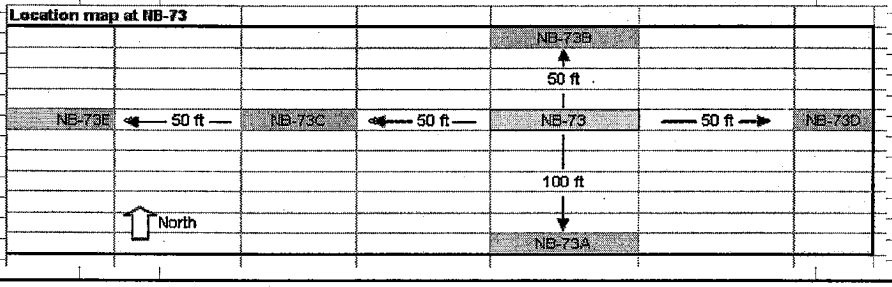
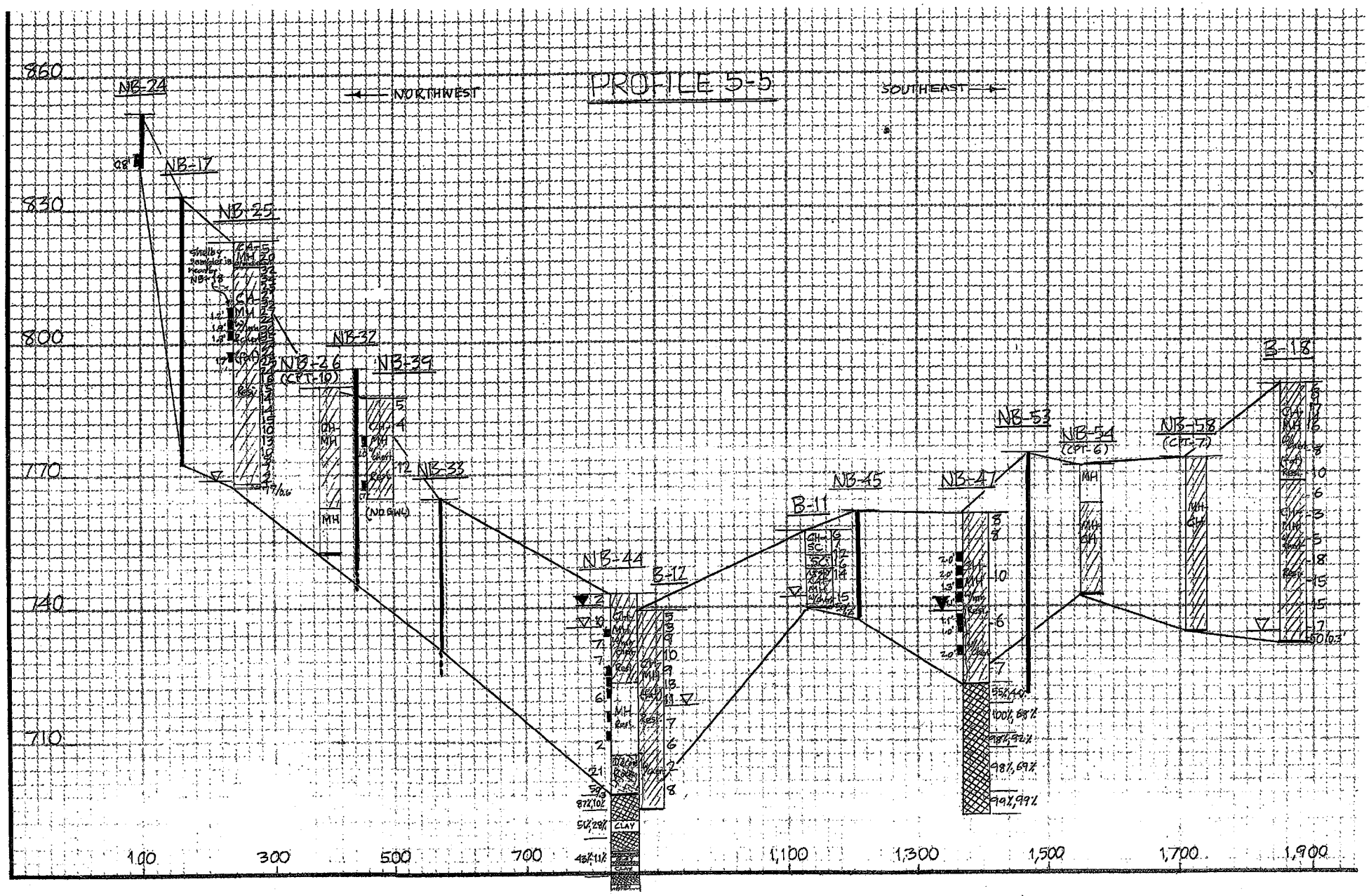
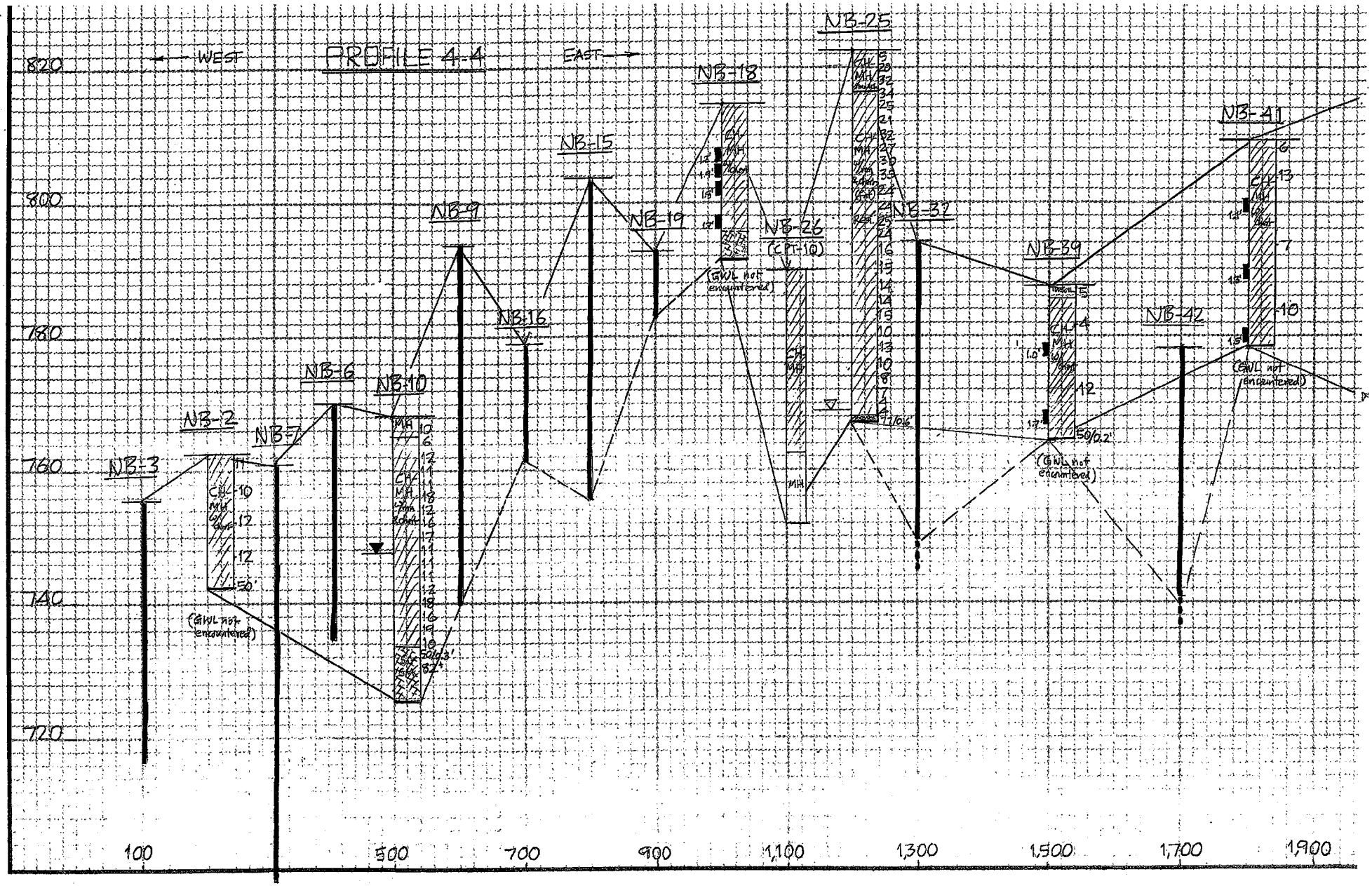
KIF Peninsula - Well and Boring Locations Requiring Resurvey

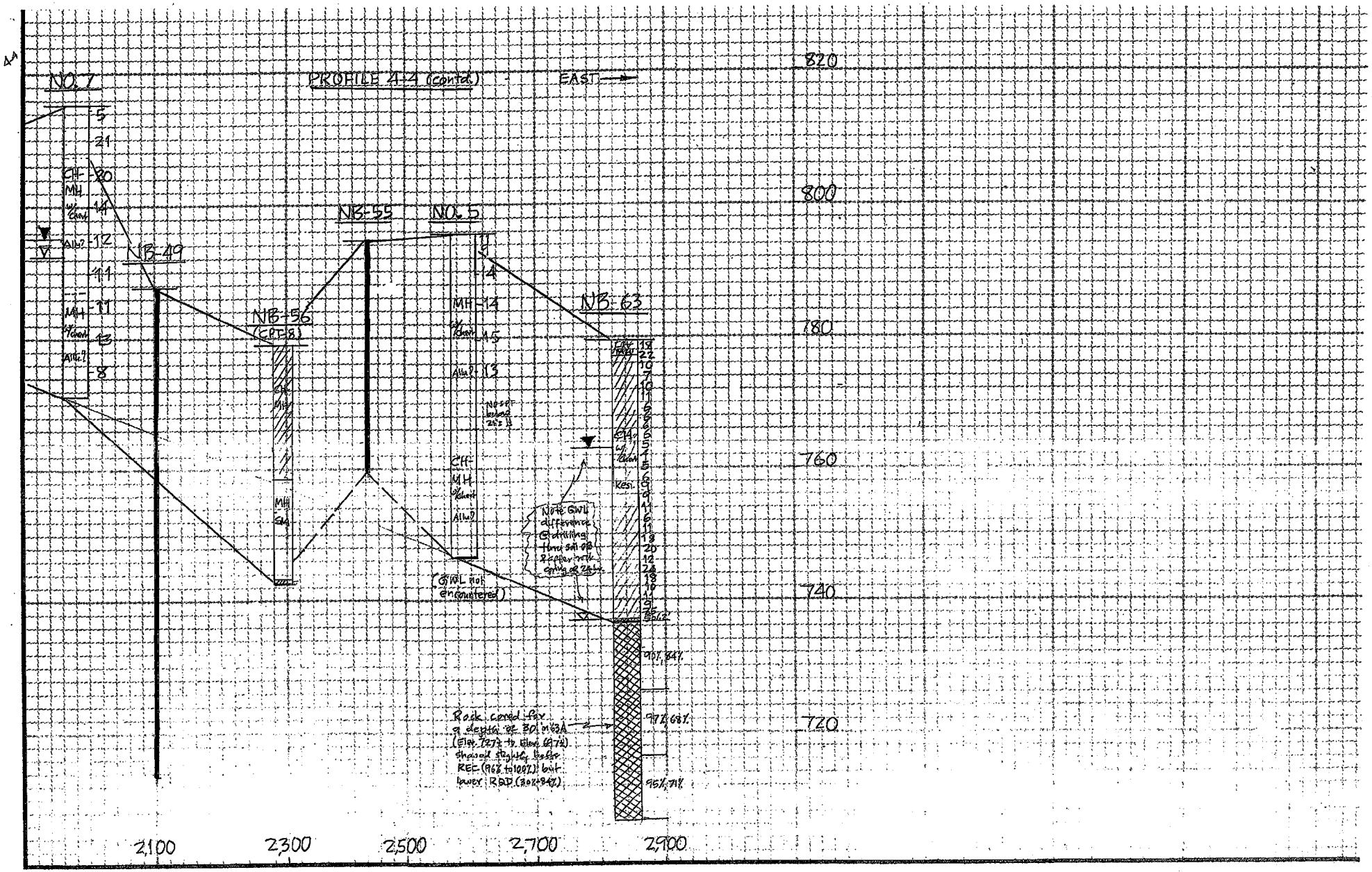
HOLE ID	Original Survey: Tennessee Lambert (NAD 27) Northing (ft)	Original Survey: Tennessee Lambert (NAD 27) Easting (ft)	Original Survey: NGVD 29 Ground Elevation (ft-msl)	Off-set (ft)	Off-set (direction)
Boring Locations Originally Surveyed					
NB-3	549815.23	2441041.16	755.44	23.0	south
NB-7	549927.06	2441209.11	760.65	5.0	East
NB-8	550429.54	2441364.13	824.23	14.1	East
NB-9	550227.71	2441370.38	793.66	10.1	East
NB-18	550498.59	2441685.44	814.48	6.5	S 82 degrees W of original staked location
NB-22	549601.93	2441600.16	739.35	50.0	S 14 degrees W of original staked location
NB-37	550995.08	2442189.76	848.02	4.0	South
NB-35	never surveyed			200.0	N 45 degrees E of NB-36 and about 20 feet SE from the edge of the existing pond
NB-38	550805.76	2442193.52	816.69	3.8	West
NB-40	551076.38	2442372.59	827.35	20.5	South
NB-44	550230.34	2442326.52	743.01	9.0	S 85 degrees E of original staked location
NB-46	550253.21	2442681.63	752.18	26.0	East
NB-55	551142.98	2442970.31	794.60	28.0	South
NB-60	551347.17	2443231.71	798.75	48.0	South
NB-61	550879.19	2443263.67	766.37	12.0	North
NB-63	551260.87	2443352.08	779.64	39.0	S 45 degrees E of original staked location
NB-68	551132.02	2443506.10	773.16	42.8	South
NB-87	550643.76	2441240.55	873.37	14.7	West
NB-88	550716.66	2441445.55	854.33	15.4	West
NB-89	550780.18	2441618.74	848.05	7.0	West
Well Locations Not Originally Surveyed					
MW-10A	550030.19	2441383.04	768.11		at NB-10
MW-10B	550030.19	2441383.04	768.11		at NB-10
MW-21A	549791.49	2441645.61	757.00		at NB-21
MW-44A	550230.34	2442326.52	743.01		at NB-44
MW-44B	550230.34	2442326.52	743.01		at NB-44
MW-47A	549775.07	2442632.74	762.78		at NB-47
MW-63A	551260.87	2443352.08	779.64		at NB-63
MW-63B	551260.87	2443352.08	779.64		at NB-63
MW-66A	550502.24	2443453.56	752.66		at NB-66
MW-74A	550357.65	2443822.35	752.05		at NB-74
MW-77A	550108.13	2443887.66	749.32		at NB-77
MW-81A	550973.35	2444125.88	762.63		at NB-81
MW-81B	550973.35	2444125.88	762.63		at NB-81
New Boring Locations Not Originally Surveyed					
NB-22A	never surveyed			3.4	S 55 degrees W of NB-22
NB-47A	never surveyed			9.0	N 48 degrees E of NB-47
NB-73A	never surveyed			5.0	N 11 degrees E of NB-73
NB-74A	never surveyed			8.0	N 65 degrees E of NB-74
NB-77A	never surveyed			11.0	N 75 degrees E of NB-77
NB-85A	never surveyed			4.3	N 25 degrees W of NB-85
NB-85B	never surveyed			7.9	N 25 degrees W of NB-85
NB-73B	never surveyed			50.0	N of NB-73
NB-73C	never surveyed			50.0	E of NB-73
NB-73D	never surveyed			50.0	W of NB-73
NB-73E	never surveyed			100.0	W of NB-73

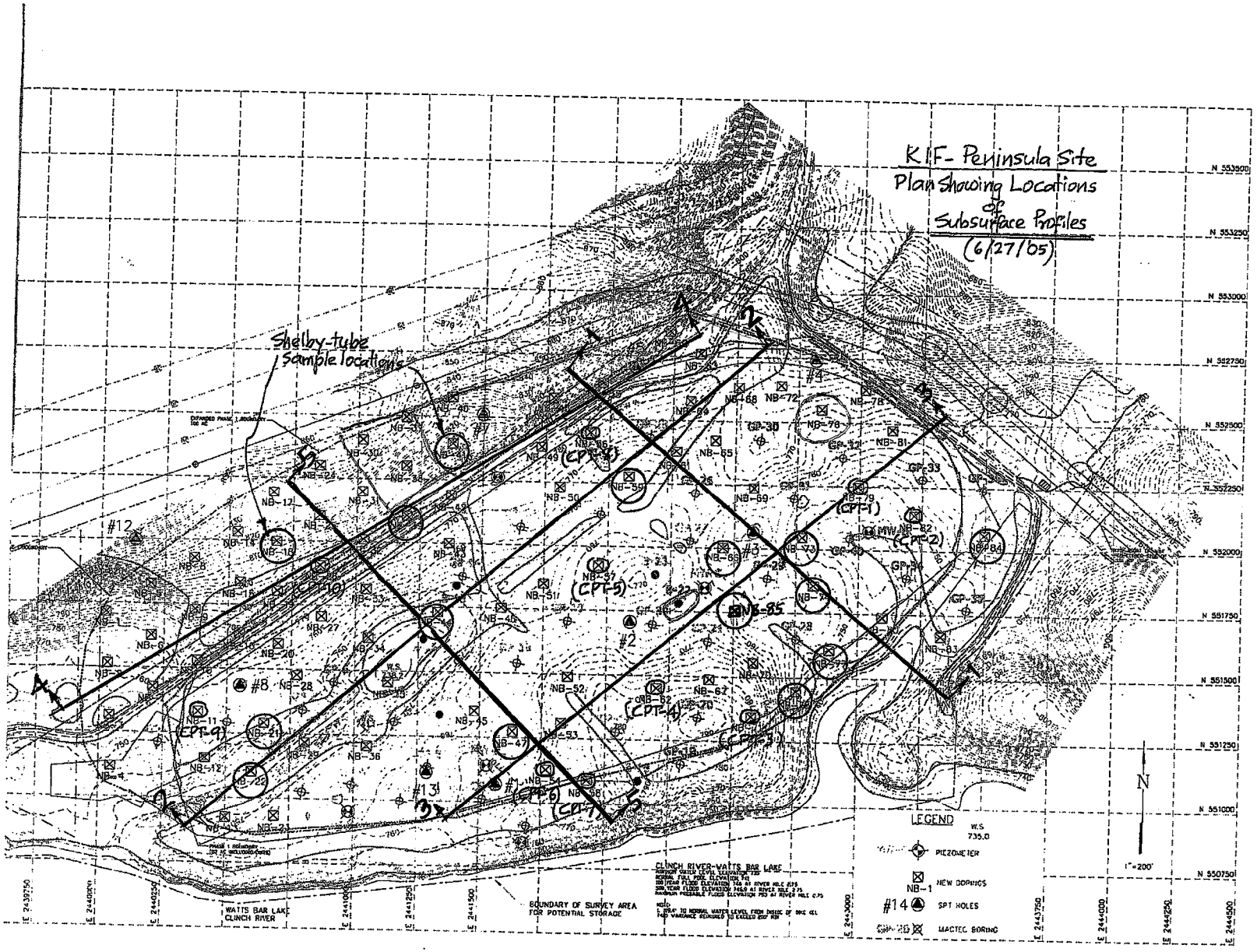
Location map at NB-73

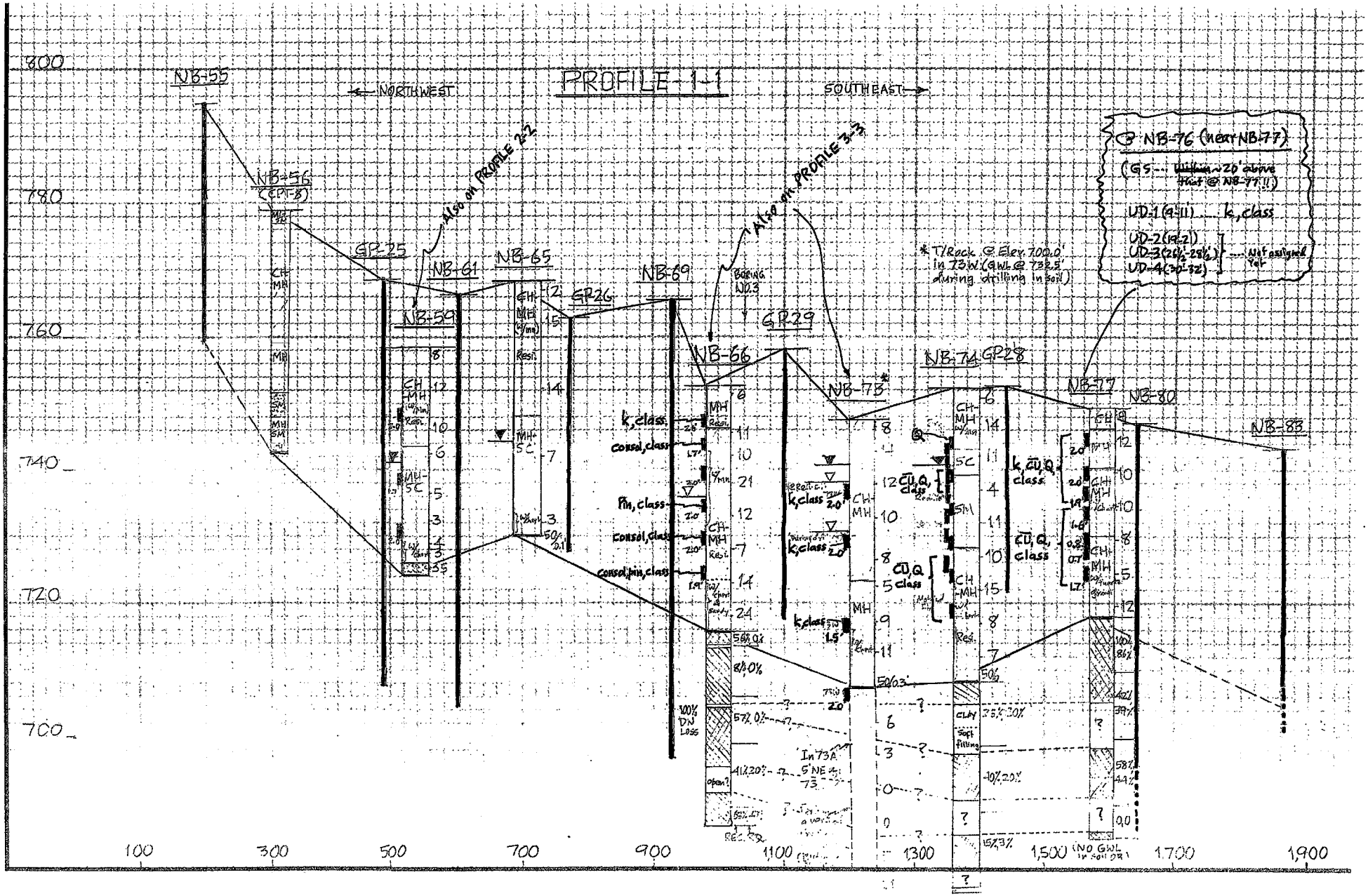


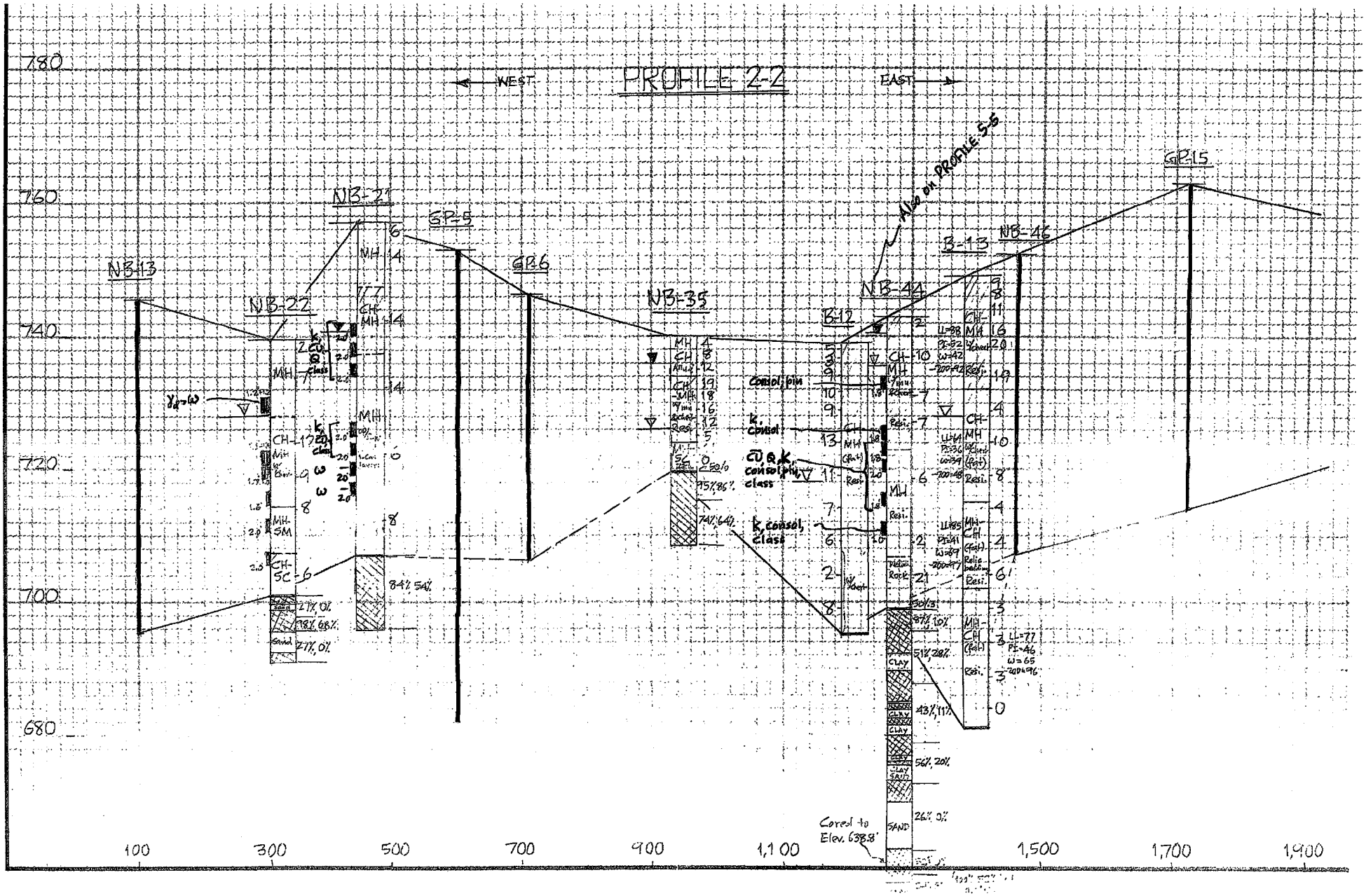


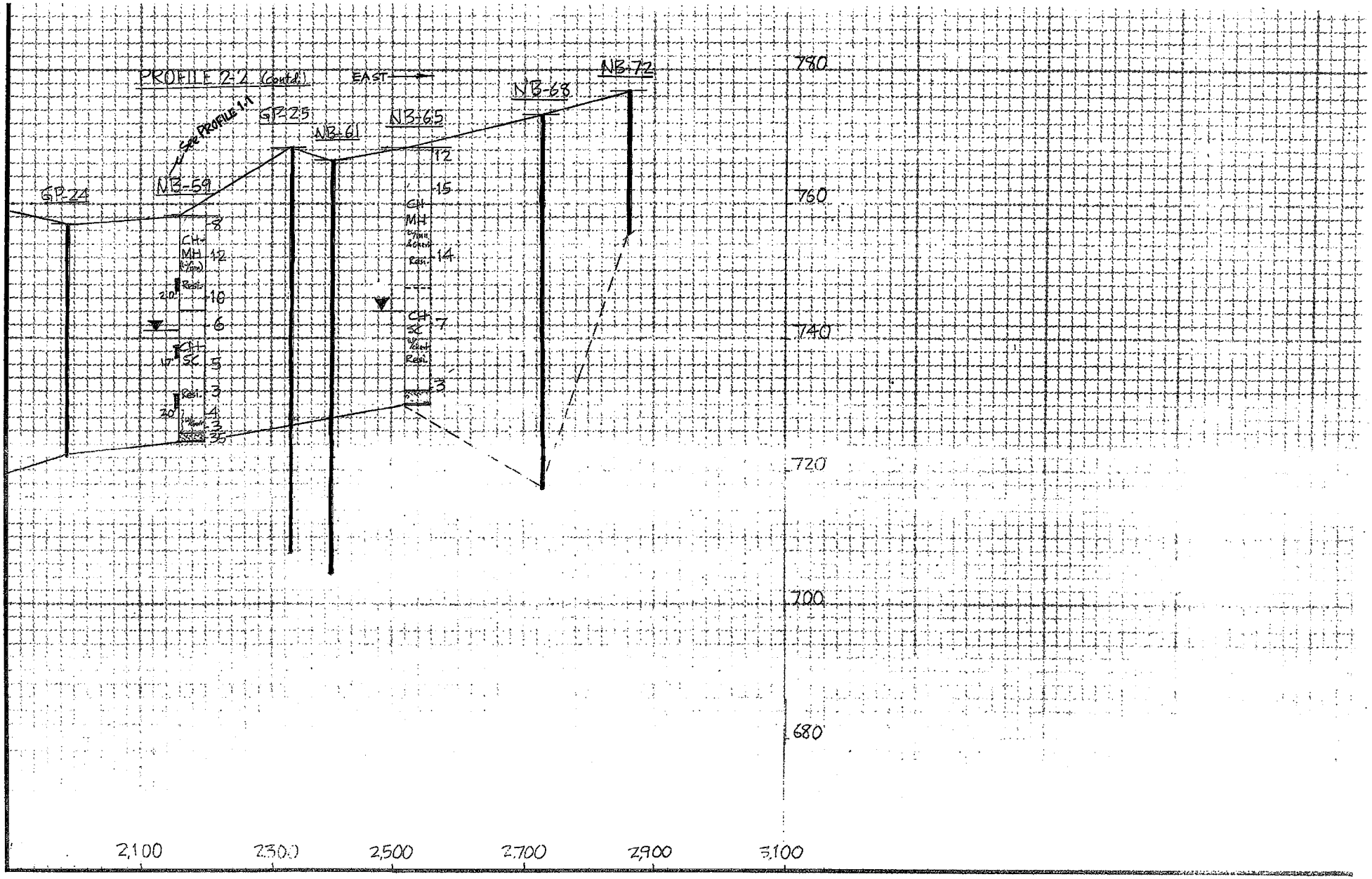


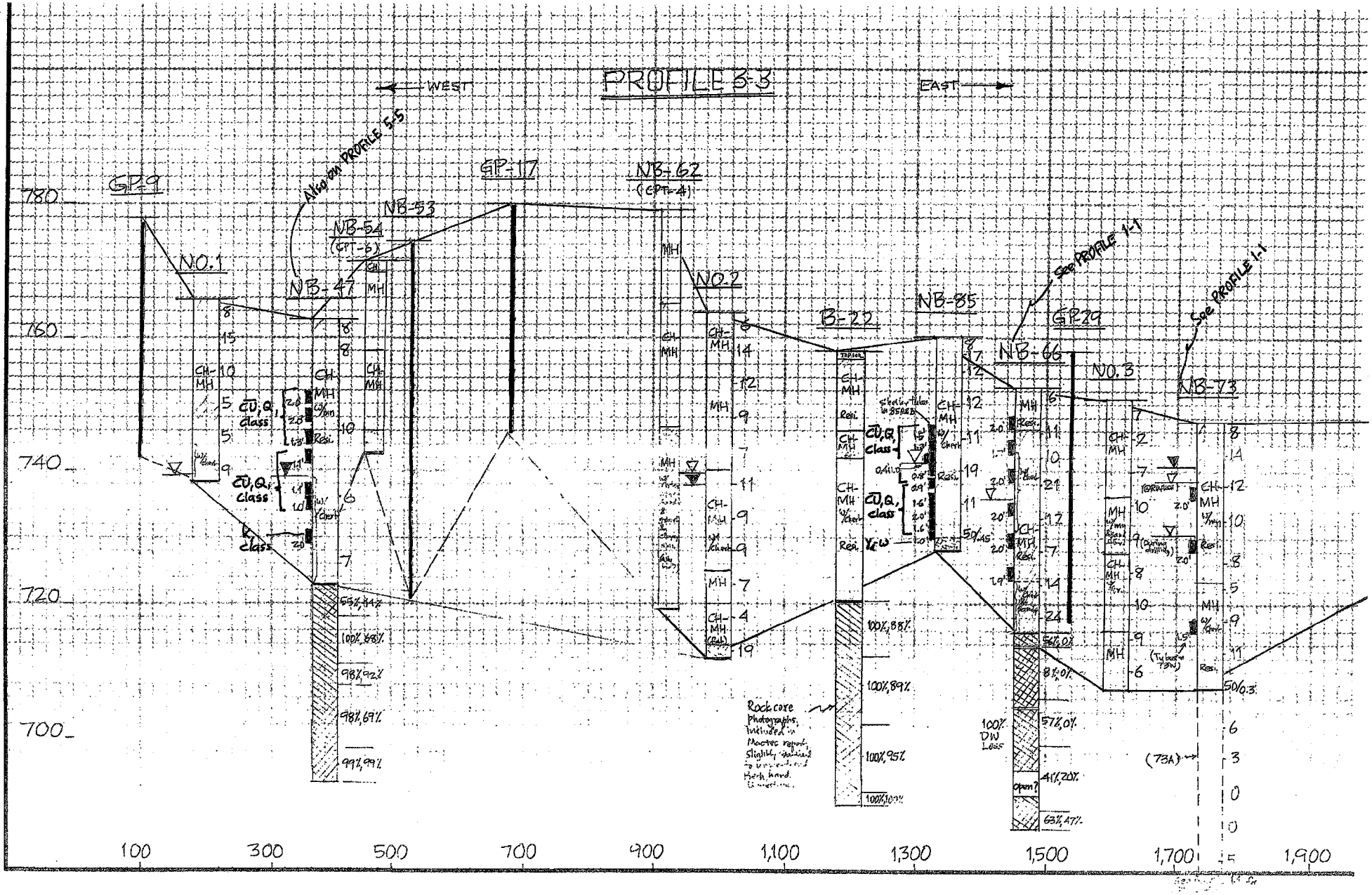


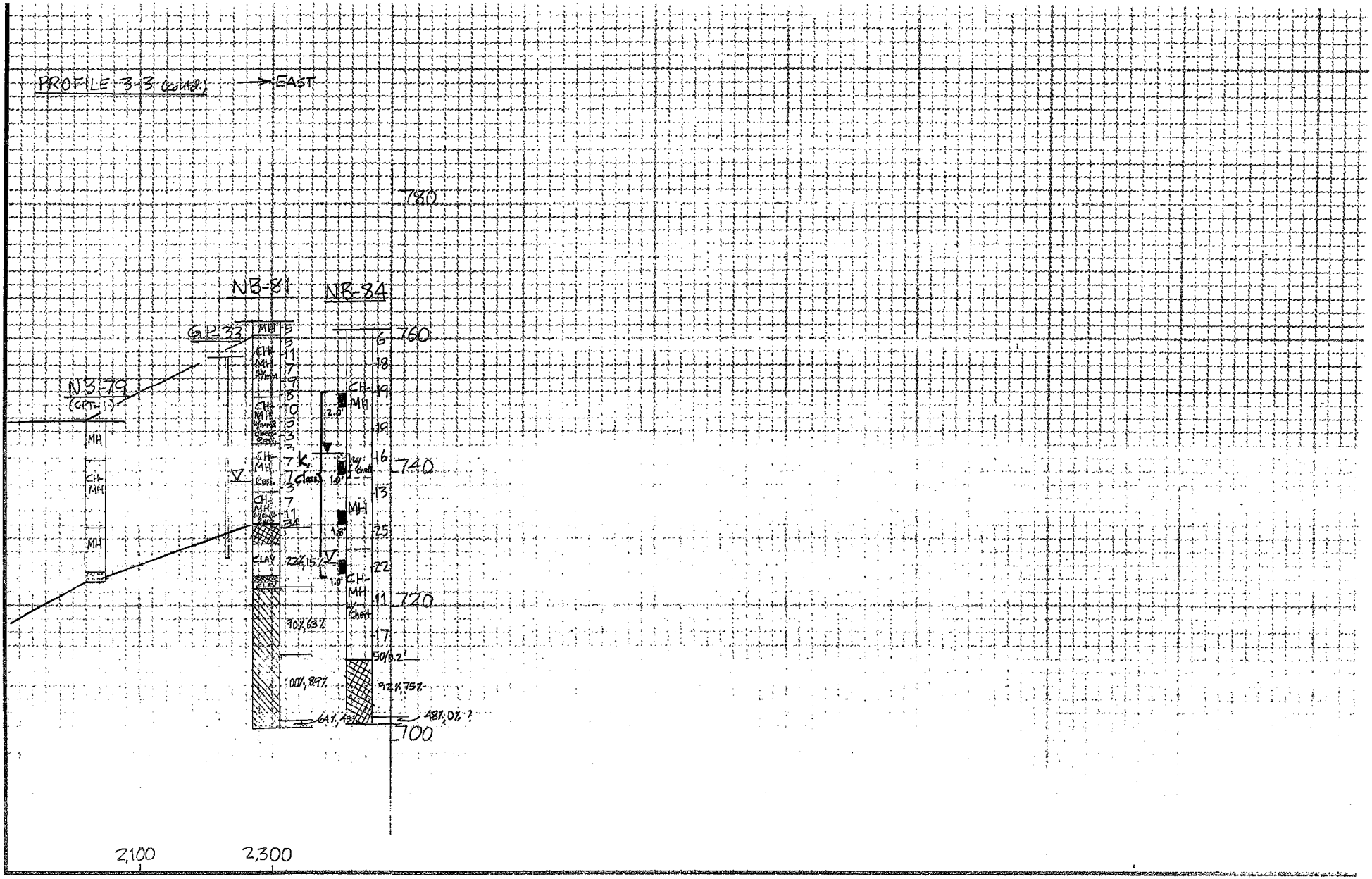


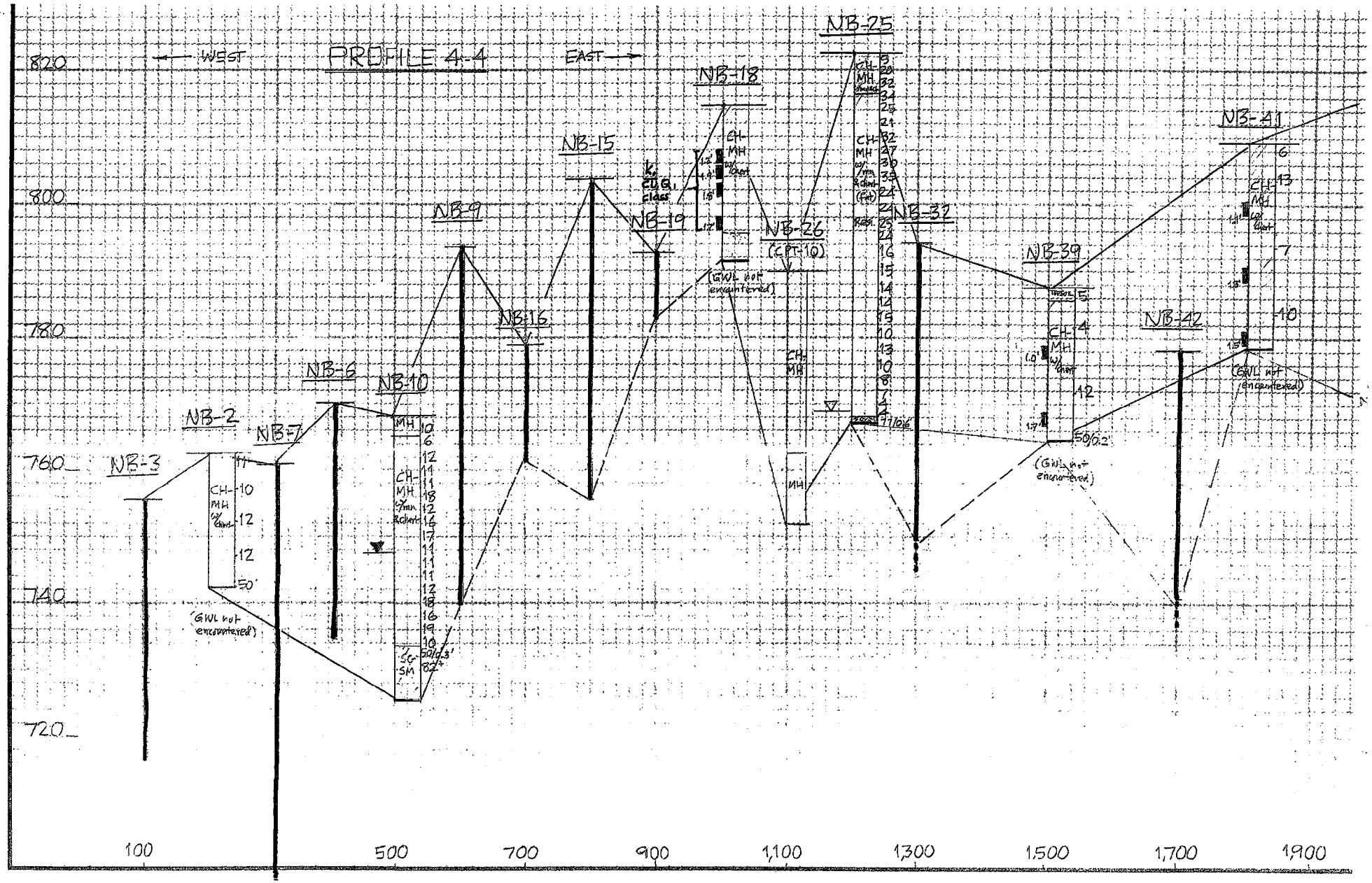


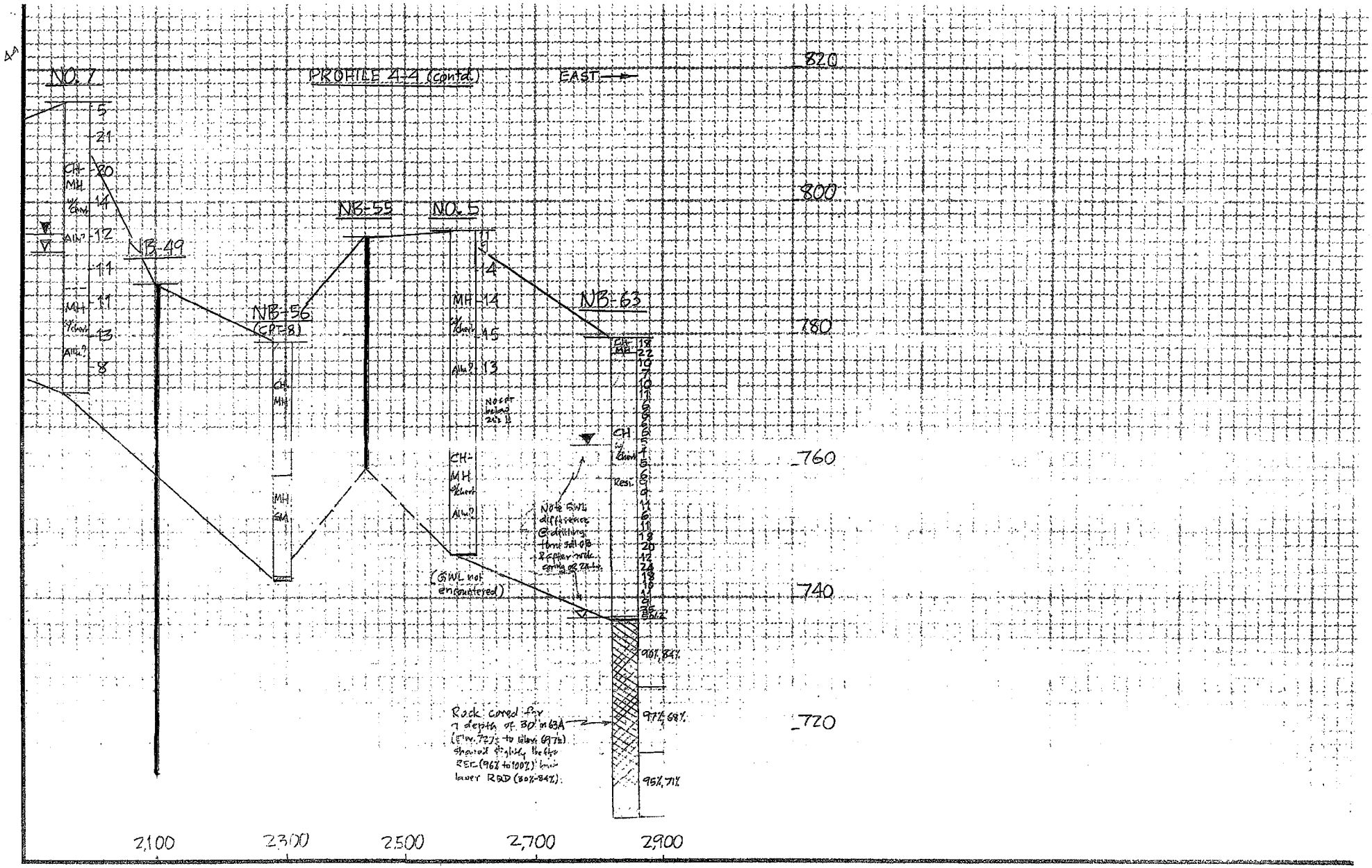


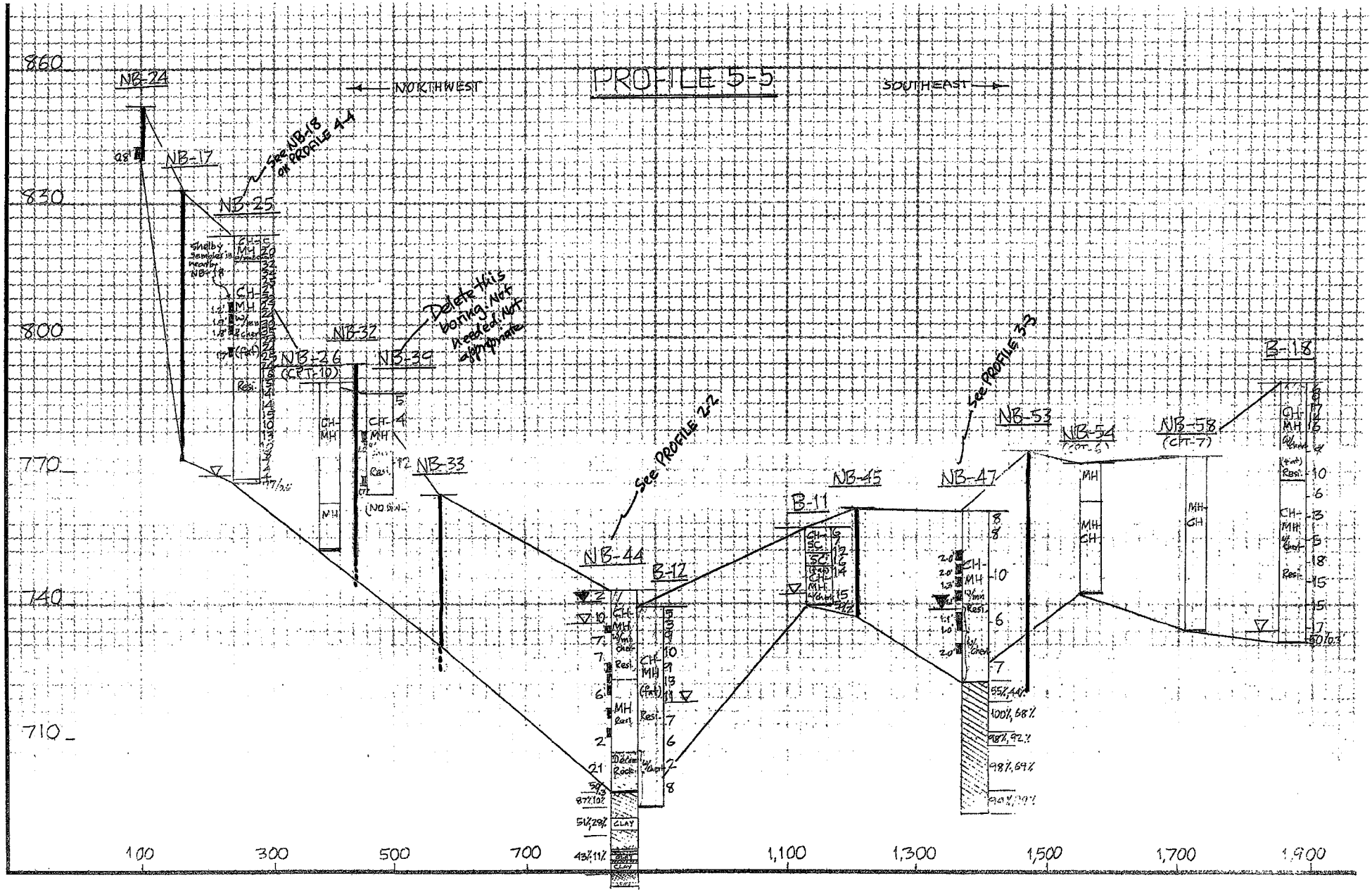












Power System Operations
Surveying & Project Services

Project: **Kingston Fossil Plant**
Subsurface Investigations
Bore Holes
Monitoring Wells
Post Drilling Locations
March 2006

Survey Date: 03/06/2006
Project: RKQ754
Job: RKQ754.2
RKQ754.4 (ESK-41 Pg 24-27)

Projection: Tennessee Lambert
Horizontal Datum: NAD 27 Order: 4th
Coordinate Type: Ground
Vertical Datum: NGVD 29 Order: 4th
Units: US Survey Feet

Printing Date: 03/08/2006

Name	US Survey Feet NAD 27 Tennessee Lambert[1] Northing	Easting	NGVD 29 Elevation	Remarks
K-Bore Holes				
K-1	549853.68	2441134.41	756.43	Ground @ boring.
K-2	549636.22	2441955.09	754.33	Ground @ boring.
K-3	549826.56	2443334.80	791.98	Ground @ boring.
K-4	550197.69	2443958.50	747.96	Ground @ boring.
K-5	549824.99	2442210.04	750.90	Ground @ boring.
K-6	550071.75	2442731.54	765.30	Ground @ boring.
K-7	550101.14	2443123.76	765.63	Ground @ boring.
K-8	550339.32	2443266.38	763.21	Ground @ boring.
K-9	550465.68	2443645.57	756.07	Ground @ boring.
K-10	549781.76	2440564.82	752.73	Ground @ boring.
K-11	550110.25	2441994.21	748.46	Ground @ boring.
K-12	550653.78	2443380.46	762.59	Ground @ boring.
K-13	550190.66	2441655.97	778.08	Ground @ boring.
K-14	550475.30	2442697.21	756.75	Ground @ boring.
K-15	551161.79	2443569.26	774.50	Ground @ boring.
K-16	550641.28	2442289.20	779.28	Ground @ boring.
K-17	550820.63	2442615.67	786.41	Ground @ boring.
K-18	551117.95	2443013.45	787.68	Ground @ boring.
Monitoring Wells				
MW-J	550683.53	2440885.56		Not drilled
MW-K	551004.41	2442016.41	864.86	Ground @ hole (no PVC pipe installed)
MW-L	551404.09	2443053.66		Not drilled
MW-M	550763.86	2443282.27	767.04	Top of PVC pipe
			761.75	Ground @ pipe
MW-N	549756.30	2440942.87	759.13	Top of PVC pipe
			754.7	Ground @ pipe

US Survey Feet				
	NAD 27 Tennessee Lambert[1]		NGVD 29	
Name	Northing	Easting	Elevation	Remarks
MW-P	549822.72	2443392.11	797.75	Top of PVC pipe
			792.58	Ground @ pipe
New Borings				
NB-90	549698.22	2440862.84	752.75	Ground @ boring.
NB-91	549932.76	2440712.01	760.60	Ground @ boring.
NB-92	549996.68	2440155.50		Could not be located.

Note[1]: Horizontal positions shown are as staked (pre-drilling) locations determined in October 2005. No horizontal survey was run to re-establish coordinates after drilling.

GAF - POND E SURVEY
SINKHOLE INVESTIGATION WALKDOWN
PRE-JOB SAFETY MEETING
LIST OF ATTENDEES

Dennis Spencer, Plant Manager
Kriste Lanius, Asst. Plant Manager
Charles Proffitt, TVA
Amos Smith, TVA
Hank Julian, TVA
Ron Purkey, TVA
Lynn Petty, TVA
Mike Hughes, TVA
Dirk Cooper, TVA
Larry Radford, HED
William Perry, HED
Brad Workman, HED
Dan Smith, PEC
Pat Taylor, PEC
Gary Melton, PEC

GENERIC - PRE-JOB BRIEF CHECKLIST

Activity: GAF - Ash Pond E Survey **WO No.:**

Date:

☐ What are we going to do?

- Visual reconnaisance of Ash Pond E interior
- Field Surveying of Ash Pond E Interior
- Possible investigative excavation(s) using track-mounted backhoe
- Geoprobe investigation

☐ What is the worst thing that could happen?

- Collapse of bridged ash overlying an unidentified sinkhole could result in accidental burial of personnel

☐ What are the Critical Steps?

- Initial loading of ash surface by backhoe
- Maintaining footfall within existing backhoe trail
- Maintaining safe distance from sinkholes and exploratory excavations

☐ What are we going to do, especially at those critical steps, to make sure that a mistake doesn't happen?

- Maintain personnel footfall boundaries within backhoe trail
- Maintain safe clearance from sinkholes and exploratory excavations
- Maintain safe clearance from backhoe during operation
- All other non-essential vehicles prohibited from access of the investigation area

☐ What are the Error-Likely situations?

- First time job performed following dewatering
- Unique work environment - sinkhole and ash bridging unknowns
- Wet ash, uncertain footing

☐ What are our safety concerns?

- engulfment/burial from ash collapse
- Slips, trips and falls

☐ Operating Experience

- Analog industry events include trench construction accidents (e.g. slope stability)

☐ General

☐ Attendee Sign-off

Hank E. Julian	Mike Hughes	William Perry
Harold Lynn Petty	Pat Taylor	Larry Radford
Amos Smith	Dan Smith	Survey team

Responsible Foreman or Supervisor conducting briefing:

_____

Hughes, Michael

From: Smith, Daniel R (Chattanooga) [Daniel.R.Smith@worleyparsons.com]
Sent: Thursday, May 12, 2005 1:31 PM
To: Hughes, Michael
Cc: Shah, Yogesh (Reading); Julian, Hank; egreg.mcnulty@parsons.com; Petty, Harold L.; Smith, Amos L
Subject: RE: New Boring at NB-73 West 50 feet from NB-73

Mike, see below additional scope in regards to the email I forwarded a couple of minutes ago.

Thanks

Dan

From: McNulty, Greg [mailto:eGreg.McNulty@parsons.com]
Sent: Thu 5/12/2005 12:15 PM
To: Shah, Yogesh (Reading); Julian, Hank; Smith, Daniel R (Chattanooga)
Subject: RE: New Boring at NB-73 West 50 feet from NB-73

Yogesh and all,

It is our intend to hold on to all the Shelby tubes and record their recoveries in the field. Based on the SPT information we can select which ones for which test. I agreed we should add 1 3-pt CU and 1 3-pt Q-type triaxial test.

Greg

From: Shah, Yogesh (Reading) [mailto:Yogesh.Shah@worleyparsons.com]
Sent: Thursday, May 12, 2005 1:10 PM
To: McNulty, Greg; Julian, Hank; Smith, Daniel R (Chattanooga)
Subject: RE: New Boring at NB-73 West 50 feet from NB-73

> Looks fine to me, except that we should hold on the two Shelby samples for consolidation testing and determine later if we want consolidation and/or triaxial and/or additional permeability testing on those two Shelby samples. For budgeting, the triaxial testing would be conservative, being the most expensive of the three tests.
>
> I think we also should ask Mactec to note pocket penetrometer shear strength values for the top part and bottom part of each Shelby sample after removing the the seas and prior to performing other tests in the laboratory. This is a standard procedure in many soils labs and shouldn't cost extra as it's a simple test of pushing a hand penetrometer into the sample before extracting the sample. This test gives a crude measure of unconfined compressive strength that is noted on the boring log. Since we do have an SPT at each Shelby location, this just serves as an additional verification of strength difference between the top and bottom parts of the sample.
>
> Yogesh.
>
> -----Original Message-----
> **From:** McNulty, Greg [mailto:eGreg.McNulty@parsons.com]
> **Sent:** Thursday, May 12, 2005 12:09 PM

To: Julian, Hank; Smith, Daniel R (Chattanooga); Shah, Yogesh (Reading)
Cc: Greg McNulty (McNulty, Greg)
Subject: New Boring at NB-73 West 50 feet from NB-73

All,

In accordance with our telephone conversion this morning, the following is a summary for the new boring at NB-73 West, located 50 feet from NB-73:

1. Obtain Shelby (Undisturbed) tubes samples starting at 10 foot (skip 20 feet) depth and continue in 10 foot interval.

2. Follow each Shelby by SPT.
3. Obtain a unit weight measurement and moisture content on each Shelby.
4. Obtain a moisture content on each SPT sample (sealed glass jars).
5. Conduct 4 D-5084 flexible wall hydraulic conductivity tests.
6. Conduct 2 D-2435 Consolidation Tests from 0.5 times insitu overburden stress to 32 tsf, used square root of time analysis to determine Cv, report all time versus deflection data, initial dial readings, scale and dial conversion factors in both readable printed and readable electronic Excel *.xls formats.

7. Conduct 1 pinhole test - D-4647

Greg McNulty PhD, PE, PG

Parsons
2443 Crowne Point Drive
Cincinnati, Ohio 45241-5407
Cinci Office 513 552-7052
Fax 513 554-6572
Cell Personal 513 304-9099
egreg.mcnulty@parsons.com

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(me)

Thanks.

Stan

Hughes, Michael

From: Smith, Daniel R (Chattanooga) [Daniel.R.Smith@worleyparsons.com]
Sent: Thursday, May 12, 2005 1:30 PM
To: Hughes, Michael
Cc: Julian, Hank; Petty, Harold L.; Smith, Amos L
Subject: FW: New Boring at NB-73 West 50 feet from NB-73

Mike, this email covers 3 projects. See below.

KIF Peninsula drilling.
Mike, we encountered a very deep layer of soil at NB-73 last week. We then followed up with some geoprobes yesterday and today. One geoprobe went to 120 ft deep without hitting rock. There is probably no need to do any more geoprobes at this time. TVA I think has probably completed all the planned geoprobing, and will probably demob from site today or tomorrow.

Greg, Hank, and Yogesh discussed what should be done next, and below is what they came up with. We are requesting that this be added to Mactec's scope of work. Please discuss with Lynn/Amos, etc. We would like to get this in the Mactec work hopper within the next couple of days (I know it takes a little time to get decisions made, and communicate to Mactec). We're not asking that this be done tomorrow or anything, but would like to get approval to send this scope to Mactec to get a price, and then approval to do the work.

I think the scope of work is fairly straightforward and can be pasted in an email and sent to Mactec.

If I need to do anything let me know. You can reach me on cell phone today.

PAF Coarse and Medium Coal Refuse Stack Closure

Also, Mactec sent an email and 5/17 (I think) is the date to receive PAF info.

KIF Dredge Cell Restoration (French Drain)

Also, talked to Larry Radford and Brad Workman. We are going to need low perm clay (1 E-6 cm/s) from the borrow source at KIF. I can write up scope of work. We probably need to get Mactec on board to do that work while they're a the site.

I will forward a proposed scope of work if you agree.

Thanks

Dan

From: McNulty, Greg [mailto:eGreg.McNulty@parsons.com]
Sent: Thu 5/12/2005 11:08 AM
To: Julian, Hank; Smith, Daniel R (Chattanooga); Shah, Yogesh (Reading)
Cc: Greg McNulty (McNulty, Greg)
Subject: New Boring at NB-73 West 50 feet from NB-73

All,

In accordance with our telephone conversion this morning, the following is a summary for the new boring at NB-73 West, located 50 feet from NB-73:

1. Obtain Shelby (Undisturbed) tubes samples starting at 10 foot (skip 20 feet) depth and continue in 10 foot interval.

2. Follow each Shelby by SPT.
3. Obtain a unit weight measurement and moisture content on each Shelby.
4. Obtain a moisture content on each SPT sample (sealed glass jars).
5. Conduct 4 D-5084 flexible wall hydraulic conductivity tests.
6. Conduct 2 D-2435 Consolidation Tests from 0.5 times insitu overburden stress to 32 tsf, used square root of time analysis to determine Cv, report all time versus deflection data, initial dial readings, scale and dial conversion factors in both readable printed and readable electronic Excel *.xls formats.

7. Conduct 1 pinhole test - D-4647

Greg McNulty PhD, PE, PG

Parsons
2443 Crowne Point Drive
Cincinnati, Ohio 45241-5407
Cinci Office 513 552-7052
Fax 513 554-6572
Cell Personal 513 304-9099
egreg.mcnulty@parsons.com

Hughes, Michael

From: Julian, Hank

Sent: Thursday, May 19, 2005 9:03 AM

To: 'Yogesh Shah'; 'Dan Smith (Daniel.R.Smith@worleyparsons.com)'; 'Greg McNulty'; Hughes, Michael; Smith, Amos L; Haber, Stanley M.; Petty, Harold L.; Bowers, Larry C; Boggs, J. Markus; 'habenkhayal@mactec.com'; Robinson, Dave W

Subject: KIF Peninsula: Update on Drilling - anomolies

Spent yesterday at the site an here are a few notations:

1. The rock coring at NB-81indicated two significant cavities (partially filled) beginning 2.4 ft below top of rock. The first was 4.8 ft in vertical thickness and the second was 1.7 ft thick (about 1 ft below upper cavity). Smaller cavities have been observed at NB-77, NB-66, NB-74, and NB-73 most of these appeared completely to partially infilled. As indicated in the scope of work, bedrock weathering and development of solution features is expected to be most pronounced at top of rock and decreasing with depth. Progression of weathering follows jointing and 45 degree bedding. However, solution features at greater depths may be exist and owe their origin to ancestral levels of the Clinch/Emory Rivers - i.e. old river elevevations influenced groundwater levels at the site such that solution development occurred alonged these phreatic zones.

2. Geoprobing in the area 50 feet west of NB-73 indicated a depth to bedrock in excess of 120 ft. Boring was conducted yesterday at this exact location (NB-73W) and alluvium was verified, however, refusal was encountered at 47.5 ft along with highly weathered bedrock interface. The opening that the geoprobe hit must have been small.

3. CPT work was completed yesterday. An anomoly was observed at NB-58 - operator indicated a void above the bedrock interface - he could not recall dimensions. The logs from CPT surveys should be available in about a week.

4. Geoprobe work was completed early this week - I will send along logs (probably today).

5. Alluvium was definately encountered at NB-21. Hussein, could you please fax logs from John? Thanks

6. We need to relocate borings NB-22 and NB-35 (those originally located in the drainage channel) - reservoir levels are up and the channel is filled with water. Greg and Yogesh - let's discuss by phone.

7. Well development began yesterday.

8. Schedule looks good - we currently anticipate that drilling work will be completed in 2-1/2 weeks. Dave Robinson indicated that TWRA would like to plant the pastures. Dave - note my voice mail yesterday, we need to resurvey offset borings and new wells prior to plowing. We should probably allow about 4 weeks from now. Note also that we did not plan to install protective bollards at this site since access is limited and most of these wells are considered temporary. I don't like the thought of a tractor clipping a $6,000 pair of our wells - do we need bollards for all of our wells? If so, how do we pay for this?

9. Hussein - probably need to have your guys haul about nine bollards to the site for installation at wells NB-63, NB-10, and our piezometer I (near the road) - likely to have some hunters at the site this fall.

10. I downloaded our water level instruments and measured groundwater levels - I will update the database and send along to Parsons.

11. Mike/Lynn - can you please talk to Dallas Sluss to tentatively set up the resurvey - assume 2-1/2 weeks from now. I will provide a list of wells and borings that were offset for resurvey.

Hank

-----Original Message-----
From: Hensley, Christopher W.
Sent: Thursday, May 19, 2005 6:07 AM
To: Yogesh Shah; Dan Smith (Daniel.R.Smith@worleyparsons.com); Greg McNulty; Hensley, Christopher W.; Hughes, Michael; Julian, Hank; Smith, Amos L
Subject: MACTEC - KIF Field Log 6 5/18/05

Please find the attached file for KIF from MACTEC.

Thank you,

Chris Hensley

Hughes, Michael

From: Julian, Hank
Sent: Tuesday, June 21, 2005 8:29 AM
To: 'cdlawson@mactec.com'; Tockstein, Carl
Cc: 'Justice, Todd'; Yogesh Shah (Yogesh.Shah@worleyparsons.com); Dan Smith (Daniel.R.Smith@worleyparsons.com); McNulty, Greg; Petty, Harold L.; Hughes, Michael
Subject: FW: KIF - Peninsula Site - Final Logs of Borings
Importance: High

Please conform to Yogesh's instructions below - I would also like to arrange to examine jar samples personally.

Thanks

Hank

Hank E. Julian, P.E., P.G.

hejulian@tva.gov
865.632.6942 (office)
865.632.8375 (fax)

-----Original Message-----
From: Shah, Yogesh (Reading) [mailto:Yogesh.Shah@worleyparsons.com]
Sent: Friday, June 17, 2005 8:02 PM
To: Julian, Hank
Cc: Smith, Daniel R (Chattanooga); egreg.mcnulty@parsons.com
Subject: KIF - Peninsula Site - Final Logs of Borings
Importance: High

Hank,

As we discussed to-day, we should request Mactec to do the following for finalizing the logs of the borings besides making other minor corrections and adding GS elevations on the logs:

1. Keep all the information as stated on the handwritten logs provided to us after modifying the logs for the aspects stated in the folowing two items.

2. In addition to the other description of the soils provided, the description of soil in each SPT jar should be reexamined carefully by an experienced geologist again to provide as precise identification as possible to be either "residual" or "alluvial" soil. This will require the jar samples to remain undisturbed and not undergo any lab testing prior to the visual examination for this purpose so that the geologist can examine the relic structure, color, grain distribution, grain-shape, bedding, etc. to help make the determination. This information is critical for a proper analysis of the site conditions in support of determining its suitability for the proposed disposal. Mactec may need some help from you in this determination.

3. Use of word "void" in the bedrock may be avoided because the logs do not indicate that the "drill rods dropped" under self weight. Since the rods apparently did not drop, use of phrases like "rock fracture (or joints) filled with soil" or "softened highly weathered rock" or any other appropriate wordage may be consistently used in all logs. Also, a review of the handwritten logs show that the rock fractures at bedrock surface or below are filled with soil that may be partly residual and partly carried by water flow through the fractures or joints; i.e., a void space created primarily by solutioning of limestone is not evident from the detailed descriptions written in the logs. Therefore, if it is so clear based also on an examination of the recovered rock cores that the bedrock is not solutioned significantly, it will be helpful to state in the logs, where such "cavities" exist, that "significant solutioning of the bedrock is not apparent based on an examination of the recovered cores." This, again, is an important observation for determining the site suitability and may also be incorporated in the logs.

Thanks.

Yogesh.

Hughes, Michael

From: Shah, Yogesh (Reading) [Yogesh.Shah@worleyparsons.com]
Sent: Tuesday, June 14, 2005 3:52 PM
To: Julian, Hank
Cc: egreg.mcnulty@parsons.com; Petty, Harold L.; Hughes, Michael; Smith, Daniel R (Chattanooga)
Subject: RE: KIF - Peninsula Site
Importance: High

Hank,

First, I must apologize for some typos left in my e-mail below to Dan - importantly, please read, "....."**cavity" or "void" is used consistently**.... " instead of "..... **"cavity" or "void" is not used consistently**....."

What boggles me is: Going down from GS is the presence of more than 20 feet thick stiff residual clayey soil (see logs of borings NB-44 and NB-74) that has evolved from the parent bedrock which is highly fractured. This "dissolution along fracture faces" apparently occured after the formation of the overlying residual soil by water movement along the fractures. Since the clayey residual soil allowed virtually no drainage of storm water into these underlying bedrock fractutres, it must have been through water-level fluctuations in the adjacent stream water. The flow velocity of seepage along the soil-filled fractures due to these fluctuations must have been low to cause any large-scale solutioning of the rock along those fractures. Thus, the voids, although found to have significant depth, are not likely to be much wider than the width of the fractures.

The cavity below the top of bedrock at NB-44 may be due to a fracture/fractures that lie at an angle, that outcrops at the bedrock top at some distance from the NB-44 location. The driller does not apparently report experiencing "drill rods dropped"; rather he went through soft drilling, although at some locations, he does report "loss of drill water". Meaning, perhaps, the rock there was softened for that depth in the vicinity of the fracture. It is possible that the soft rock was grinded up, resulting in low REC. Similarly, the reported sand-filliing in the fractures may have resulted in the weak/weathred-rock cuttings identified as sand. Well, an examination of the cores can throw more light on this. Also, this has to be examined from the groundwater-contaminant transport perspective as you suggest. These are the things that have to be looked at closely before the logs are finalized.

My intent is primarily to assess conclusively that there is no serious existing solution cavity that is likely to cause any sink-hole formation that may affect the proposed stack if the stiff-clay cover is not removed. Any significant stripping of the existing natural clay stratum then must be avoided in our plans.

Sorry not to respond immediately due to constant interruptions I had since I came in to-day. Let me know when you want to discuss this further and with who. I will be available now until 7:00 PM today and, if not to-day, to-morrow. (Dan, let me know the time.)

Thanks.

Yogesh.

-----Original Message-----
From: Julian, Hank [mailto:hejulian@tva.gov]
Sent: Tuesday, June 14, 2005 11:41 AM
To: Shah, Yogesh (Reading)
Cc: egreg.mcnulty@parsons.com; Petty, Harold L.; Hughes, Michael; Smith, Daniel R (Chattanooga)
Subject: RE: KIF - Peninsula Site

Yogesh:

Let's discuss. I don't have a major problem with changing nomenclature or terminology for final logs, but we need to reach some agreement on what is appropriate. However, the primary weathering mechanism associated with the Knox is dissolution along fracture faces and this is generally expected to be most pronounced at the soil bedrock interface, with occurrence of weathered/solutioned fractures decreasing with depth. There may be exceptions to this: i.e., deeper weathering horizons when groundwater levels were lower (lower ancestral river elevation control) - note the cavity at NB-44 from 42 to 50 ft below top of bedrock. I would also include a term to relate to "partially soil-filled cavity or fracture". We should also differentiate between clay- or sand-filled bedrock features.

From a groundwater/contaminant transport perspective, what is more important is the occurrence of open or partially filled solution features that may be interconnected and extend some distance. The borehole flowmeter logging will be most helpful to identify "hydraulically active" solutioned fractures. At survey wells, we can determine how these correlate with drilling logs. However, we will not be able to gage extent of these features of connectivity. Initial flowmeter tests are conducted under ambient (natural gradient conditions), this is followed by stressing the well (pumping or injection) and resurveying at steady-state discharge rates. Based on the current scope of investigation, site suitability will primarily be a function of thickness and hydraulic characteristics of overburden soils (e.g. sufficiently thick strata of low permeability soil) as well as landfill design (especially the base). We can describe potential transmissivity of bedrock features based on single-well aquifer tests and aperatures estimates, but the soil serves as our moderator.

Let's discuss examination of bedrock core materials.

Hank

Hank E. Julian, P.E., P.G.

hejulian@tva.gov
865.632.6942 (office)
865.632.8375 (fax)

-----Original Message-----
From: Smith, Daniel R (Chattanooga) [mailto:Daniel.R.Smith@worleyparsons.com]
Sent: Thursday, June 09, 2005 5:27 PM
To: Julian, Hank
Cc: Shah, Yogesh (Reading); egreg.mcnulty@parsons.com; Petty, Harold L.; Hughes, Michael
Subject: FW: KIF - Peninsula Site
Importance: High

Hank, everyone, FYI. Hank after you get back, you might want to coordinate with Chad Lawson (cdlawson@mactec.com). Yogesh has raised some good points here.

Thanks, Yogesh.

Dan

From: Shah, Yogesh (Reading)
Sent: Thursday, June 09, 2005 3:28 PM
To: Smith, Daniel R (Chattanooga)
Subject: KIF - Peninsula Site
Importance: High

Dan,

I have carefully reviewed the hand-written logs of the exploratory borings, especially the cored rock descriptions. Luckily, the logging was done by three apparently experienced fellows, including Chad. Although the bedrock is described to contain significant "cavities" or a "voids" (specifically at borings NB-22, 44, 66, 74 and 77), there is hardly any conclusive indication from the description that these cavities or voids are primarily due to solutioning. These anamolies are filled up with soil (silty sand or silty clay) and are not voids per say. Also, it is possible that a highly weathered fractured and, hence, softened rock turned into soil (primarily silty sand or sandy soil) when cored using a water-circulation method. This soil then may not be all that secondary filling in the bedrock fractures (although some of it should be), it also may have been produced due to the drilling, as indicated from the use of words "containing rock fragments" or "weathered chert fragments" in describing the soil. Also, the rock is described as highly fractured and weathered; and, that is perhaps what it actually is - just highly fractured and weathered, but not solutioned.

I came to this conclusion, pending a further visual examniation of the rock cores for these borings, especially by an experienced geologist, specifically to examine if there are smooth and rounded core surfaces strongly indicating solutioning (due to action of water flow) or just conchoidal-type planar irregular surfaces that show just highly weathered fractured rock. This perhaps should be easy for the geologist to come to a conclusion. We have enough cores, from both suspected weak areas (one around NB-44 and the other at NB-73-NB-77 area) for such an examination.

I am bringing up this issue for an examination and conclusion w.r.t. solutioning so that use of the word"cavity" or "void" is not used consistently in the final logs of the borings and to state specifically in the logs that the bedrock cores do not show indication of solutioning and show just highly fractured and zones of the bedrock, if Chad also agrees.

I suggest that we have a confrerence call with Chad soon after Hank returns to discuss this issue. In the meantime, you may consider forwarding this e-mail to Chad. Note that these logs will be submitted to TDEC and the use of the word "soil-filled cavity or fracture" be chosen than simply "cavity" or "void" (the word "void" seems inapprropriate) in the final logs so that it does not make someone at TDEC to believe that the rock is solutioned. That will make it difficult for us to convincingly establish that this site does not have any significant solutioning of the bedrock at least for the top 30 feet (that is my honest opinion based on the logs - reading between the lines) and, therefore, the surface depressions are merely "dolines" that are underlain by a sufficiently thick strata of residual soil that consist primarily of stiff to very stiff silty clay.

Thanks.

Yogesh.

Hughes, Michael

From: Smith, Daniel R (Chattanooga) [Daniel.R.Smith@worleyparsons.com]
Sent: Thursday, June 09, 2005 5:27 PM
To: Julian, Hank
Cc: Shah, Yogesh (Reading); egreg.mcnulty@parsons.com; Petty, Harold L.; Hughes, Michael
Subject: FW: KIF - Peninsula Site
Importance: High

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Thanks, Yogesh.

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From: Shah, Yogesh (Reading)
Sent: Thursday, June 09, 2005 3:28 PM
To: Smith, Daniel R (Chattanooga)
Subject: KIF - Peninsula Site
Importance: High

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Thanks.

Yogesh.

Hughes, Michael

From: Smith, Daniel R (Chattanooga) [Daniel.R.Smith@worleyparsons.com]
Sent: Tuesday, October 11, 2005 7:29 AM
To: Justice, Todd
Cc: McNulty, Greg; Shah, Yogesh (Reading); Petty, Harold L.; Hughes, Michael; Tockstein, Carl
Subject: FW: Residual Strength Tests on Liner Material - Amendment Item 15

Todd, please add one additional test to the borrow material for KIF.

Thanks

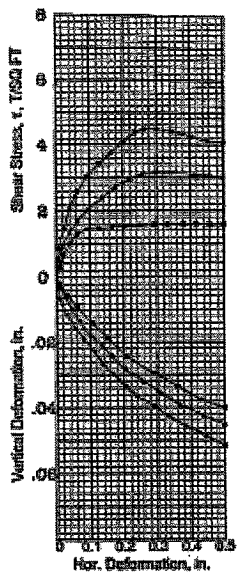
Dan

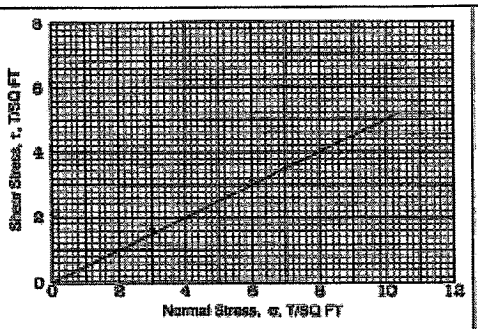
From: McNulty, Greg [mailto:eGreg.McNulty@parsons.com]
Sent: Monday, October 10, 2005 6:30 PM
To: Smith, Daniel R (Chattanooga)
Cc: Shah, Yogesh (Reading)
Subject: Residual Strength Tests on Liner Material - Amendment Item 15

15. **Add one residual cyclic shear tests for the MH soil with the highest plasticity index (PI) from the either the borrow area or the 80 acre site to test remolded compacted soils for the liner under cyclic shear.** Note the batch mixing times in Section 7.6 of ASTM D-3080 **for MH materials of 36 hours. Specimen shall be compacted to standard compaction at 2-percent moisture content of optimum dry density.** The normal stresses shall be 6 ksf, 12 ksf, 24 ksf. The time to failure shall be a minimum of 400 minutes (unless 50 times t50 indicates the **use of a longer time to failure**) for each of the loadings and its three cyclic loadings under each normal stress. Note, determine the time to failure under each normal stress by the logarithm of time method by taking consolidation readings at 0.1, .25, .5, 1, 2, 4, 8, 16, 30, 60,100, 120, 150, 180, 200, 240, 300, 420, 480, 600, 720, 960, and 1440 minutes to ensure that sufficient points have been taken for curve fitting and the end of log time settlement curve has begun to curve / flatten / reach to ensure that a straight line portion exists to be used for curve fitting.

    For the **cyclic direct shear test, use with a time to failure greater than 500 minutes** (unless 50 times t50 indicates the **use of a longer time to failure**) using at least 3 cycles under each effective normal stress (minimum of three to define a straight line). You crank the test forward and backward with for each cycle necessary to allow complete drainage and no pore pressure build up to occur. You allow about 10 minutes after you crank the specimen back to zero deflection between each cycle. On some rare occasions you have to run it 4 times. That is how you get a residual strength envelope.

<<EM-1110-1902-Slope Stability.png>>





Shear Strength Parameters

ϕ' = 27.0 deg

tanϕ = 0.510

c' = 0.0 T/sq ft

☐ Controlled stress

☒ Controlled strain

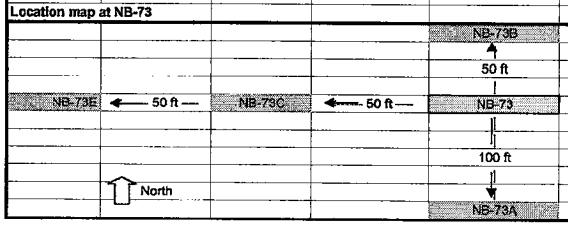
Test No.						
Initial	Water content	w_o	24.4%	24.4%	24.4%	
	Void ratio	e_o	0.769	0.709	0.779	
	Saturation	S_o	87%	95%	88%	
	Dry density lb/cu ft	γ_d	97.2	100.4	98.5	
Void ratio after consolidation		e_c	0.694	0.615	0.610	
Time for 50 percent consolidation, min		t_{50}	16	24	23	
Final	Water content	w_f	25.5%	26.1%	26.4	
	Void ratio	e_f	0.688	0.464	0.494	
	Saturation	S_f	100	100	100	
Normal stress T/sq ft		σ	3.0	5.0	9.0	
Maximum shear stress, T/sq ft		τ_{max}	1.60	3.18	4.47	
Actual time to failure, min		t_f	600	600	600	
Rate of displ., in/min			0.0003	0.0003	0.0003	
Ultimate shear stress, T/sq ft		τ_{ult}	1.58	3.00	4.08	

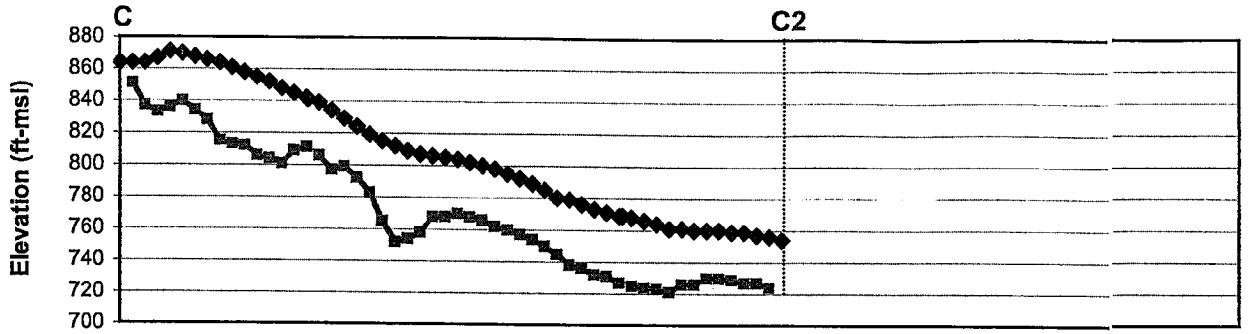
Type of specimen Undisturbed		3.28 in. square	0.80 in. thick
Classification Brown and Gray Lean CLAY (CL)			
LL 34.1	PL 20.9	PI 13.2	G_s 2.75
Remarks	Project Yatesville Dam		
	Area		
	Boring No. UD-1A	Sample No. 4	
	Depth/Elev 879.5-877.0	Date DEC 1973	
	DIRECT SHEAR TEST REPORT		

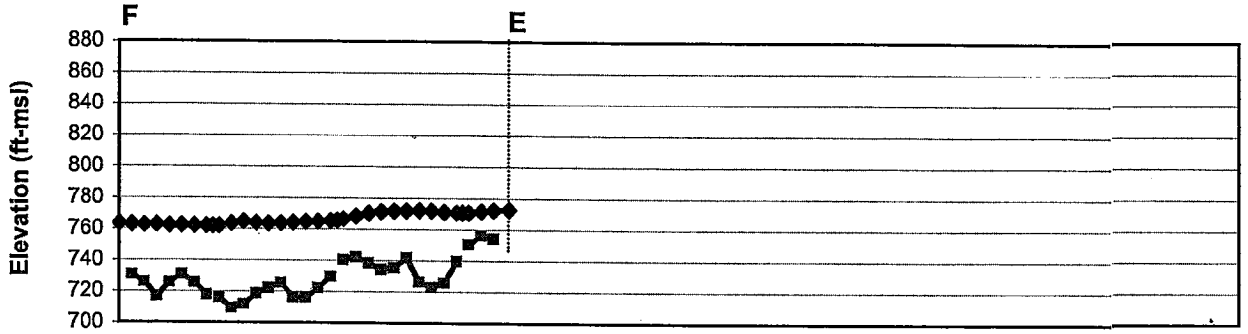
Figure 4-10. Direct shear test report – effective stress envelope

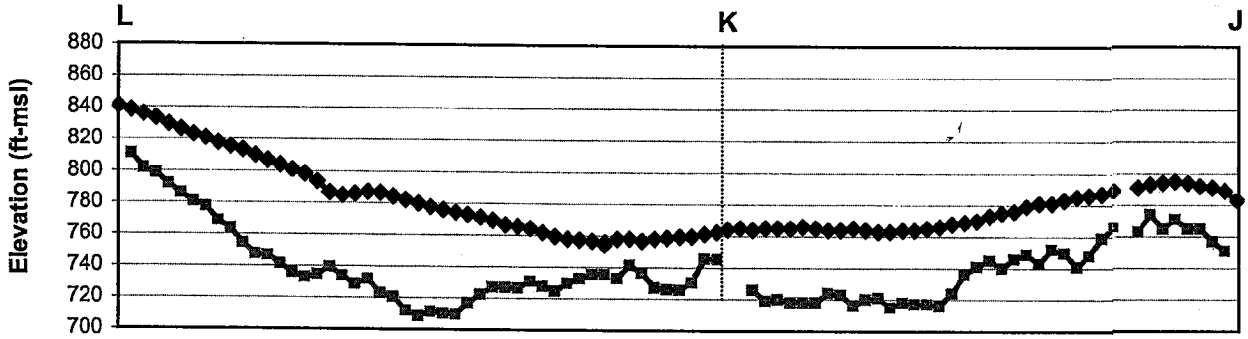
KIF Peninsula - Geoprobe Results								*P = Push, Hydraulics only*
note: red text holes require resurvey								*LH = Light Hammer*
								MH= Moderate Hammer
		Tennessee Lambert (NAD 27)		NGVD 29				*HH= Heavy Hammer*
HOLE ID	Depth to Resistance (ft)	Northing (ft)	Easting (ft)	Ground Elevation (ft-msl)	Top of Resistance (ft msl)	Off-set (ft)	Off-set (direction)	Resistance Notations (ft from ground surface)
NB-3	39	549815.23	2441041.16	755.44		23	south	0 to 24' P only, 24' to 37' LH, 37' to 38' MH, 38' to 39' HH & loamy
NB-4	59	549818.48	2441047.69	746.80	687.80			0 to 21.5 P only, 21.5' to 38' LH, 38' to 40' HH, 40' to 44' P only, 44' to 54' LH & P, 54' to 59' HH
NB-5	Deleted	550326.85	2441195.87	812.32				inaccessible
NB-6	35.5	550124.49	2441200.86	770.12	734.62			LH 0 to 34, HH to 35.5 (Loamy)
NB-7	63	549927.06	2441209.11	760.65		5	East	Push and LH 0 to 56, HH 56 to 63 (Loamy)
NB-8	53.3	550429.54	2441364.13	824.23		14.1	East	0 to 12' P only, 12' to 27' LH, 27' to 51' P only, 51' to 52' MH, 52' to 53.3' HH
NB-9	53.8	550227.71	2441370.38	793.66		10.1	East	0 to 12' P,12' to 16' LH,16' to 28' P,28' to 36' P&LH, 36' to 40'LH&MH,40' to 52'LH,52' to 53.8' HH
NB-12	29.6	549653.41	2441417.18	755.43	725.83			Push 0 to 19.8, MH to21.8, Push to 23.7, MH to 29.2, HH to 29.6 (SANDY)
NB-13	50.5	549425.15	2441500.07	745.68	695.18			Push 0 to 36.8, MH to 47.5, Push to 50.5
NB-14	28.3	550534.65	2441532.38	826.49	798.19			0 to 8'P, 8'to12' LH, 12'to18'LH&MH, 18'to 20'MH, 20'to22'LH,22'to 24'P, 24'to 25'HH,25'to27'MH, 27'to 28.3'HH
NB-15	48.3	550337.11	2441545.00	803.85	755.55			0to40'P, 40'to44'MH, 44'to46' MH to HH, 46' to 47.3'HH
NB-16	19.7	550137.49	2441545.01	779.03	759.33			Push 0 to 8, MH to 12, HH 19.7
NB-17	60.5	550692.68	2441671.50	832.89	772.39			0 to 16'P, 16'to 28'P&LH,28'to35'Pto36'LH, 36'to57'P, 57'to 60.5'HH
NB-19	31.7	550498.59	2441685.44	814.48	782.78			Push 0 to 2, MH to 14, Push to 15.5, HH to 31.7 (loamy)
NB-20	57.2	550099.14	2441697.87	765.74				Push to 12.2, LH to 13.7, Push to 57.2, HH at 57.2 (SANDY)
NB-23		549433.16	2441690.16	753.87				
NB-27	37.2	550208.54	2441868.14	765.60	728.40			0-26'P,26'-28LH,28'-32'P,32'-36'LH,36'-37.2'HH
NB-28	55.1	549978.18	2441773.72	752.33	697.23			Push 0 to 17, MH to 18.5, Push to 32, HH to 35, Push to 37, HH to 55.1 (SANDY)
NB-29		549716.17	2441808.23	739.62				Location Inaccessible, Down ravine in the middle of creek
NB-30	76	550905.12	2442018.47	855.36	779.36			0 to 18'P, 18' to 20'LH, 20'to24'MH,24'to28'MH,28'to50'LH,50'to70'P&LH,70'to74'MH, 74'to76'HH
NB-31	25.9	550699.93	2442020.55	824.83	798.93			0-20'LH&P,20'-25.9'LH-MH-HH (Truck Walking down Hill)
NB-32	44.6	550511.14	2442027.98	794.07	749.47			Push 0 to 5, LH to 11, MH to 21, Push to 41.8, HH to 44.6
NB-33	33.9	550315.82	2442040.71	764.31	730.41			Push 0 to 17, LH to 30, MH to 33.9 (SANDY)
NB-34	23.2	550127.00	2442051.50	746.91	723.71			Push 0 to 17.2, LH to 19.0, HH to 23.2
NB-36	8.5	549708.16	2442050.55	747.64	739.14			Push 0 to 8.5, MH to 8.5
NB-37	21	550995.08	2442189.76	848.02		4	South	0to12'P,12'to16'MHtoHH,16'to20'LH,20'to21'HH
NB-38	23.3	550805.76	2442193.52	816.69		3.83	West	0to8'P&LH,8'to20'MH,20'to23'-4"HH
NB-40	13.3	551076.38	2442372.59	827.35		20.5	South	0to8'P,8'to12'MH,12'to13.3'HH
NB-42	37.7	550691.23	2442374.03	778.37	740.67			Push 0 to 12.4, LH to 22, Push to 34, LH to 37.7
NB-43	35.3	550501.85	2442367.58	764.07	728.77			Push 0 to 8, MH to 14, Push to 22, MH to 35.3 (SANDY)
NB-45	23.7	549851.56	2442479.11	761.45	737.75			Push 0 to 17, HH to 23.7
NB-46	45.4	550253.21	2442581.63	752.18		28	East	Push 0 to 5,MH to 13, Push to 23, MH to 35, Push to 37, HH to 45.4
NB-48	deleted	551080.97	2442776.31	810.59				could not locate
NB-49	74.5	550888.80	2442732.86	787.78	713.28			Push and LH 0 to 42,HH to 74.5
NB-50	23.5	550731.94	2442807.28	771.36	747.86			Push 0 to 15, MH to 23.5
NB-51	51.4	550350.81	2442748.90	754.33	702.93			Push 0 to 25, LH to 26.5, Push to 37.2, MH to 38, Push to 45, MH to 51.4 (Sandy)
NB-52	75.1	549990.54	2442848.37	775.21	700.11			Push 0 to 2.5, MH to75.1 (Sandy)
NB-53	54.2	549811.36	2442824.67	774.53	720.33			Push 0 to 16.2, MH to 36, Push to 43.5, MH to 47, HH to 54.2
NB-55	35	551142.98	2442970.31	794.60		28	South	0-16'LH,16'-28'P,28'-32'LtoMH,32'-35'HH
NB-60	41.7	551347.17	2443231.71	798.75		48	South	0'-20'LH,20'-24'MH,24'-41.7'HH
NB-61	61.9	550879.19	2443263.67	766.37		12	North	Push 0 to 8.2, MH to 28, Push/MH to 36.5,MH to 48, HH to 61.9 Sandy
NB-64	35.6	551076.22	2443316.44	775.13	739.53			Push 0 to 29, MH to 35.6
NB-67	49.6	549988.68	2443407.78	780.10	730.50			MH 0 to 23, Push to 31, MH to 45, Push to 49.6 (Sandy)
NB-68	55.9	551132.02	2443506.10	773.16		42.8	South	Push 0 to 8, MH to 16.5, HH to 55.9 offset
NB-69	68.7	550739.28	2443575.53	765.49	696.79			Push 0 to 8, MH to 15, Push to 28, MH to 34, HH to 35.5 MH to 42, HH to 68.7
NB-70	30.4	550055.79	2443581.96	768.05	737.65			Push 0 to 3, MH to 12, HH to 25, MH to 30.4
NB-72	21.2	551141.39	2443678.20	776.84	755.64			Push 0 to 3, MH to 12, HH to 21.2
NB-73A	76	550546.45	2443773.74	747.53	671.53			0-40'P,40'-48'MH,48'-52'P,52'-55'P&LH,55'-58'LH&MH,58'-73'P&LH,73'-76'LH-MH-HH (Loamy)
NB-73B	30.3	550546.45	2443773.74	747.53	717.20			0-16'P,16-20'LH,20'-28'P&LH,28-30'-4"HH
NB-73C	120	550546.45	2443773.74	747.53	627.53			0-30'P,30'-32'LH,32'-67'P&LH,67'-69'HH,69'-91'P&LH,91'-93'P,93'-106'LH,106'-108'P,108'-120'LH&P
NB-73D	35	550546.45	2443773.74	747.53	712.53			0-18'P,18'-20'LH,20'-34'P7LH,34'-35'HH
NB-73E	33	550546.45	2443773.74	747.53	714.53			0-18'P,18'-24',24'-28'P,28'-32'LH,32'-33'HH (Silty w/loam)
NB-75	35.2	549947.10	2443757.52	751.08	715.88			Push 0 to 10, MH to 21, LH to 33.4, MH to 35.2 (Sandy)
NB-78	28.8	551129.05	2444016.59	775.43	746.63			Push 0 to 28.8
NB-80	51.6	550237.50	2444094.58	747.00	695.40			Push 0 to 12, MH to 28, HH to 35, Push to 48, MH to 51.6 (Sandy)
NB-83	35.7	550166.11	2444328.55	743.35	707.65			Push 0 to 21, MH to 35.7 (Sandy)
NB-86	Deleted	550530.01	2440938.14	877.74				inaccessible
NB-87	23.9	550643.76	2441240.55	873.37		14.7	West	0-4'P,4'-8'MH,8'-12'MH&HH,12'-20'P,20'-22'MH,22'-23.9'HH
NB-88	59	550716.66	2441445.55	854.33		15.4	West	0-16'P,16'-26'LH,26'-40'P,40'-46'LH,46'-48'HH,48'-56'LH&MH,56'-59'HH
NB-89	42.3	550780.18	2441618.74	848.05		7	West	0-37'P,37'-41'MH, 41'-42.3'HH

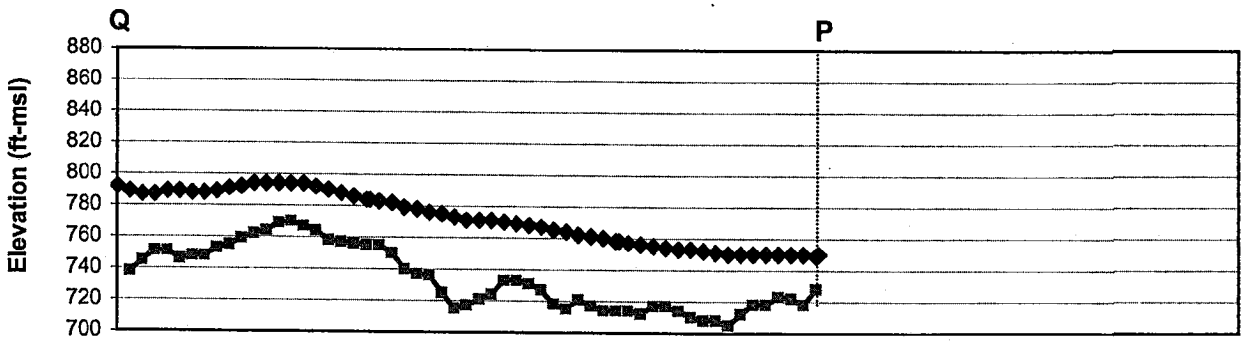
Location map at NB-73

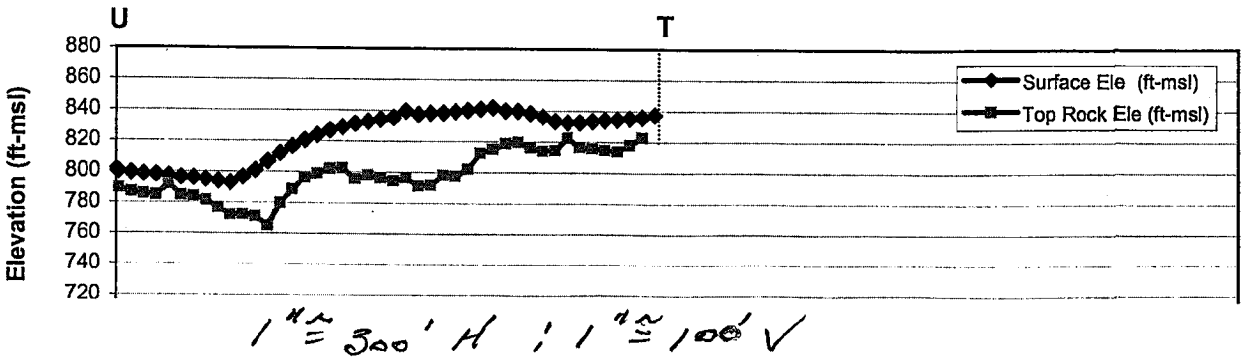



C
C2
Elevation (ft-msl)
880
860
840
820
800
780
760
740
720
700


F
E
Elevation (ft-msl)
880
860
840
820
800
780
760
740
720
700


L
K
J
Elevation (ft-msl)
880
860
840
820
800
780
760
740
720
700


Q
P
Elevation (ft-msl)
880
860
840
820
800
780
760
740
720
700


U
T
Elevation (ft-msl)
880
860
840
820
800
780
760
740
720
Surface Ele (ft-msl)
Top Rock Ele (ft-msl)

1" ≅ 300' H ; 1" ≅ 100' V

Transmission/Power Supply
Surveying & Project Services

Project: **Kingston Fossil Plant**
Subsurface Investigations
As Drilled Bore Holes
June 2005

Survey Date: 06/22/2005
Project: RKQ724
Job: RKQ724.5

Projection: Tennessee Lambert
Horizontal Datum: NAD 27 Order: 4th
Vertical Datum: NGVD 29 Order: 4th
Units: US Survey Feet

Printing Date: 07/08/2005

Bore Hole Number	US Survey Feet NAD 27 Tennessee Lambert Northing	Easting	NGVD 29 Elevation	Remarks
* 3	549792.90	2441047.90	754.2	Ground @ drilled boring hole.
* 7	549931.54	2441212.25	760.5	Ground @ drilled boring hole.
* 8	550426.16	2441378.12	822.1	Ground @ drilled boring hole.
* 9	550230.89	2441380.31	793.4	Ground @ drilled boring hole.
* 18	550497.92	2441678.35	813.5	Ground @ drilled boring hole.
* 22	549543.93	2441614.34	742.1	Ground @ drilled boring hole.
22A	549559.18	2441621.50	742.1	Ground @ drilled boring hole.
35	549885.41	2442165.34	744.8	Ground @ drilled boring hole.
* 37	550993.80	2442193.20	847.3	Ground @ drilled boring hole.
* 38	550803.31	2442190.93	816.4	Ground @ drilled boring hole.
* 40	551057.09	2442378.89	823.6	Ground @ drilled boring hole.
* 44	550230.85	2442334.83	742.7	Ground @ drilled boring hole.
* 46	550277.65	2442590.14	751.5	Ground @ drilled boring hole.
47A	549781.87	2442639.03	762.9	Ground @ drilled boring hole.
* 60	551333.23	2443276.51	784.8	Ground @ drilled boring hole.
* 61	550898.66	2443239.01	766.6	Ground @ drilled boring hole.
* 63	551224.69	2443381.98	781.0	Ground @ drilled boring hole.
* 68	551099.43	2443532.30	772.0	Ground @ drilled boring hole.
73A	550504.74	2443682.97	753.0	Ground @ drilled boring hole.
73B	550589.15	2443761.10	747.9	Ground @ drilled boring hole.
73C	550526.59	2443727.62	749.7	Ground @ drilled boring hole.
73D	550551.72	2443819.30	746.2	Ground @ drilled boring hole.
73E	550506.85	2443810.85	747.7	Ground @ drilled boring hole.
74A	550357.39	2443821.82	752.3	Ground @ drilled boring hole.
77A	550109.14	2443892.53	749.3	Ground @ drilled boring hole.
85A	550254.15	2443504.40	760.6	Ground @ drilled boring hole.
85B	550255.75	2443502.05	761.1	Ground @ drilled boring hole.
* 89	550784.09	2441624.67	847.7	Ground @ drilled boring hole.

* = Revised location. Not drilled at previously staked position.

Transmission/Power Supply
Surveying & Project Services

Project: **Kingston Fossil Plant**
Subsurface Investigations
Monitoring Wells
June 2005

Survey Date: 06/21/2005
Project: RKQ724
Job: RKQ724.5
RKQ724.6 (ESK-41 Pg. 14-17)

Projection: Tennessee Lambert
Horizontal Datum: NAD 27 Order: 4th
Vertical Datum: NGVD 29 Order: 4th
Units: US Survey Feet

Printing Date: 07/08/2005

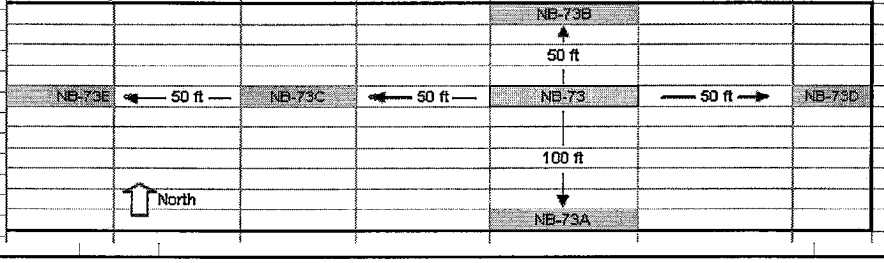
	US Survey Feet NAD 27 Tennessee Lambert			
Name	Northing	Easting	NGVD 29 Elevation	Remarks
MW-10A	550029.94	2441382.19	768.2	Ground @ PVC pipe
			771.87	Top of PVC pipe (cap removed)
MW-10B	550032.15	2441388.23	768.2	Ground @ PVC pipe
			771.61	Top of PVC pipe (cap removed)
MW-21A	549807.05	2441639.95	757.7	Ground @ PVC pipe
			762.34	Top of PVC pipe (cap removed)
MW-44A	550225.57	2442337.37	742.4	Ground @ PVC pipe
			745.00	Top of PVC pipe (cap removed)
MW-44B	550230.54	2442335.66	742.7	Ground @ PVC pipe
			744.04	Top of PVC pipe (cap removed)
MW-47A	549788.84	2442637.11	762.9	Ground @ PVC pipe
			766.38	Top of PVC pipe (cap removed)
MW-63A	551241.81	2443385.49	780.2	Ground @ PVC pipe
			781.96	Top of PVC pipe (cap removed)
MW-63B	551229.72	2443376.76	780.9	Ground @ PVC pipe
			784.94	Top of PVC pipe (cap removed)
MW-66A	550505.31	2443457.06	752.9	Ground @ PVC pipe
			756.39	Top of PVC pipe (cap removed)
MW-74A	550361.72	2443829.55	752.0	Ground @ PVC pipe
			756.01	Top of PVC pipe (cap removed)

Name	US Survey Feet NAD 27 Tennessee Lambert Northing	Easting	NGVD 29 Elevation	Remarks
MW-77A	550108.71	2443880.98	749.9	Ground @ PVC pipe
			754.37	Top of PVC pipe (cap removed)
MW-81A	550981.60	2444131.45	763.4	Ground @ PVC pipe
			765.25	Top of PVC pipe (cap removed)
MW-81B	550976.54	2444127.77	762.9	Ground @ PVC pipe
			764.27	Top of PVC pipe (cap removed)

KIF Peninsula - Well and Boring Locations Requiring Resurvey

HOLE ID	Original Survey: Tennessee Lambert (NAD 27) Northing (ft)	Original Survey: Tennessee Lambert (NAD 27) Easting (ft)	Original Survey: NGVD 29 Ground Elevation (ft-msl)	Off-set (ft)	Off-set (direction)
Boring Locations Originally Surveyed					
NB-3	549815.23	2441041.16	755.44	23.0	south
NB-7	549927.06	2441209.11	760.65	5.0	East
NB-8	550429.54	2441364.13	824.23	14.1	East
NB-9	550227.71	2441370.38	793.66	10.1	East
NB-18	550498.59	2441685.44	814.48	6.5	S 82 degrees W of original staked location
NB-22	549601.93	2441600.16	739.35	50.0	S 14 degrees W of original staked location
NB-37	550995.08	2442189.76	848.02	4.0	South
NB-35	---------- never surveyed ----------			200.0	N 45 degrees E of NB-36 and about 20 feet SE from the edge of the existing pond
NB-38	550805.76	2442193.52	816.69	3.8	West
NB-40	551076.38	2442372.59	827.35	20.5	South
NB-44	550230.34	2442326.52	743.01	9.0	S 85 degrees E of original staked location
NB-46	550253.21	2442581.63	752.18	26.0	East
NB-55	551142.98	2442970.31	794.60	28.0	South
NB-60	551347.17	2443231.71	798.75	48.0	South
NB-61	550879.19	2443263.67	766.37	12.0	North
NB-63	551260.87	2443352.08	779.64	39.0	S 45 degrees E of original staked location
NB-68	551132.02	2443506.10	773.16	42.8	South
NB-87	550643.76	2441240.55	873.37	14.7	West
NB-88	550716.66	2441445.55	854.33	15.4	West
NB-89	550780.18	2441618.74	848.05	7.0	West
Well Locations Not Originally Surveyed					
MW-10A	550030.19	2441383.04	768.11		at NB-10
MW-10B	550030.19	2441383.04	768.11		at NB-10
MW-21A	549791.49	2441645.61	757.00		at NB-21
MW-44A	550230.34	2442326.52	743.01		at NB-44
MW-44B	550230.34	2442326.52	743.01		at NB-44
MW-47A	549775.07	2442632.74	762.78		at NB-47
MW-63A	551260.87	2443352.08	779.64		at NB-63
MW-63B	551260.87	2443352.08	779.64		at NB-63
MW-66A	550502.24	2443453.56	752.66		at NB-66
MW-74A	550357.65	2443822.35	752.05		at NB-74
MW-77A	550108.13	2443887.66	749.32		at NB-77
MW-81A	550973.35	2444125.88	782.63		at NB-81
MW-81B	550973.35	2444125.88	782.63		at NB-81
New Boring Locations Not Originally Surveyed					
NB-22A	---------- never surveyed ----------			3.4	S 55 degrees W of NB-22
NB-47A	---------- never surveyed ----------			9.0	N 48 degrees E of NB-47
NB-73A	---------- never surveyed ----------			5.0	N 11 degrees E of NB-73
NB-74A	---------- never surveyed ----------			8.0	N 66 degrees E of NB-74
NB-77A	---------- never surveyed ----------			11.0	N 75 degrees E of NB-77
NB-85A	---------- never surveyed ----------			4.3	N 25 degrees W of NB-85
NB-85B	---------- never surveyed ----------			7.9	N 25 degrees W of NB-85
NB-73B	---------- never surveyed ----------			50.0	N of NB-73
NB-73C	---------- never surveyed ----------			50.0	E of NB-73
NB-73D	---------- never surveyed ----------			50.0	W of NB-73
NB-73E	---------- never surveyed ----------			100.0	W of NB-73

Location map at NB-73



Well	easting	northing	TOC (ft-msl)	TOG Ele (ft-msl)	GW Depth (ft)	GW Ele (ft-msl)
B	2412581	571957	746.12	743.9	4.85	741.27
C	2411992	571754	763.84	761.8	22.42	741.42
E	2411221	571123	767.53	764.5	28.24	739.29
F	2410489	570887	752.75	749.8	11.95	740.80
I	2411170	572239	789.61	786.6	28.76	760.85
MW-10A	2409891	571412	771.87	768.2	29.68	742.19
MW-21A	2410149	571189	762.34	757.7	21.33	741.01
MW-44A	2410846	571607	745.00	742.4	3.88	741.12
MW-44B	2410844	571612	744.04	742.7	2.89	741.15
MW-47A	2411146	571171	766.38	762.9	25.13	741.25
MW-63A	2411894	572624	781.96	780.2	18.58	763.38
MW-66A	2411966	571887	756.39	752.9	14.84	741.55
MW-74A	2412338	571744	756.01	752.0	14.49	741.52
MW-77A	2412390	571491	754.37	749.9	13.08	741.29
MW-81A	2412640	572363	765.25	763.4	23.83	741.42
river	2409452	570683				741.10
river	2409498	570681				741.10
river	2409539	570686				741.10
river	2409559	570697				741.10
river	2409596	570697				741.10
river	2409611	570670				741.10
river	2409648	570627				741.10
river	2409700	570595				741.10
river	2409773	570554				741.10
river	2409843	570542				741.10
river	2409907	570508				741.10
river	2409975	570497				741.10
river	2410023	570517				741.10
river	2410114	570520				741.10
river	2410255	570536				741.10
river	2410350	570540				741.10
river	2410421	570542				741.10
river	2410487	570558				741.10
river	2410544	570588				741.10
river	2410557	570597				741.10
river	2410591	570579				741.10
river	2410630	570574				741.10
river	2410716	570565				741.10
river	2410782	570577				741.10
river	2410803	570592				741.10
river	2410821	570595				741.10
river	2410848	570595				741.10
river	2410875	570592				741.10
river	2410923	570602				741.10
river	2411016	570620				741.10
river	2411107	570633				741.10
river	2411169	570658				741.10
river	2411232	570665				741.10
river	2411291	570683				741.10
river	2411346	570686				741.10

river	2411407	570704	741.10
river	2411476	570720	741.10
river	2411539	570749	741.10
river	2411551	570765	741.10
river	2411587	570774	741.10
river	2411619	570765	741.10
river	2411655	570761	741.10
river	2411723	570783	741.10
river	2411812	570815	741.10
river	2411869	570822	741.10
river	2411978	570838	741.10
river	2412033	570843	741.10
river	2412110	570845	741.10
river	2412164	570858	741.10
river	2412221	570890	741.10
river	2412251	570922	741.10
river	2412271	570958	741.10
river	2412278	571020	741.10
river	2412276	571099	741.10
river	2412276	571152	741.10
river	2412287	571236	741.10
river	2412287	571270	741.10
river	2412310	571302	741.10
river	2412351	571336	741.10
river	2412437	571379	741.10
river	2412503	571411	741.10
river	2412565	571450	741.10
river	2412617	571506	741.10
river	2412649	571561	741.10
river	2412669	571625	741.10
river	2412696	571666	741.10
river	2412719	571666	741.10
river	2412762	571625	741.10
river	2412790	571536	741.10
river	2412755	571525	741.10
river	2412728	571479	741.10
river	2412710	571438	741.10
river	2412665	571359	741.10
river	2412612	571309	741.10
river	2412555	571236	741.10
river	2412474	571197	741.10
river	2412437	571170	741.10
river	2412433	571129	741.10
river	2412446	571077	741.10
pond/channel	2409596	570702	741.10
pond/channel	2409625	570738	741.10
pond/channel	2409671	570786	741.10
pond/channel	2409748	570820	741.10
pond/channel	2409832	570856	741.10
pond/channel	2409943	570893	741.10
pond/channel	2410103	570958	741.10
pond/channel	2410200	571038	741.10

pond/channel	2410293	571120	741.10
pond/channel	2410359	571159	741.10
pond/channel	2410421	571143	741.10
pond/channel	2410462	571131	741.10
pond/channel	2410507	571129	741.10
pond/channel	2410539	571152	741.10
pond/channel	2410539	571186	741.10
pond/channel	2410534	571227	741.10
pond/channel	2410548	571252	741.10
pond/channel	2410625	571293	741.10
pond/channel	2410691	571352	741.10
pond/channel	2410739	571400	741.10
pond/channel	2410764	571459	741.10
pond/channel	2410775	571509	741.10
pond/channel	2410760	571545	741.10
pond/channel	2410719	571550	741.10
pond/channel	2410664	571543	741.10
pond/channel	2410619	571529	741.10
pond/channel	2410571	571481	741.10
pond/channel	2410514	571427	741.10
pond/channel	2410466	571379	741.10
pond/channel	2410448	571340	741.10
pond/channel	2410473	571279	741.10
pond/channel	2410425	571254	741.10
pond/channel	2410280	571147	741.10
pond/channel	2410141	571036	741.10
pond/channel	2410071	570984	741.10
pond/channel	2409912	570918	741.10
pond/channel	2409755	570858	741.10
pond/channel	2409664	570815	741.10
pond/channel	2409589	570752	741.10
pond/channel	2409561	570697	741.10

7/18 - 7/22/2005 Groundwater Elevations
NAD83 (ft)

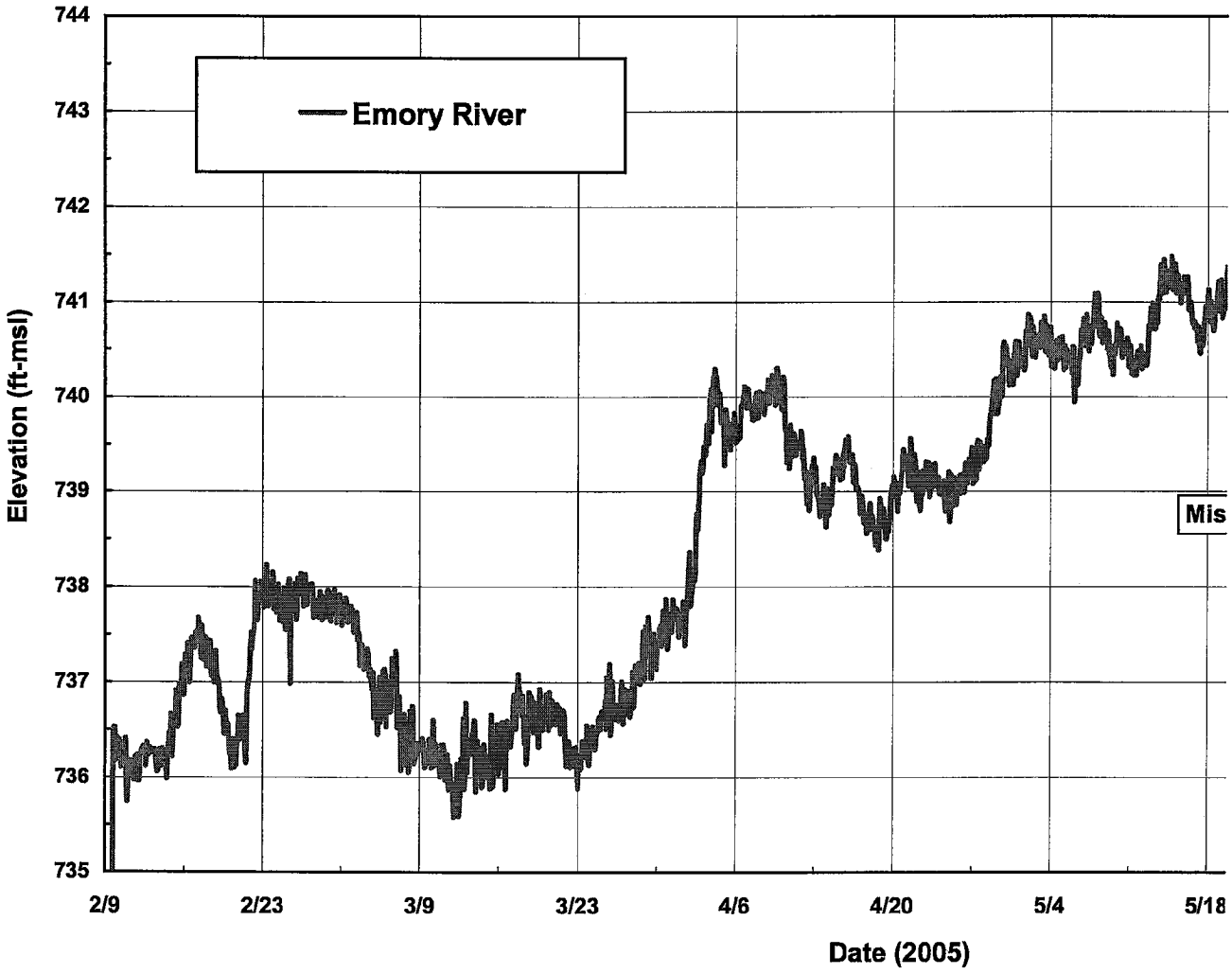
7/18 - 7/22/2005 Groundwater Elevations

NAD83 (ft)

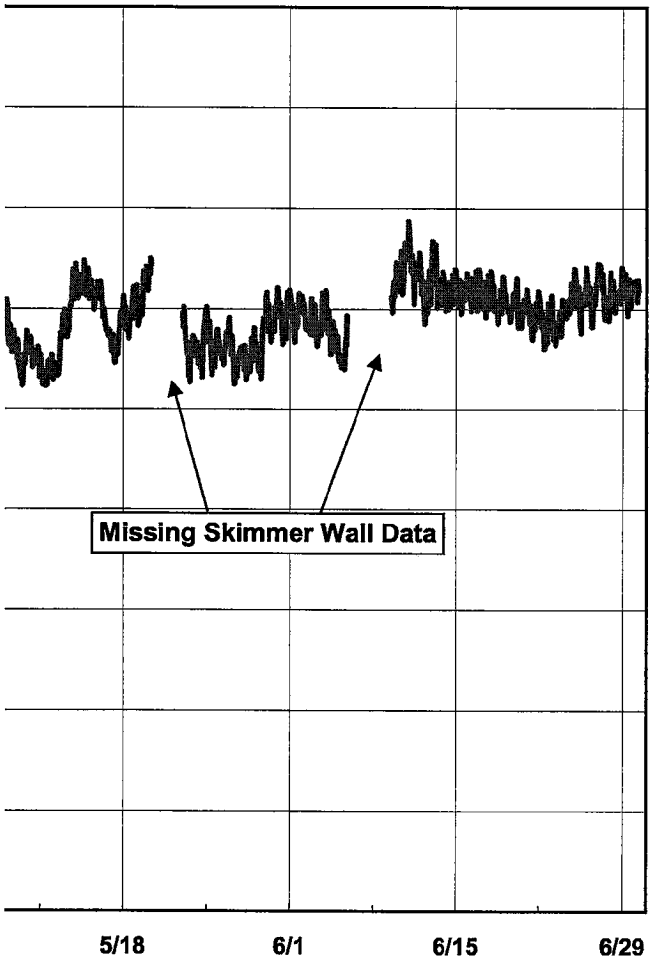
Well	*easting*	northing	TOC (ft-msl)	TOG Ele (ft-msl)	GW Depth (ft)	GW Ele (ft-msl)
B	2412581	571957	746.12	743.9	4.85	741.27
C	2411992	571754	763.84	761.8	22.42	741.42
E	2411221	571123	767.53	764.5	28.24	739.29
F	2410489	570887	752.75	749.8	11.95	740.80
I	2411170	572239	789.61	786.6	28.76	760.85
MW-10A	2409891	571412	771.87	768.2	29.68	742.19
MW-10B	2409897	571414	771.61	768.2	30.35	741.26
MW-21A	2410149	571189	762.34	757.7	21.33	741.01
MW-44A	2410846	571607	745.00	742.4	3.88	741.12
MW-44B	2410844	571612	744.04	742.7	2.89	741.15
MW-47A	2411146	571171	766.38	762.9	25.13	741.25
MW-63A	2411894	572624	781.96	780.2	18.58	763.38
MW-63B	2411886	572612	784.94	780.9	25.07	759.87
MW-66A	2411966	571887	756.39	752.9	14.84	741.55
MW-74A	2412338	571744	756.01	752.0	14.49	741.52
MW-77A	2412390	571491	754.37	749.9	13.08	741.29
MW-81A	2412640	572363	765.25	763.4	23.83	741.42
MW-81B	2412637	572358	764.27	762.9	22.88	741.39

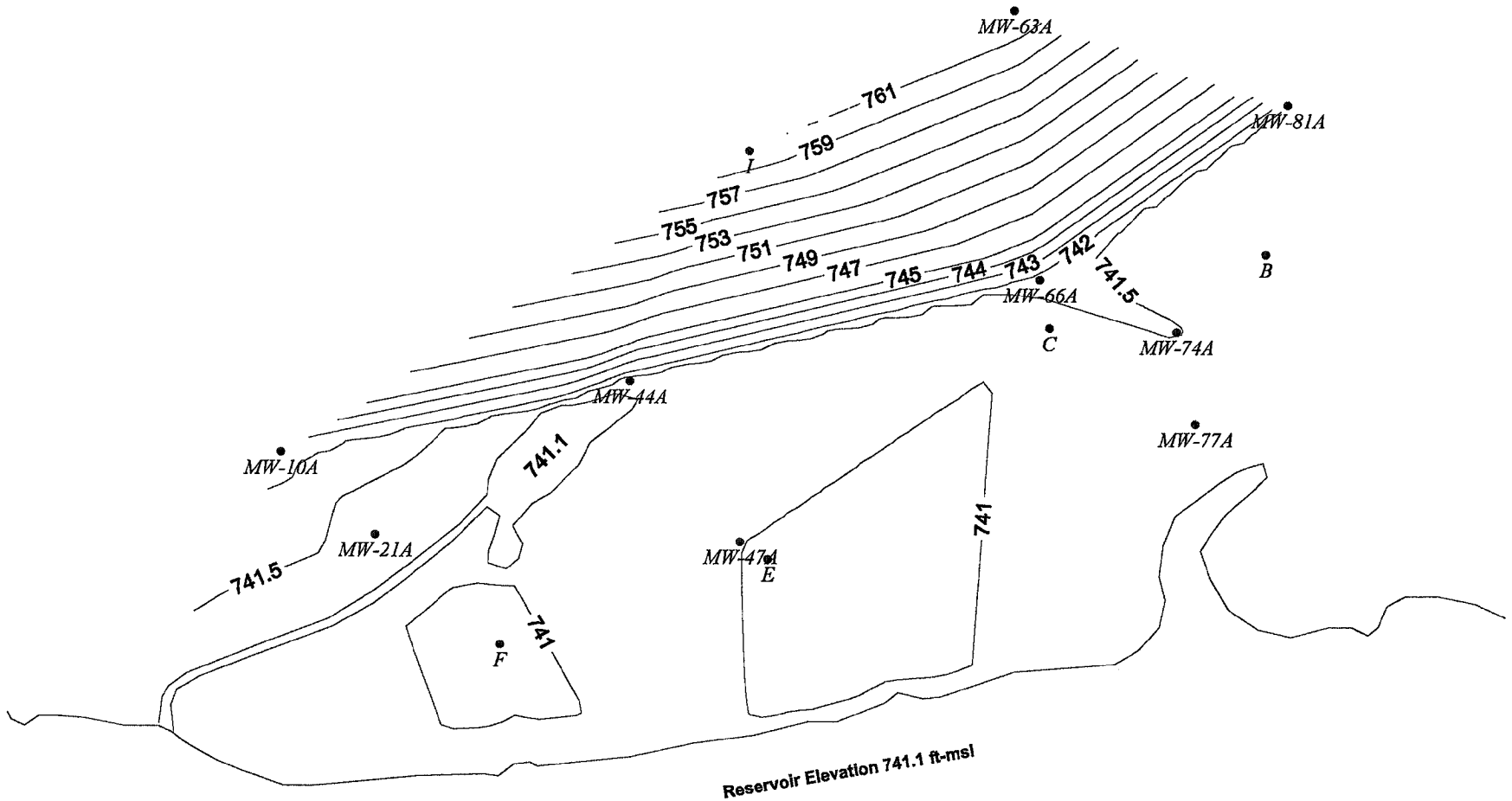
Well	*easting*	northing
B	2412581	571957
C	2411992	571754
E	2411221	571123
F	2410489	570887
I	2411170	572239
MW-10A	2409891	571412
MW-21A	2410149	571189
MW-44A	2410846	571607
MW-47A	2411146	571171
MW-63A	2411894	572624
MW-66A	2411966	571887
MW-74A	2412338	571744
MW-77A	2412390	571491
MW-81A	2412640	572363

Emory River at Skimmer Wall



Wall





Hughes, Michael

From: Julian, Hank

Sent: Tuesday, June 21, 2005 4:04 PM

To: 'Justice, Todd'

Cc: Lawson, Chad; Stone, Sam; Tockstein, Carl; Yogesh Shah (Yogesh.Shah@worleyparsons.com); Dan Smith (Daniel.R.Smith@worleyparsons.com); McNulty, Greg; Petty, Harold L.; Hughes, Michael

Subject: RE: KIF - Peninsula Site - Final Logs of Borings

Todd:

we should get together to examine the soil samples (i'll bring the beer) - are you guys doing USC classifications at your office? what would be the best time?

please don't take offense, we agree with everything you stated about the bedrock cores (see attached email) - however, your field notes only indicated drill rod drop in one or two places although this might have been observed at numerous points. we understand that the primary weathering mechanism is via dissolution, would just like to be consistent in the logs in using terms - let's just stick with "cavities" rather than "voids". I also want to maintain the detailed information in logs related to filled, partially-filled cavities along with your observations of fill types (silty clay, sand, etc).

forget the instruction below stating "it will be helpful to state in the logs, where such "cavities" exist, that "significant solutioning of the bedrock is not apparent based on an examination of the recovered cores." this is self-defeating - i should have reviewed this more closely - we can look at cores together also and examine weathering surface at cavity intervals - most important is identification of "hydraulically active" solutioned fractures (from your logs) via flowmeter logging and single aquifer testing

thanks again - you guys did a great job out there

Hank

-----Original Message-----
From: Justice, Todd [mailto:TJUSTICE@mactec.com]
Sent: Tuesday, June 21, 2005 11:33 AM
To: Julian, Hank
Cc: Lawson, Chad; Stone, Sam; Tockstein, Carl
Subject: RE: KIF - Peninsula Site - Final Logs of Borings

Hank,

All of the SPT samples obtained during the Kingston exploration have been carefully kept in storage and are ready for reexamination. I agree that more time should be allocated to perform a detailed examination of the overburden soils in order to better delineate between possible alluvial/colluvial soils and residuum. Hopefully we can schedule a time when J.Mason, yourself, and I can perform this task.

During all of the coring activities performed during the Kingston exploration experienced professionals were present and noted that the "drill rods did indeed drop" when (what we believe to be) solutioned zones within the dolomite bedrock were encountered. The solutioned zones that were encountered are noted and described on the field logs as voids and/or cavities with their respective depth intervals also noted on the logs. Some of the voids and/or cavities are described as being either being "open" or "partially infilled with

soil". Although the field logs do not clearly state whether or not evidence suggests solutioning within the bedrock has occurred and is presently occurring, we can revise that accordingly to be shown on the final logs.

In our opinion the recovered rock core does tend to suggest solutioning of the bedrock has occurred and is presently occurring. The joint sets observed within recovered core are orthogonal (perpendicular) to bedding and to one another. Evidently, this creates paths for groundwater to "recirculate" and initiate solutioning of the dolomite bedrock resulting in the voids/cavities that were noted and observed during coring. The presence of iron-staining and soil infilling on the bedding and joint surfaces does not rule out solution weathering.

The general topography of the site suggests cover-subsidence sinkhole activity which is a result of the solutioning of the underlying dolomite bedrock.

During the installation of the bedrock wells the volume of no.2 sand required to fully envelope the screened intervals was substantially higher than the calculated required volumes. This was due to the voids and/or cavities which were present within the bedrock intervals.

We believe that the evidence suggests that the voids/cavities noted on the logs are due to solution weathering.

Todd Justice

From: Julian, Hank [mailto:hejulian@tva.gov]
Sent: Tuesday, June 21, 2005 8:29 AM
To: Lawson, Chad; Tockstein, Carl
Cc: Justice, Todd; Yogesh.Shah@worleyparsons.com; Daniel.R.Smith@worleyparsons.com; McNulty, Greg; Petty, Harold L.; Hughes, Michael
Subject: FW: KIF - Peninsula Site - Final Logs of Borings
Importance: High

Please conform to Yogesh's instructions below - I would also like to arrange to examine jar samples personally.

Thanks

Hank

Hank E. Julian, P.E., P.G.

hejulian@tva.gov
865.632.6942 (office)
865.632.8375 (fax)

-----Original Message-----
From: Shah, Yogesh (Reading) [mailto:Yogesh.Shah@worleyparsons.com]
Sent: Friday, June 17, 2005 8:02 PM
To: Julian, Hank
Cc: Smith, Daniel R (Chattanooga); egreg.mcnulty@parsons.com
Subject: KIF - Peninsula Site - Final Logs of Borings

Importance: High

Hank,

As we discussed to-day, we should request Mactec to do the following for finalizing the logs of the borings besides making other minor corrections and adding GS elevations on the logs:

1. Keep all the information as stated on the handwritten logs provided to us after modifying the logs for the aspects stated in the folowing two items.

2. In addition to the other description of the soils provided, the description of soil in each SPT jar should be reexamined carefully by an experienced geologist again to provide as precise identification as possible to be either "residual" or "alluvial" soil. This will require the jar samples to remain undisturbed and not undergo any lab testing prior to the visual examination for this purpose so that the geologist can examine the relic structure, color, grain distribution, grain-shape, bedding, etc. to help make the determination. This information is critical for a proper analysis of the site conditions in support of determining its suitability for the proposed disposal. Mactec may need some help from you in this determination.

3. Use of word "void" in the bedrock may be avoided because the logs do not indicate that the "drill rods dropped" under self weight. Since the rods apparently did not drop, use of phrases like "rock fracture (or joints) filled with soil" or "softened highly weathered rock" or any other appropriate wordage may be consistently used in all logs. Also, a review of the handwritten logs show that the rock fractures at bedrock surface or below are filled with soil that may be partly residual and partly carried by water flow through the fractures or joints; i.e., a void space created primarily by solutioning of limestone is not evident from the detailed descriptions written in the logs. Therefore, if it is so clear based also on an examination of the recovered rock cores that the bedrock is not solutioned significantly, it will be helpful to state in the logs, where such "cavities" exist, that "significant solutioning of the bedrock is not apparent based on an examination of the recovered cores." This, again, is an important observation for determining the site suitability and may also be incorporated in the logs.

Thanks.

Yogesh.