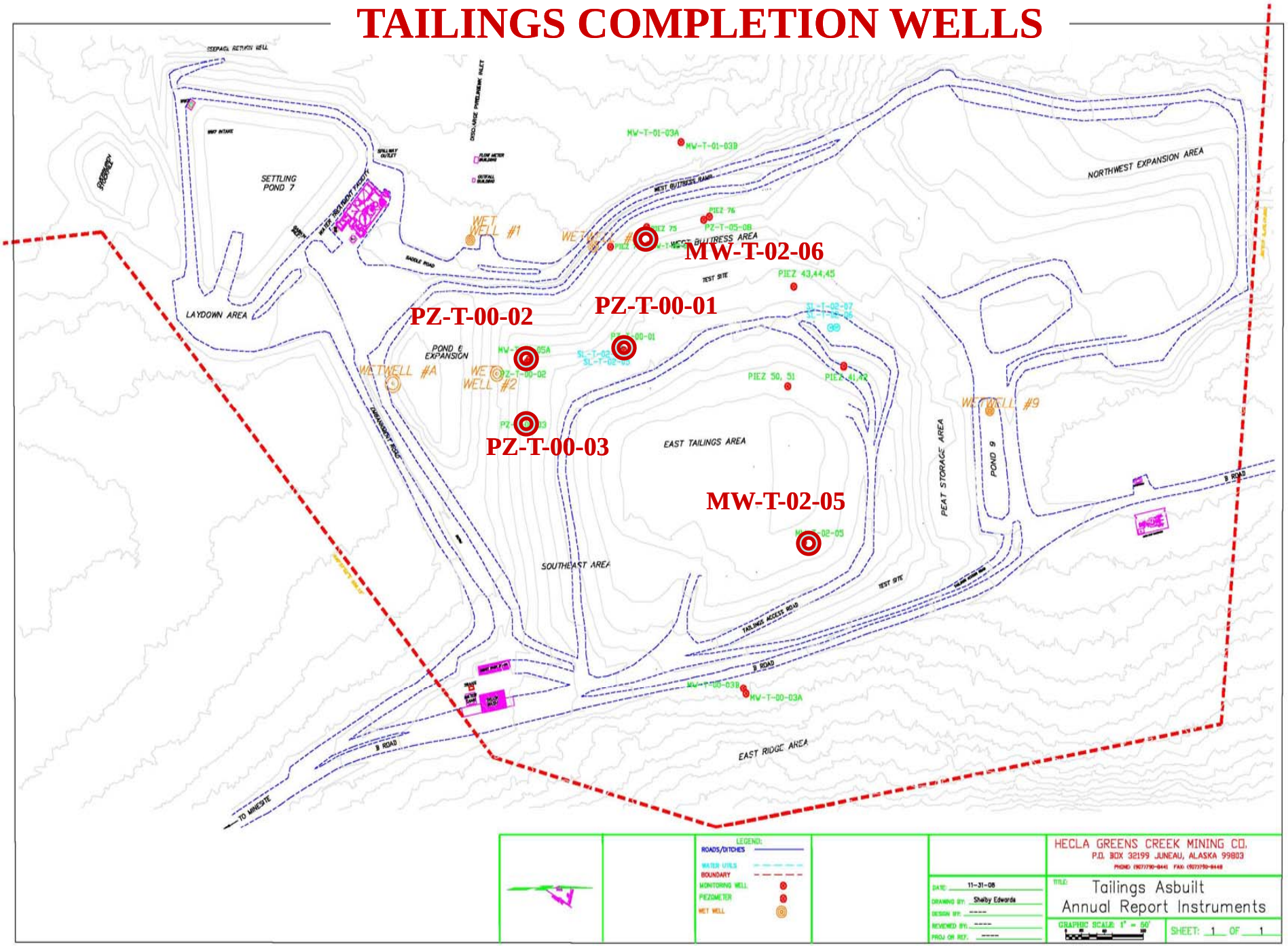
Tailings Area Internal Sites Conductivity - Figure 2.22a



Tailings Area Internal Sites
Zinc - Figure 2.26a



TAILINGS COMPLETION WELLS



Tailings Area Internal Sites pH Figure 2.20b

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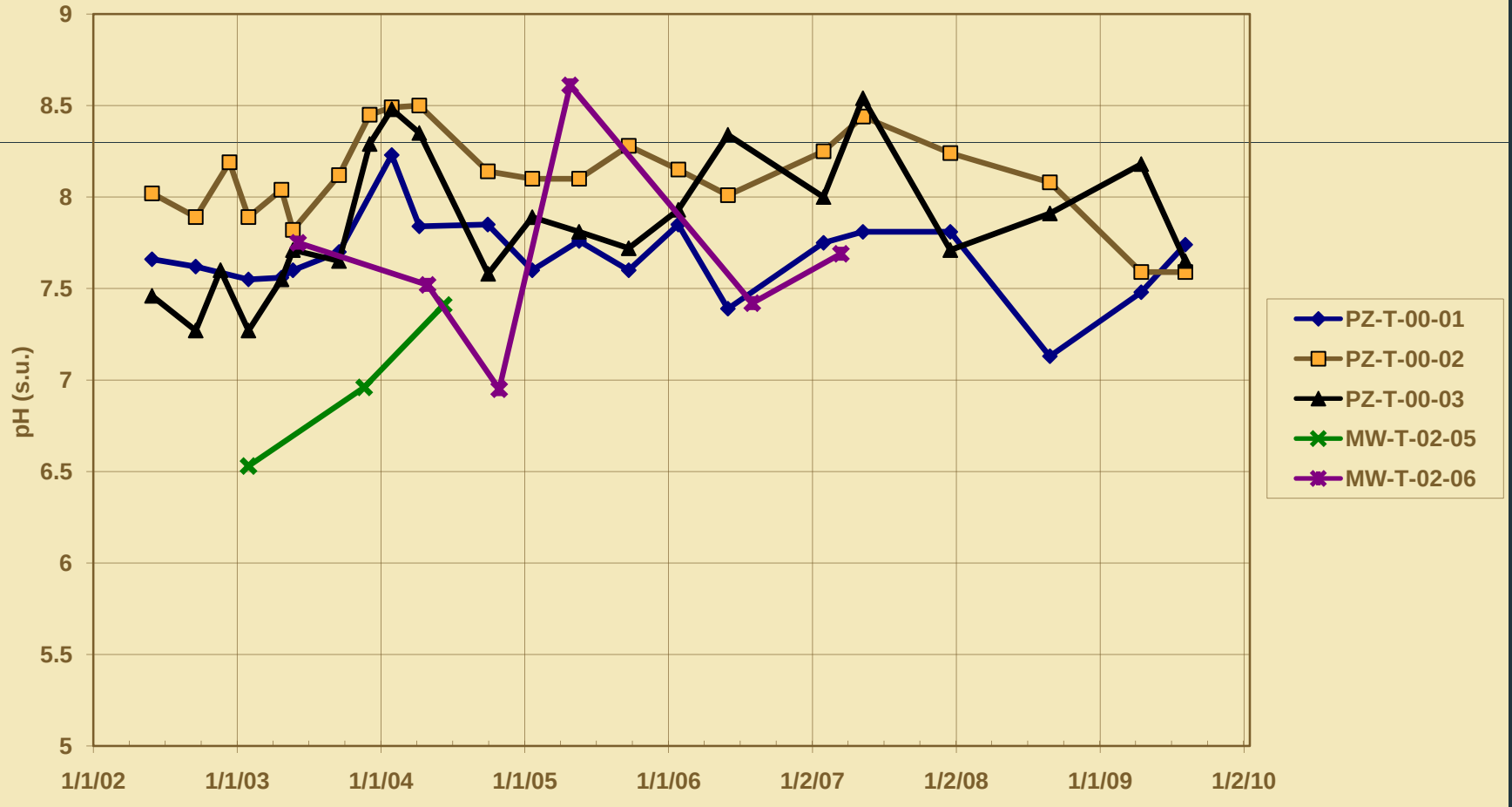
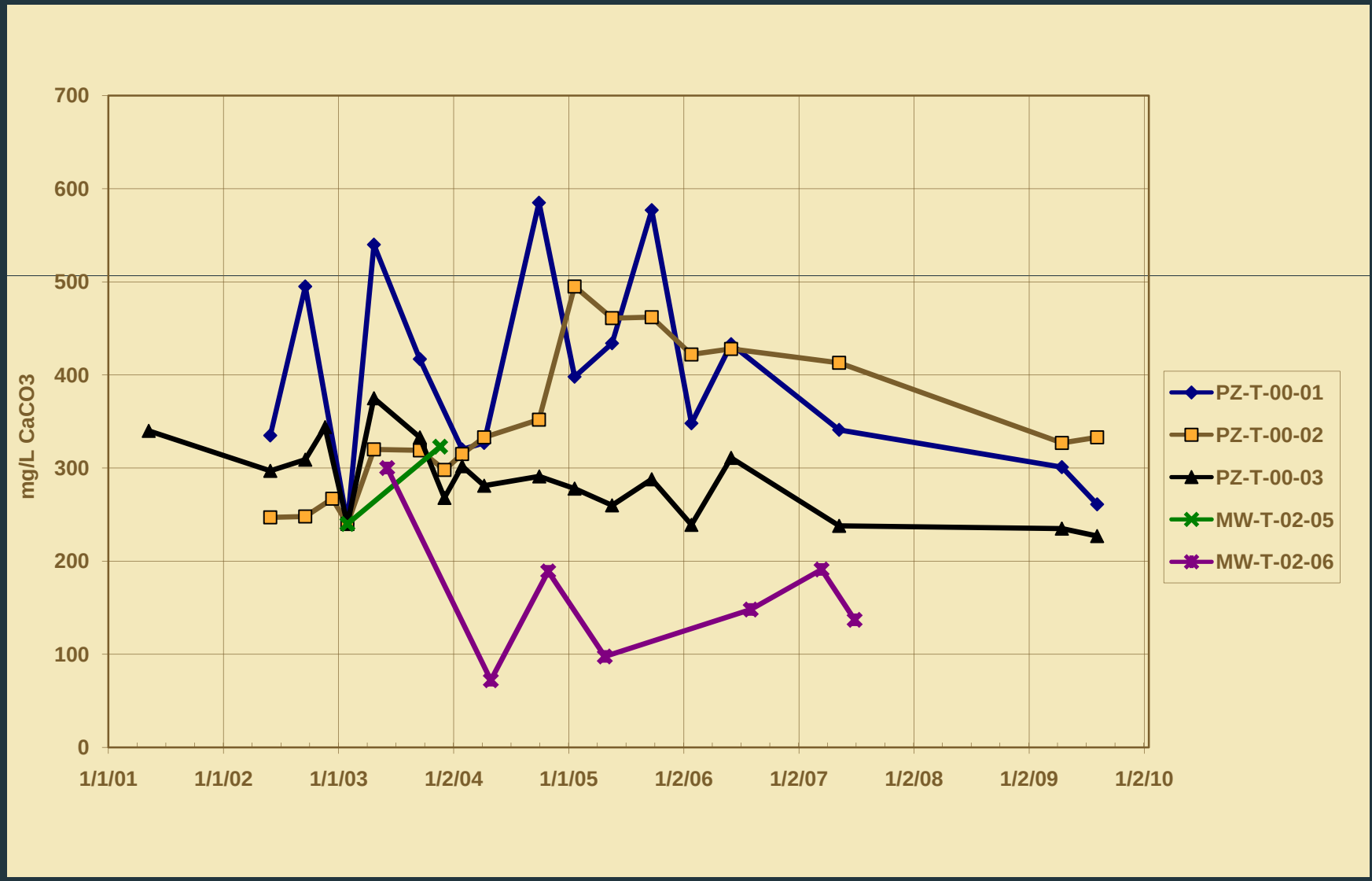
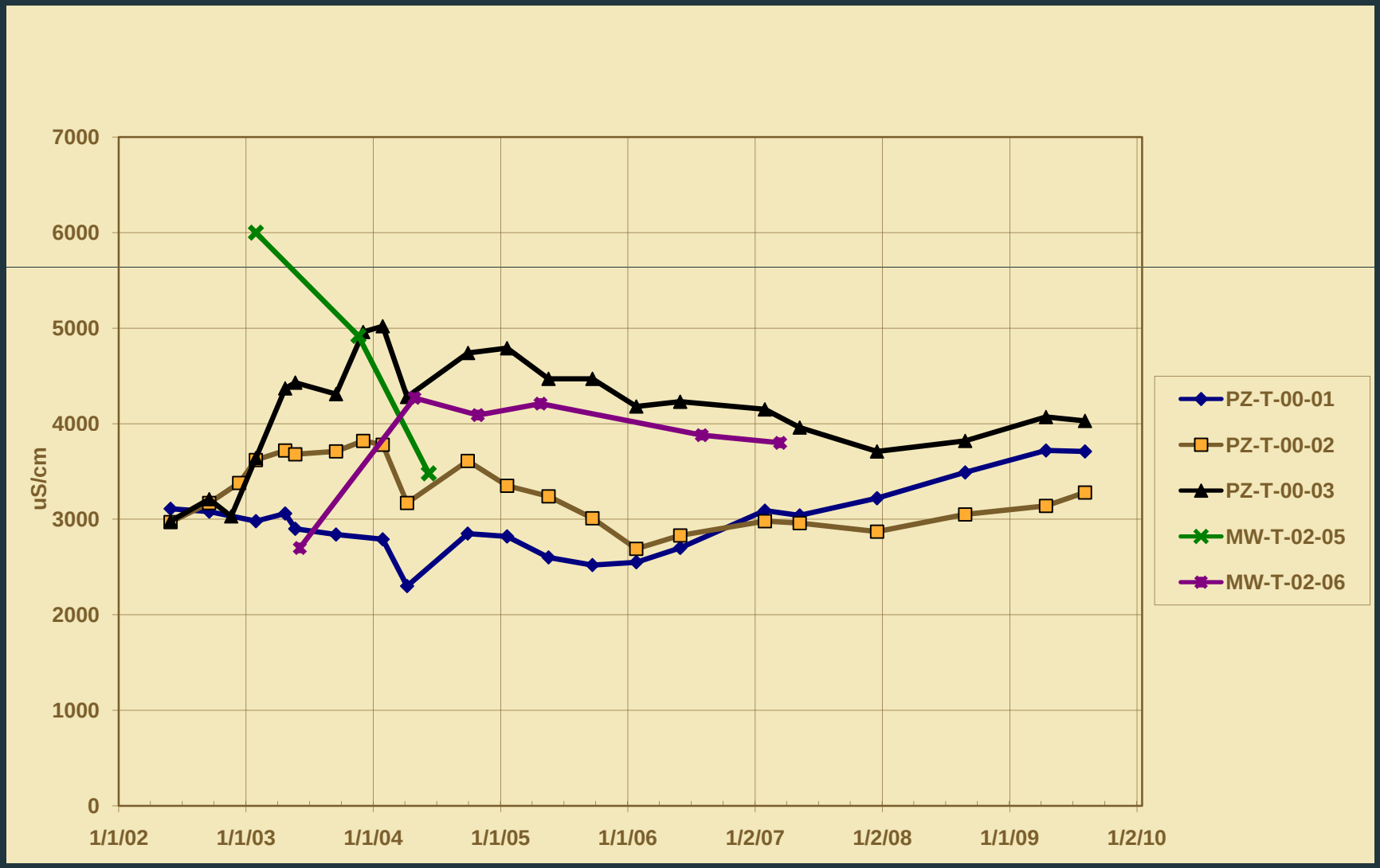
FIGURE 2.20b GREENS CREEK TAILINGS INTERNAL MONITORING SITES: TAILINGS COMPLETIONS - pH DATA



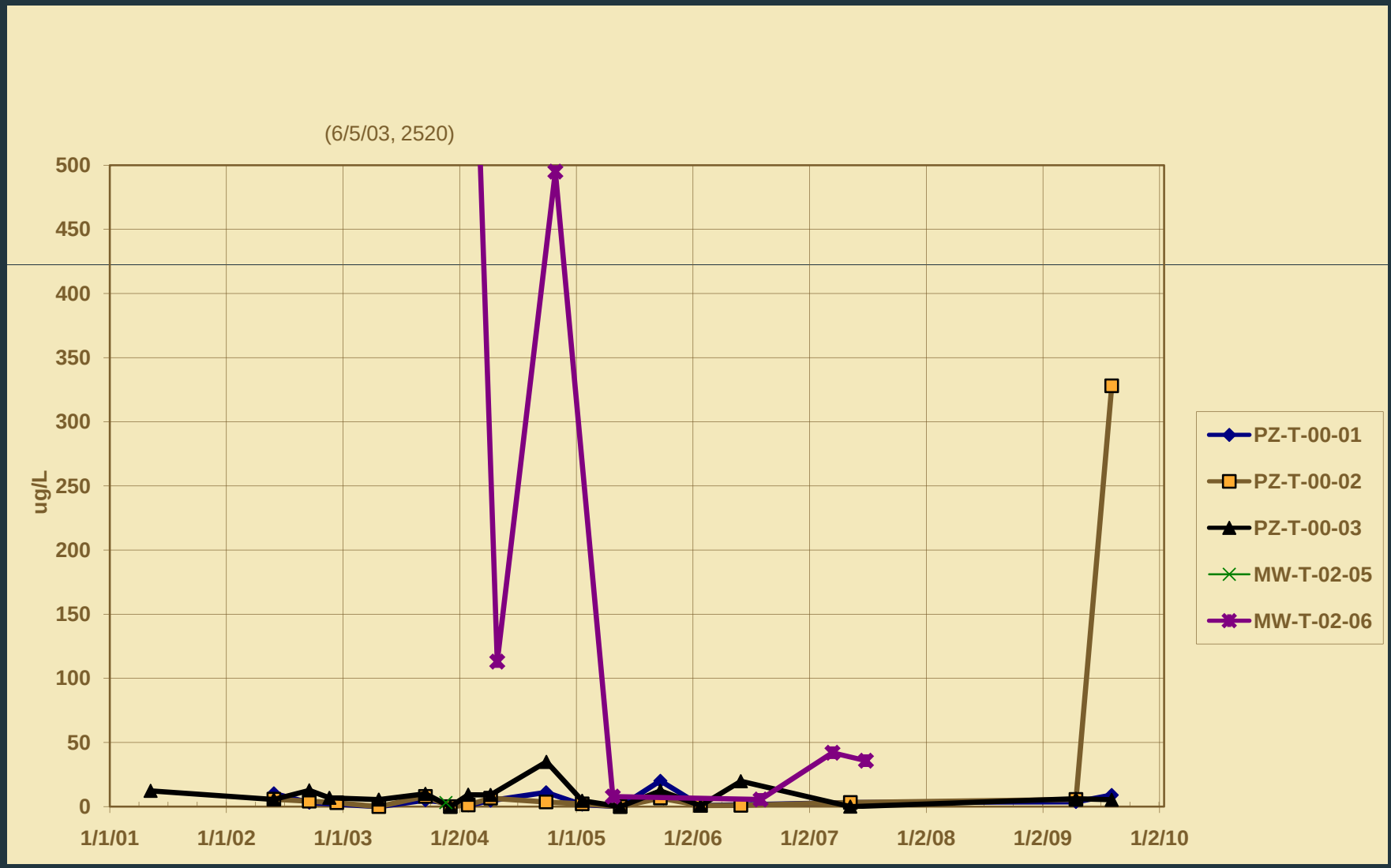
Tailings Area Internal Sites Alkalinity - Figure 2.21b



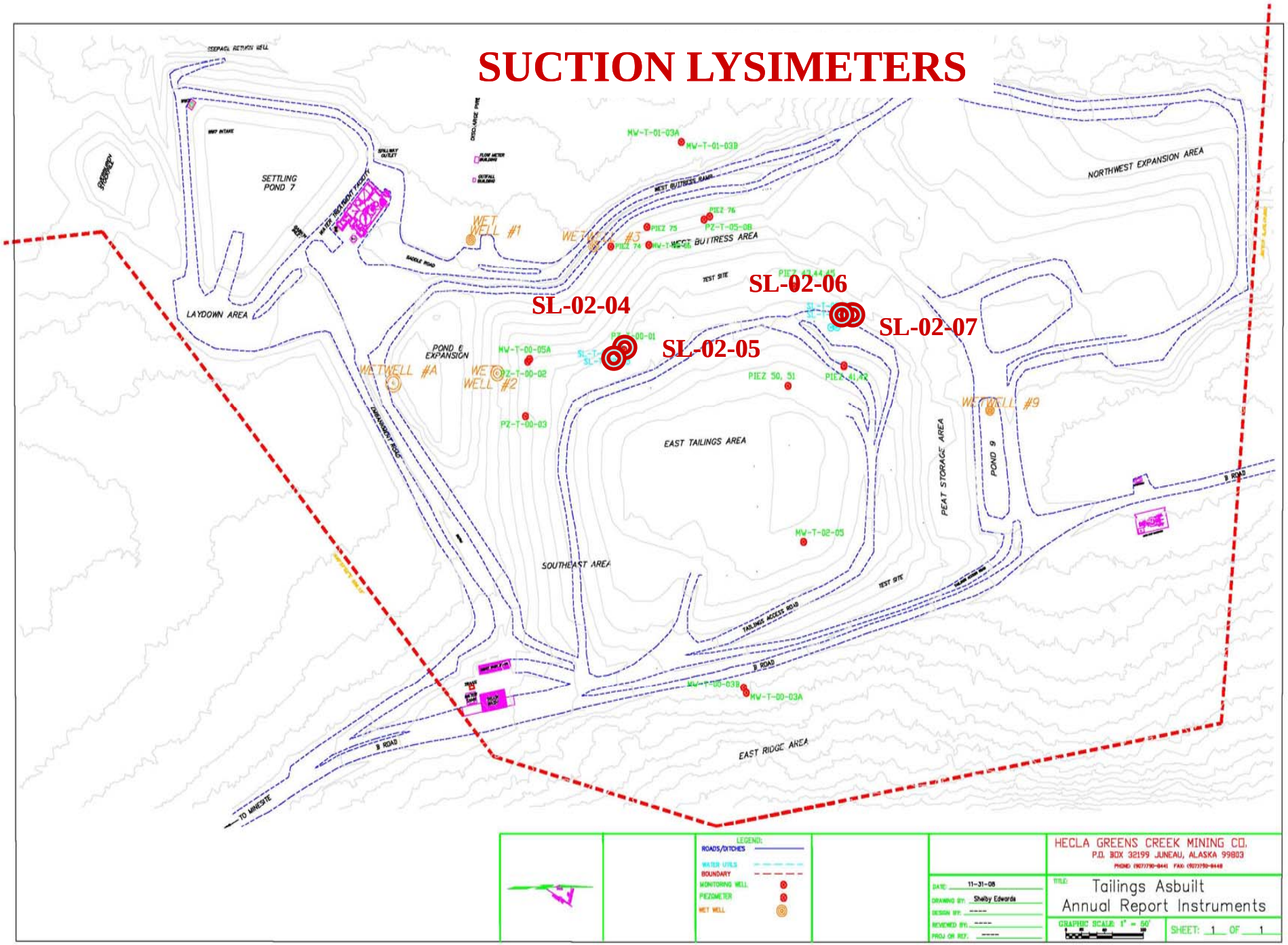
Tailings Area Internal Sites Conductivity - Figure 2.22b



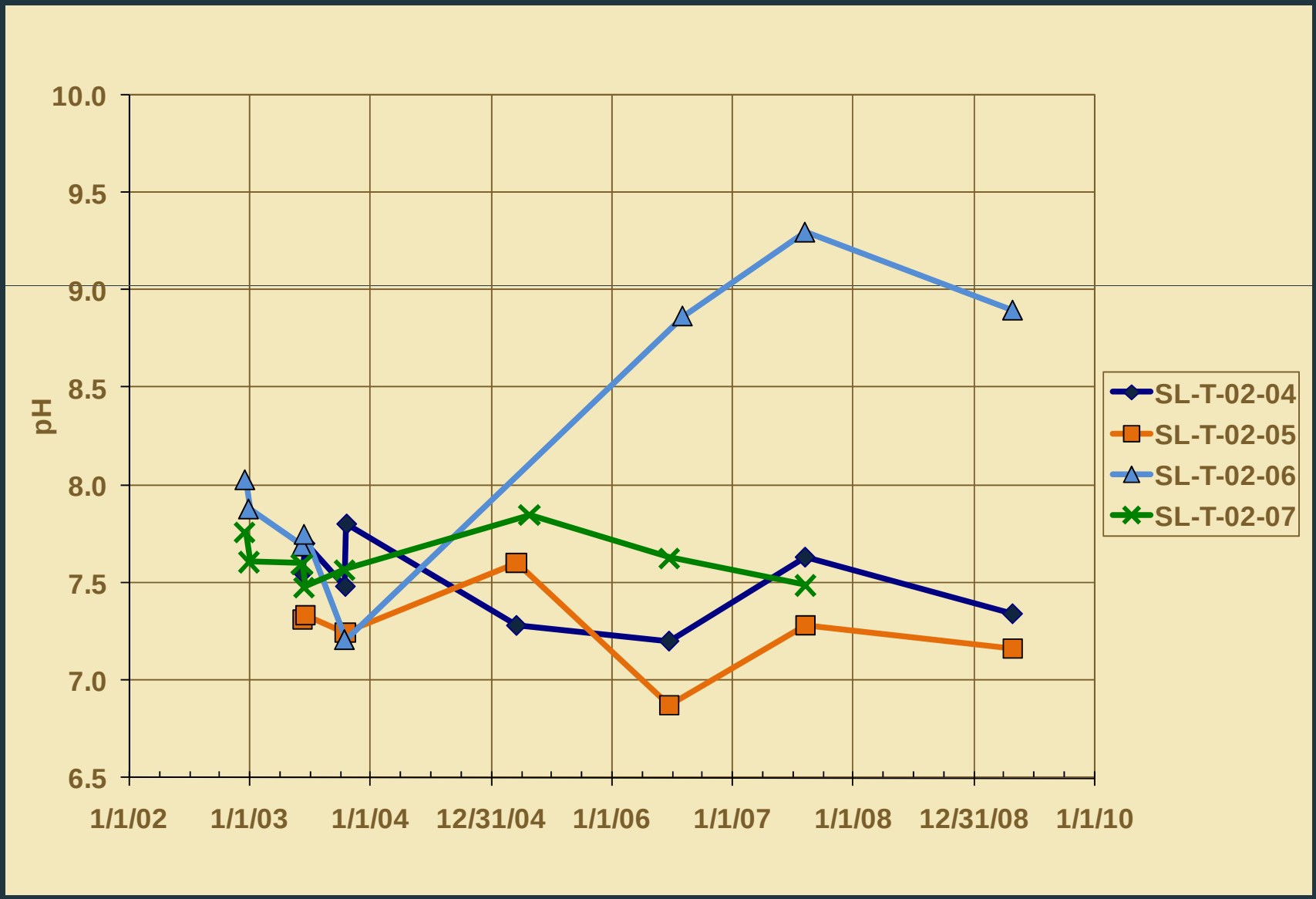
Tailings Area Internal Sites
Zinc - Figure 2.26b



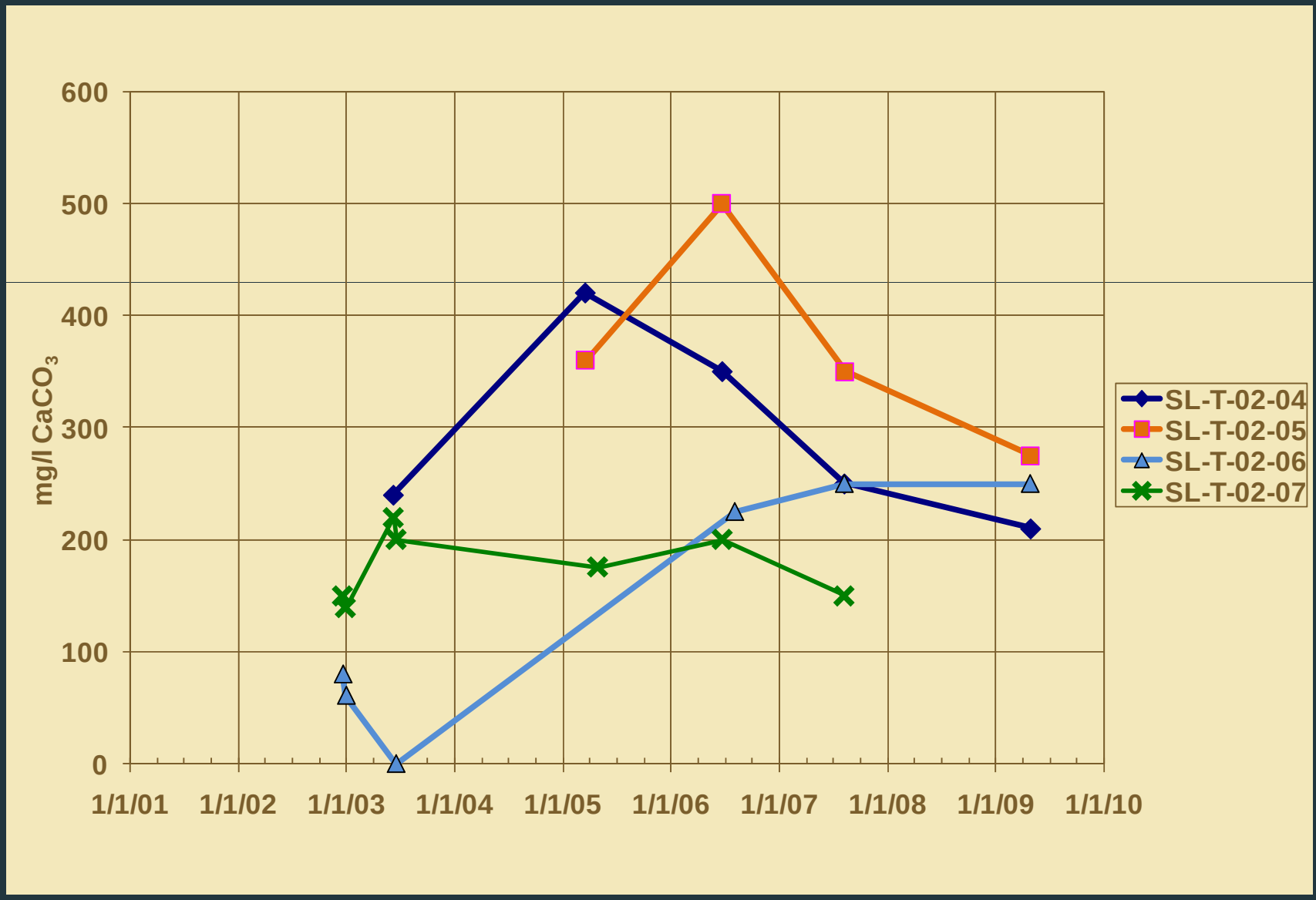
SUCTION LYSIMETERS



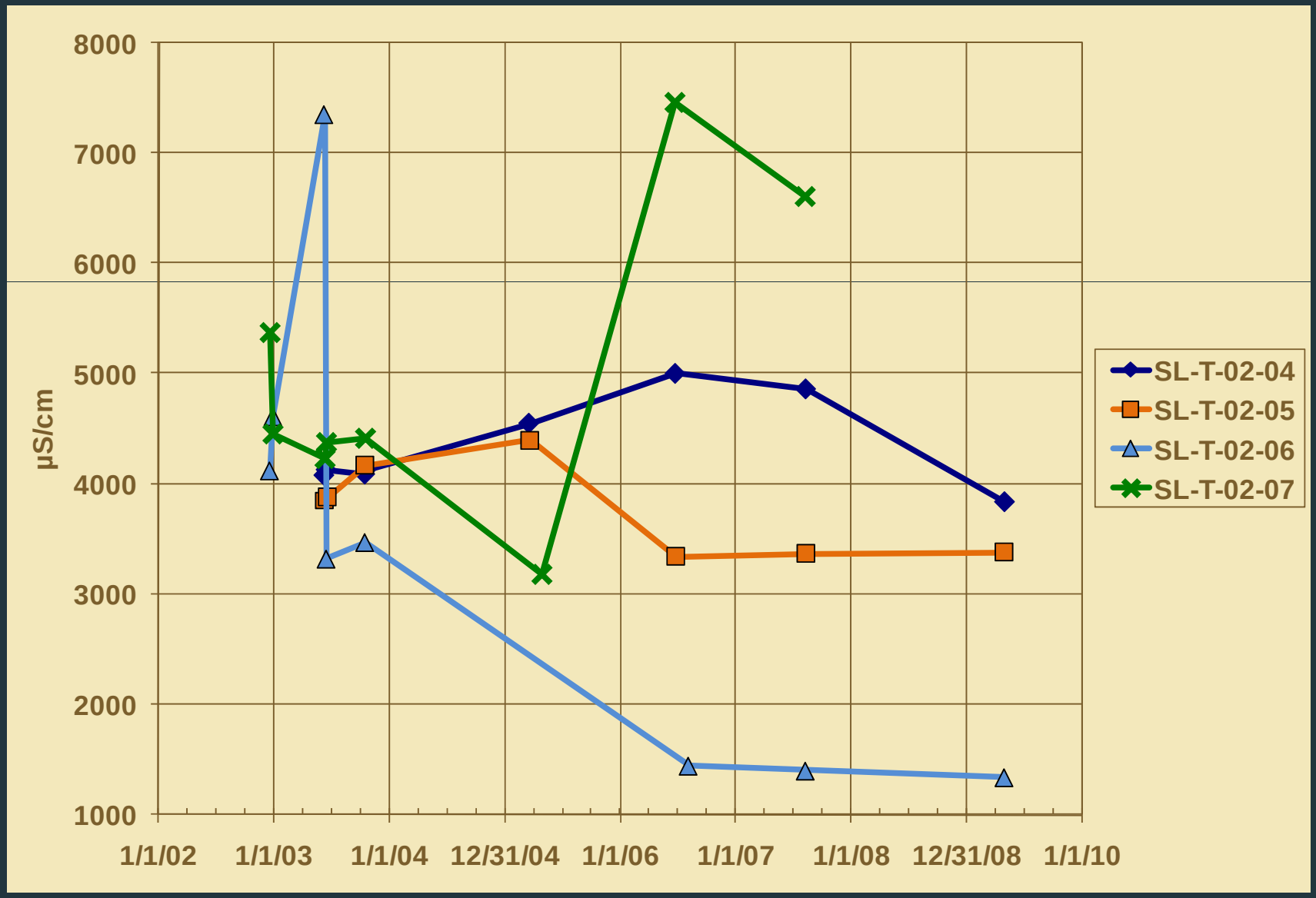
Tailings Area Internal Sites
pH - Figure 2.20c



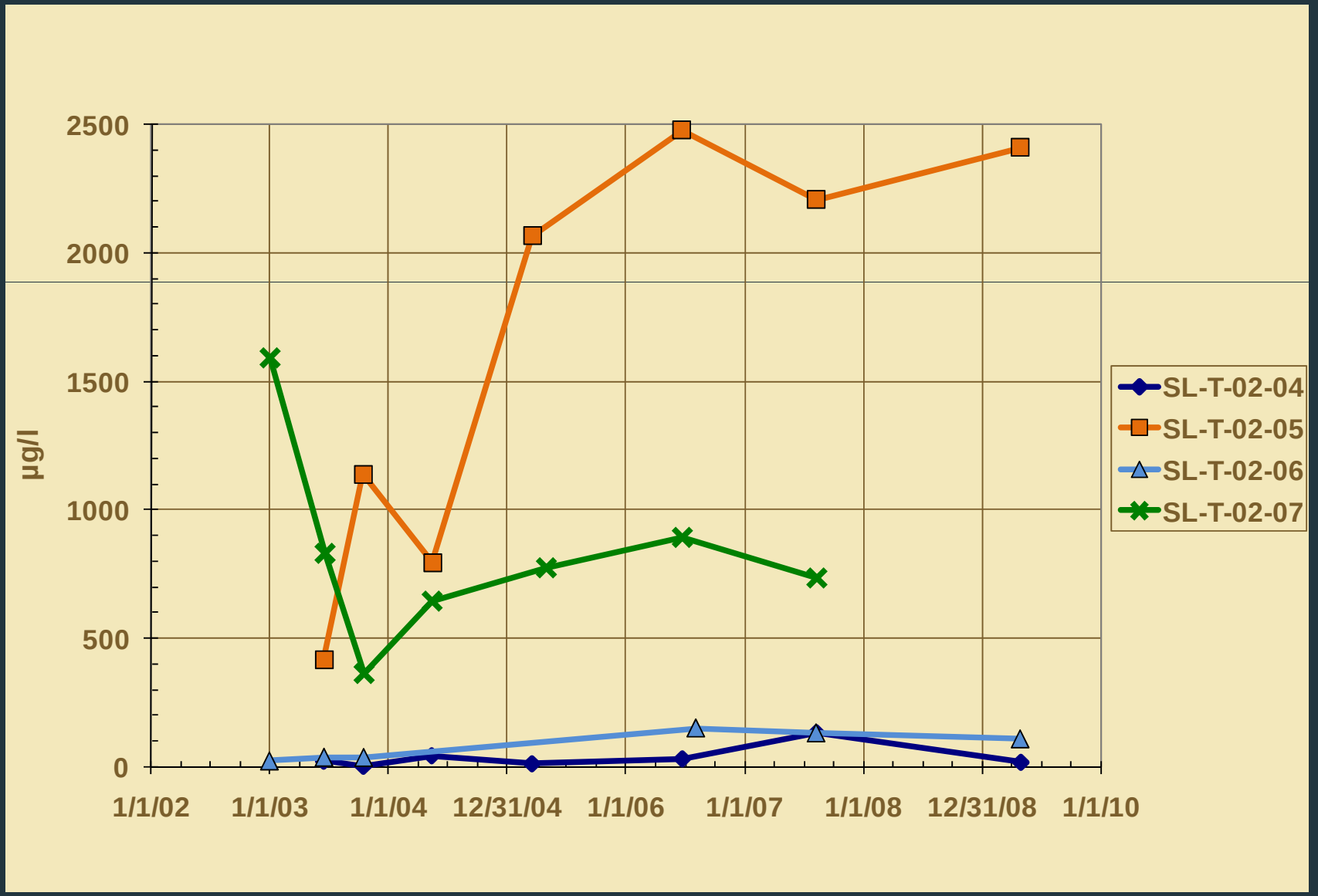
Tailings Area Internal Sites Alkalinity - Figure 2.21c



Tailings Area Internal Sites Conductivity - Figure 2.22c

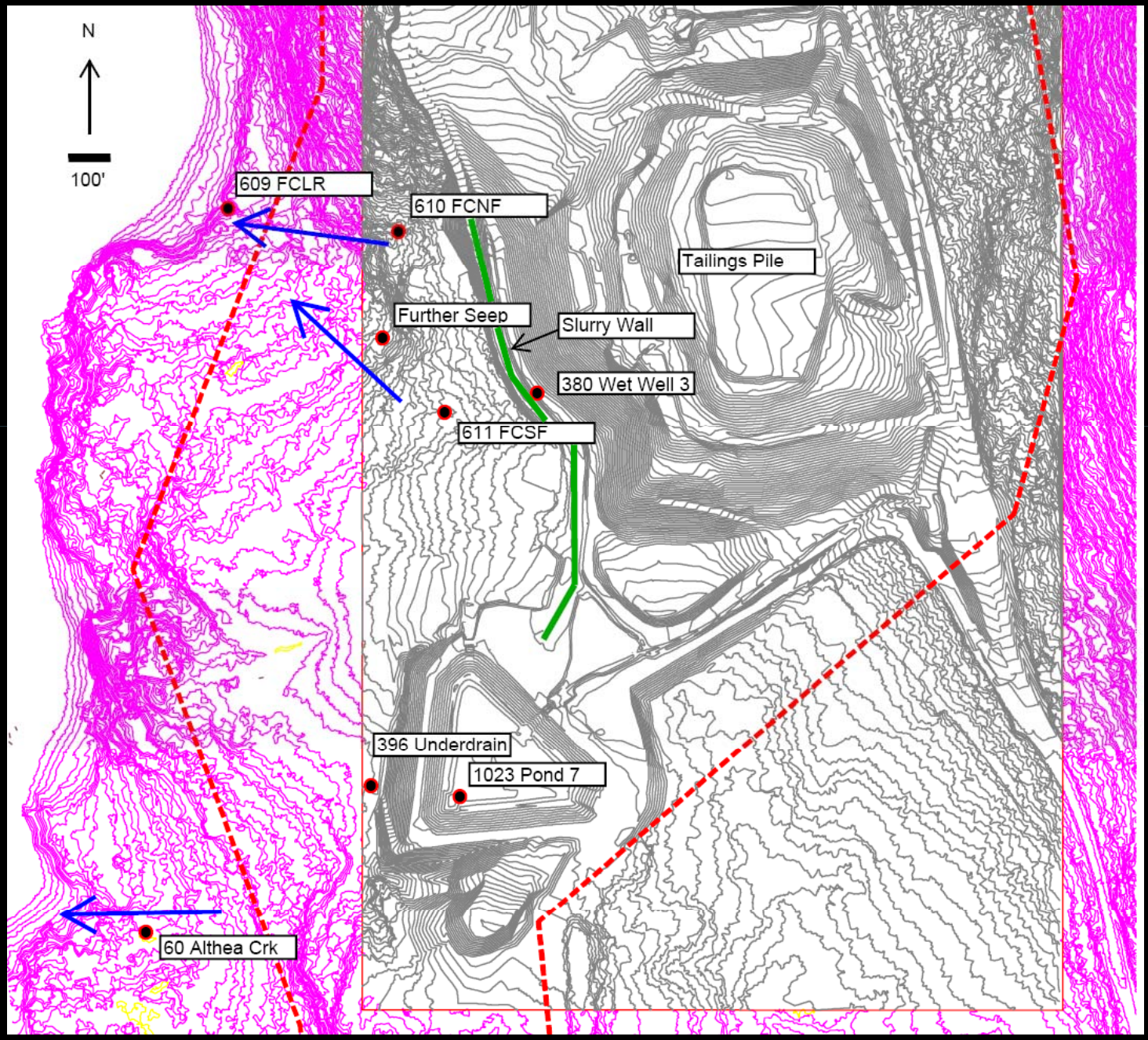


Tailings Area Internal Sites
Zinc - Figure 2.26c



Tailings Facility Additional Monitoring

- Most perimeter wells exhibit chemistry comparable to background waters
- Pyritic rock used locally for access roads produced acidic drainage in two areas (The pyritic rock was removed from both locations)
  - Water quality shows improvement in response to remediation efforts
- Residual sulfate and metal concentrations are very low relative to contact waters but higher than background levels in localized areas
- West Tailings Facility Monitoring Action Plan submitted to regulatory agencies 12-15-2009


N
100'
609 FCLR
610 FCNF
Tailings Pile
Further Seep
Slurry Wall
380 Wet Well 3
611 FCSF
396 Underdrain
1023 Pond 7
60 Althea Crk

Tailings Facility Additional Monitoring

- A complex history of disturbance poses challenges to identifying potential leakage from the facility
- Zinc in the drainage is an order of magnitude or more lower than contact water, suggesting that effects from seepage, if any, from the tailings pile are minimal
- Zinc at sites 610 and 611 increased with construction activity but subsequently decreased
- Further Creek drainage is expected to improve. Some element concentrations may temporarily increase as the drainage returns to its naturally acidic, dilute condition

Tailings Facility Additional Monitoring

- Quarrying of Pond 7 influenced Althea Creek chemistry and collection of foundation drainage caused a return toward pre-construction conditions
- Comparison of zinc concentrations above and below the liner suggests that the liner is intact and functioning as designed
- Background conditions typical of muskeg drainages preclude compliance with AWQS for pH, alkalinity, aluminum and iron at sites 60 and 609
- Pb, Zn, Cd, Hg, Mn are expected to exceed background levels and may not meet AWQS as pH and hardness decrease to background levels. The magnitude of exceedance is expected to be small and temporary

Tails Snow Dust Sampling

Hecla MINING COMPANY

Tails Snow Dust Sampling

- Mitigation
  - Snow Fences
  - Eco Blocks
  - Snow removal only in active placement area
- Lead levels in water do not directly correlate to lead loading values
- Observable up to approximately 1700 feet away
- Significant decrease in lead load over the past three years

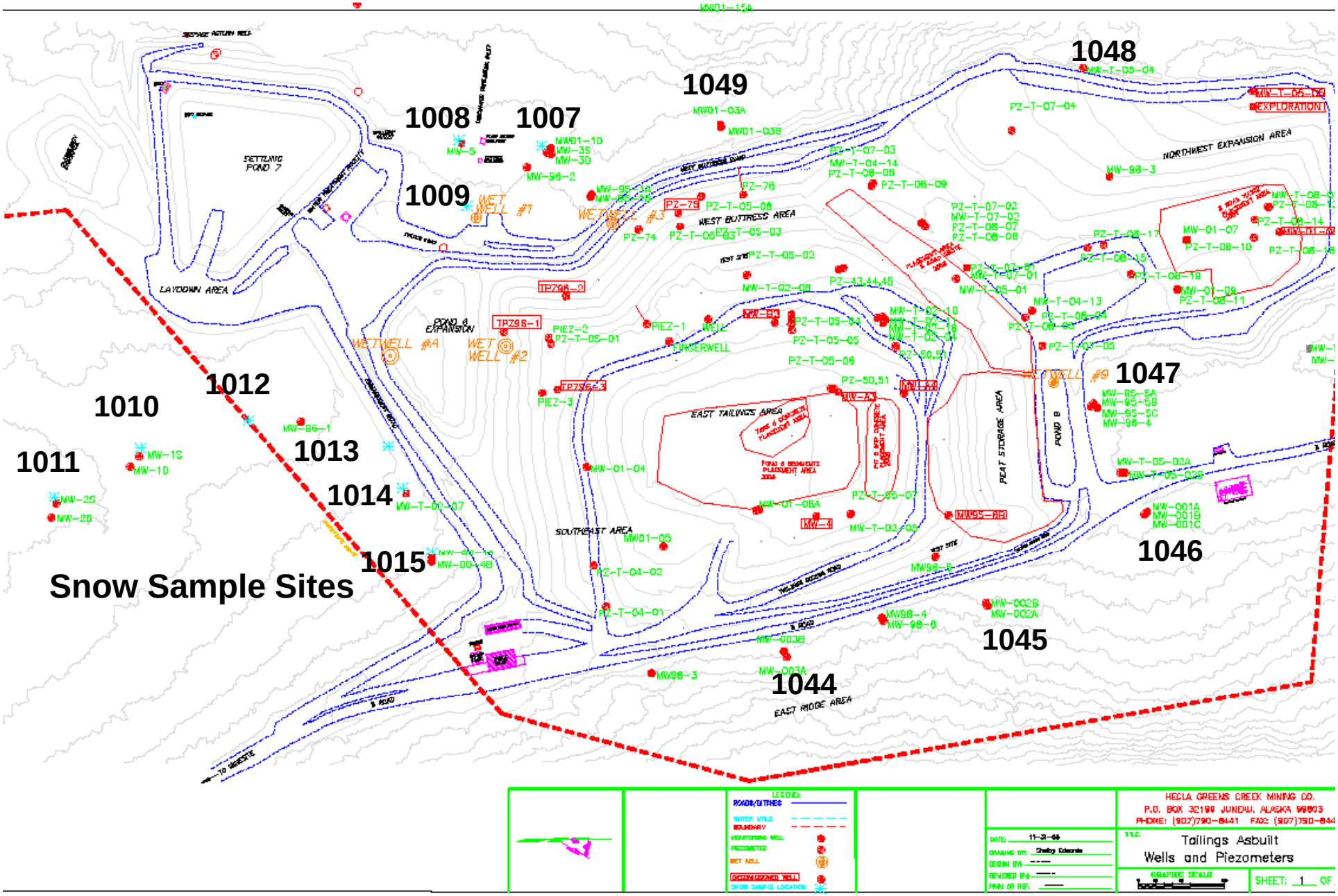

1048
1049
1008
1007
1009
1012
1010
1011
1013
1014
1015
1047
1046
1045
1044
Snow Sample Sites
SETTLING POND 7
LAYDOWN AREA
POND A EXPANSION
WET WELL #1
WET WELL #2
WET WELL #3
WET WELL #4
WET WELL #9
WEST BUTTRESS AREA
NORTHWEST EXPANSION AREA
EAST TAILINGS AREA
SOUTHEAST AREA
EAST RIDGE AREA
PEAT STORAGE AREA
POND B
FINGERWELL
EXPLORATION
HECLA GREENS CREEK MINING CO.
P.O. BOX 32199 JUNEAU, ALASKA 99803
PHONE: (907)790-8441 FAX: (907)790-844
Tailings Asbuilt
Wells and Piezometers
SHEET: 1 OF

Figure 2.35 Snow Survey Analysis

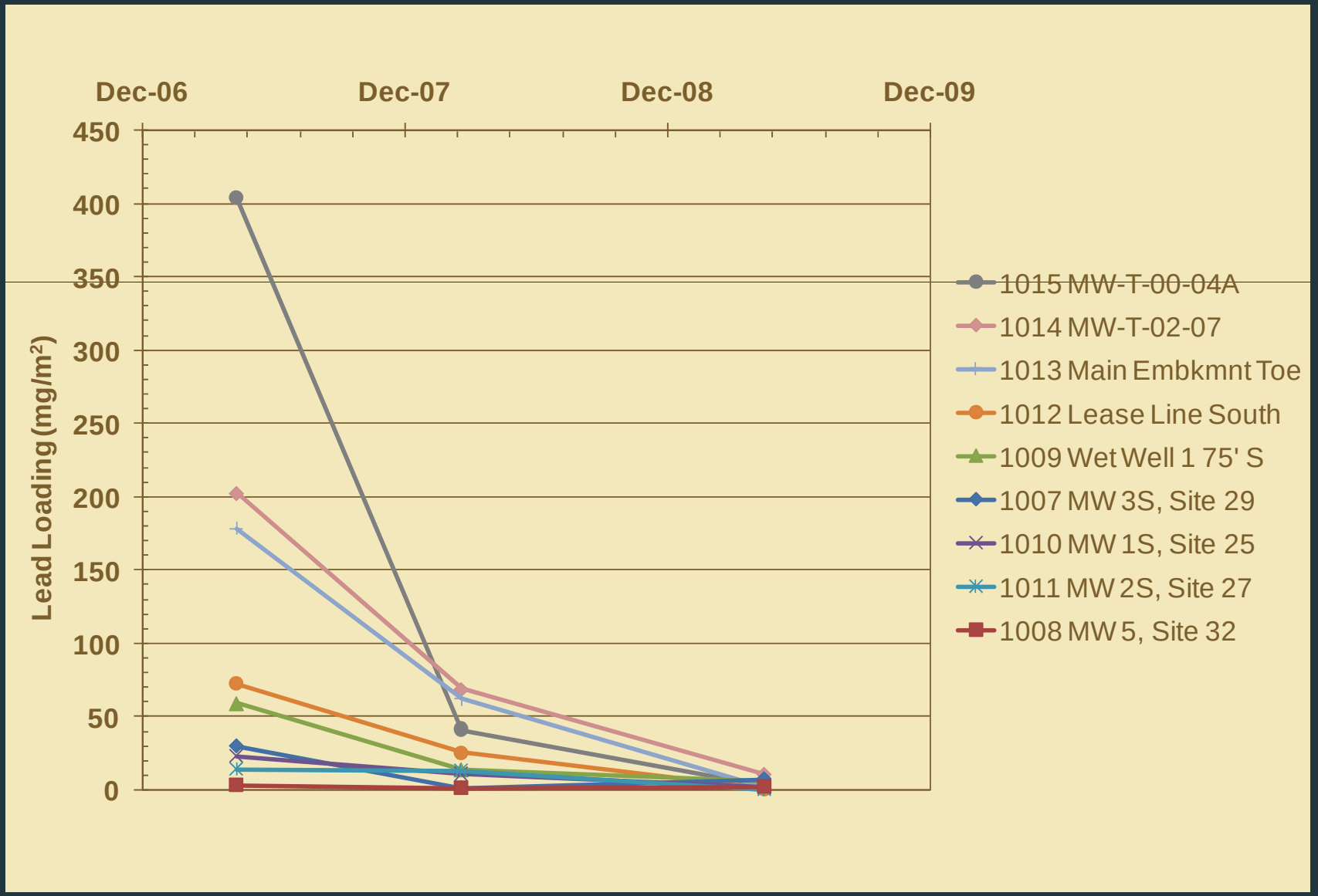


Figure 2.35 Snow Survey Analysis

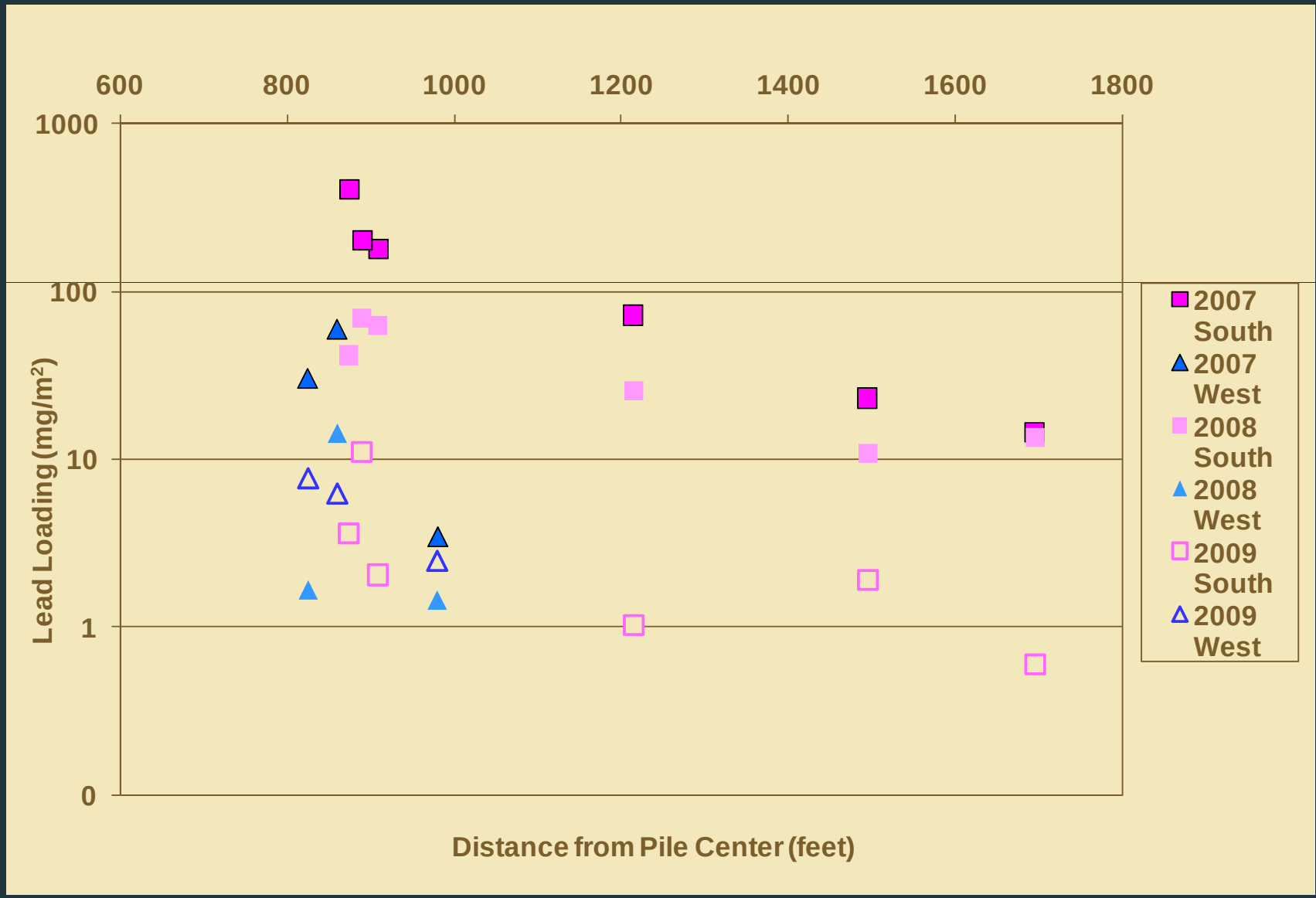
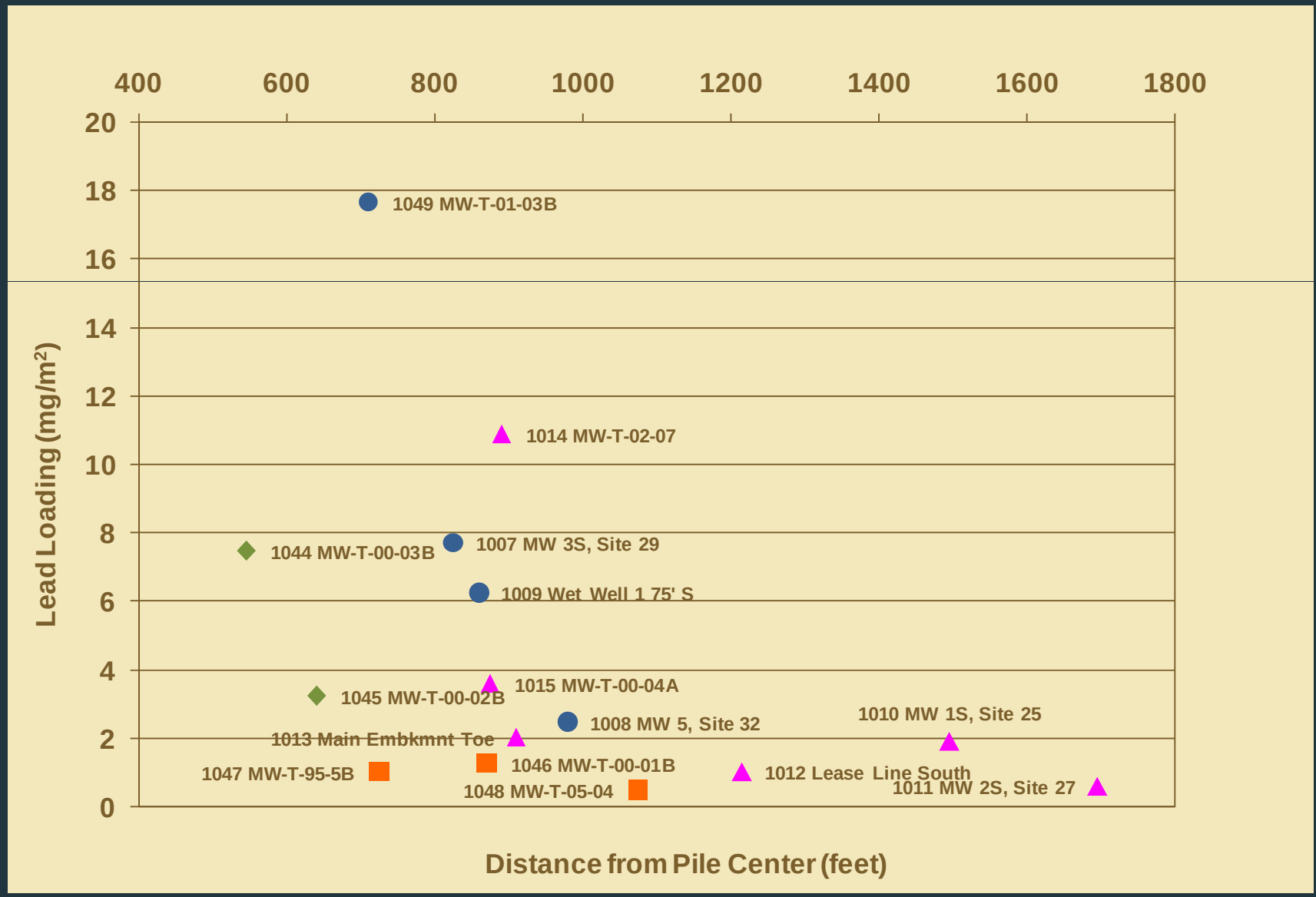


Figure 2.35 Snow Survey Analysis



Sulfate Reduction Monitoring Program (SRMP) Update

Hecla MINING COMPANY

- Tailings Expansion EIS ROD required a study to determine if long term sulfate reduction is achievable and will meet closure needs; evaluate existing and additional carbon sources and application methods
- Seven field test plots (5 carbon amendments; 2 controls) constructed, instrumented (suction lysimeters, tensiometers, moisture access probes) and sampled
- Laboratory batch and column test were performed to support field tests and constrain reaction rates
- Analyses of enzymes related to cellulose degradation were performed in support of field and laboratory testing

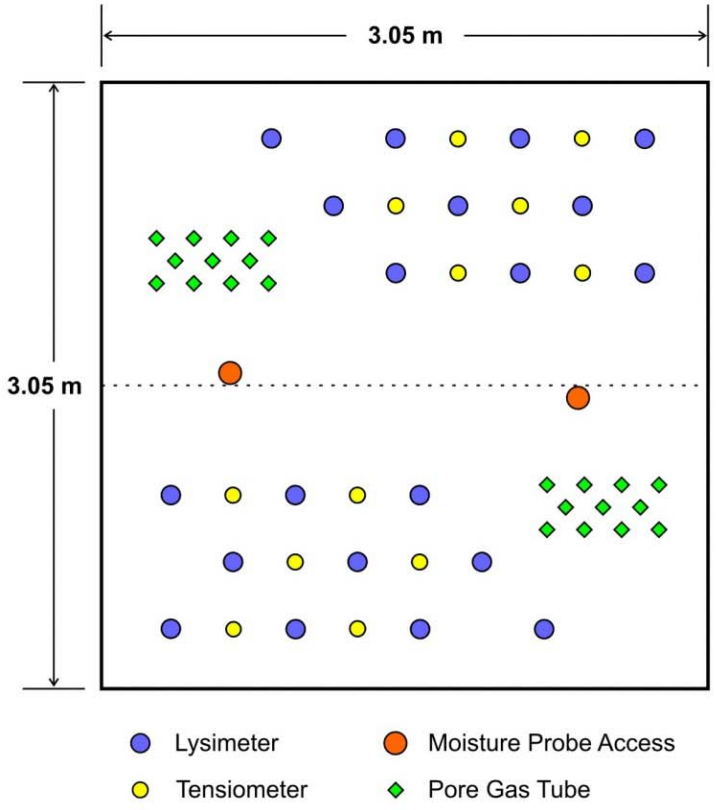
Sulfate Reduction Monitoring Program

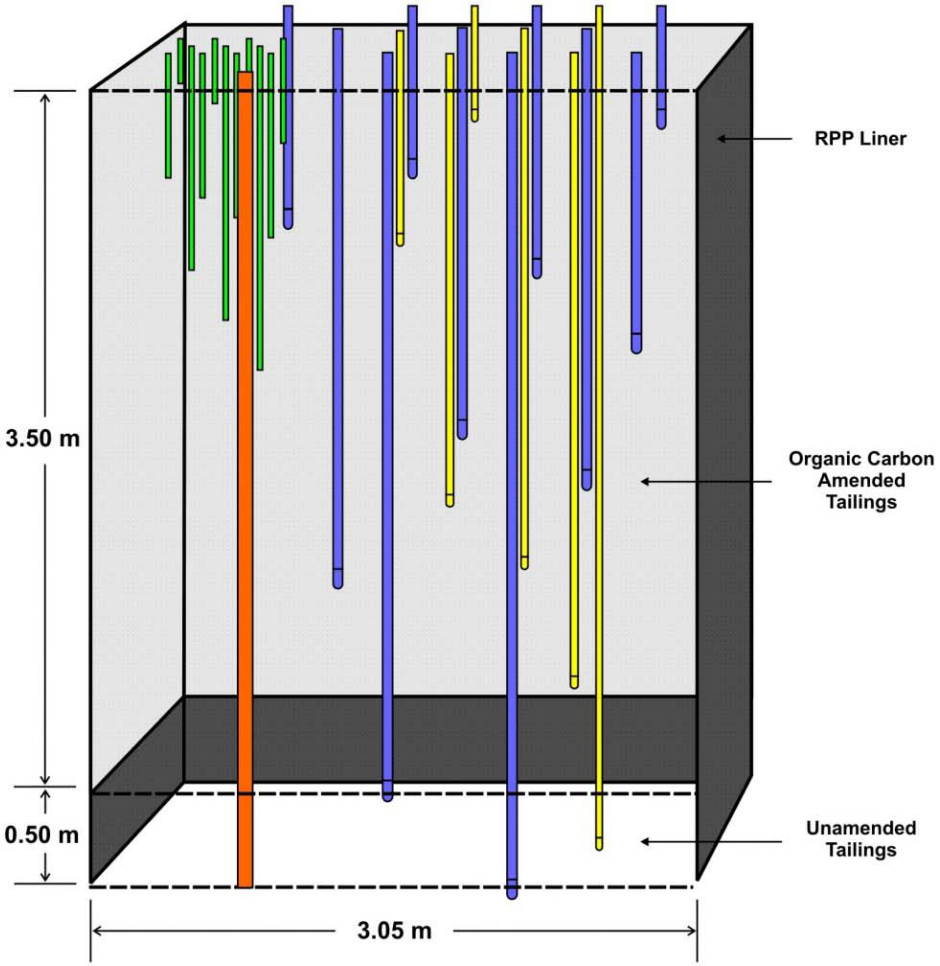
Hecla MINING COMPANY

Field Test Cell Amendment Mixtures

	Tailings (vol %)	Peat (vol %)	Brewery Grain (vol %)	Bio-Solids (vol %)	
Cell 1	100	0	0	0	Unexcavated
Cell 2	100	0	0	0	Excavated
Cell 3	95	5	0	0	Amended
Cell 4	95	2.5	2.5	0	Amended
Cell 5	95	2.5	0	2.5	Amended
Cell 6	95	2.5	1.25	1.25	Amended
Cell 7	90	5	2.5	2.5	Amended

Sulfate Reduction Monitoring Program





Sulfate Reduction Monitoring Program (SRMP) Update

Hecla MINING COMPANY

- Key findings 2004-2010
  - Microbially mediated sulfate reduction in cells 4-7
  - No significant sulfate reduction in control cells or peat-amended cell
  - Precipitation of metal sulfides contributes to a decrease in sulfate and metal concentrations
  - Increase in iron reducers, elevated dissolved Fe and As
  - Organic carbon from biosolids is rapidly consumed
  - Cells containing spent brewing grain show best performance
  - Laboratory batch and column test results support field results
  - Carbon amendment to oxidized tailings is not recommended
  - High concentrations of DOC should be avoided to minimize iron reduction and arsenic mobility
  - Laboratory analysis of enzymes related to cellulose degradation supports water chemistry and microbiology results

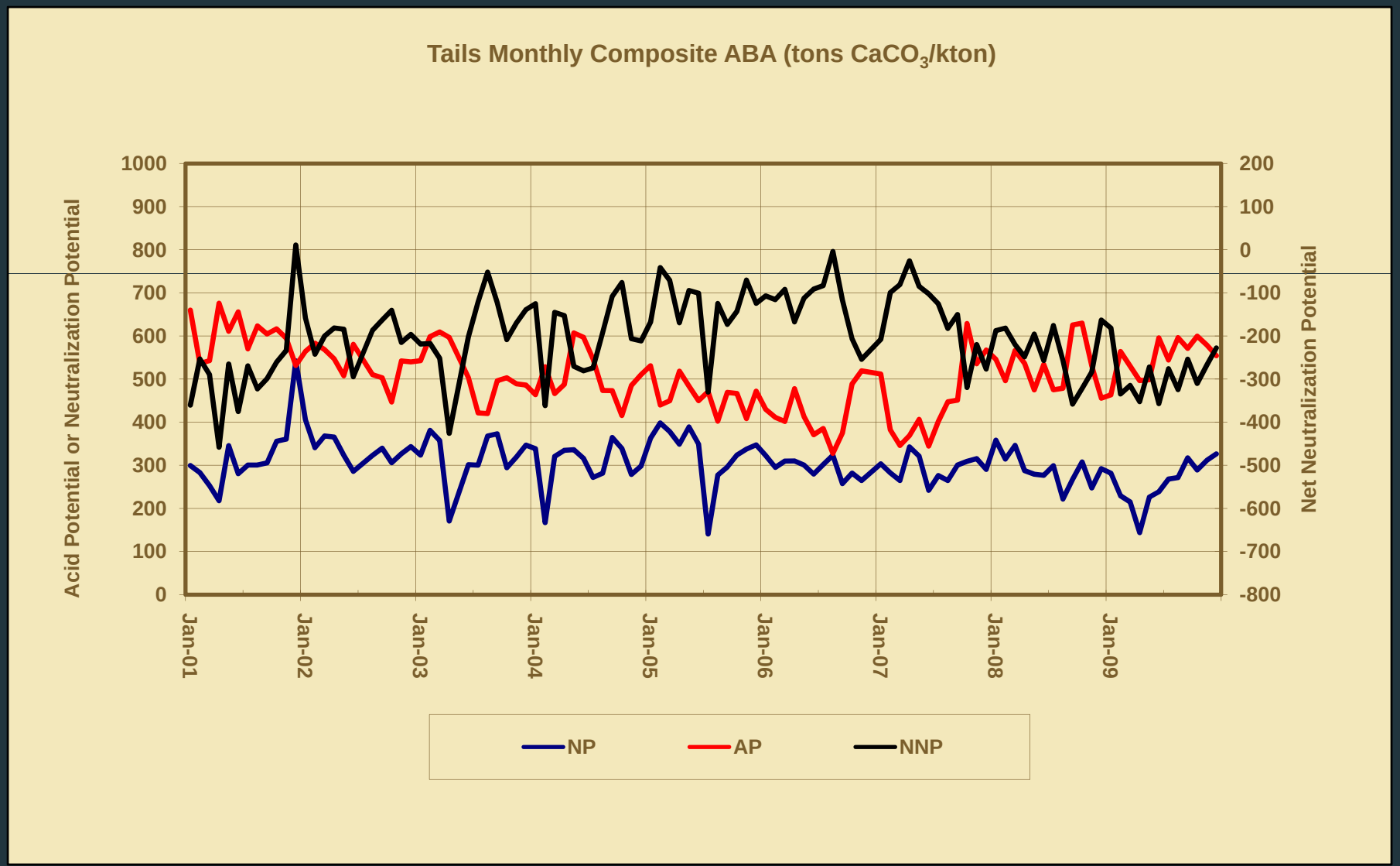
Sulfate Reduction Monitoring Program (SRMP) Update

- Future work planned
  - Ongoing performance sampling
  - Final reports from University of Waterloo
  - Geotechical evaluation
  - Logistical considerations
  - Program completion and final report

Tailings Facility Acid Base Accounting Analyses

- Tailings have the potential to generate acidic drainage if the buffering capacity of the tailings is consumed
- High carbonate content supports a long lag time for depletion of buffering capacity
- Long lag time (decades) allows time for construction and closure of the facility, including construction of an oxygen-inhibiting composite soil cover

Figure 2.32 Monthly Tailings Acid Base Accounting Data



Tailings Facility General Site Management

- Operations per GPO Appendix 3 and Waste Management Permit
- Most placement occurred in northwest expansion area
- Tailings facility activities in 2009
  - –Commissioned Pond 6 area for tailings placement
  - –Began co-disposal of Site E rock and tailings
  - –Constructed settling basins near Pond 7
  - –Began characterization of East Ridge (test pits)

Tailings Facility General Site Management

2010 Planned Tailings and Closure Planning Activities

- Clearing of East Ridge area
- Geotechnical and environmental drilling program
- Continue Site E removal and co-disposal
- SRMP field program continues
- Stage III tailings preparation
- Cover monitoring and vegetation study continues
- Underground hydrology study continues