

**Red Dog Mine
Closure and Reclamation Plan**

**SD C2: Drawings from Updated Geotechnical Report
(URS, 2008)**



P:\MCD\PROJECT\TeckCominco\Alaska\STAGE-VIII DESIGN\STAGE-VIII RAISE-REPORT\GEO\GEO\REPORT\F-1.dwg Jun 12, 2008 - 12:13pm

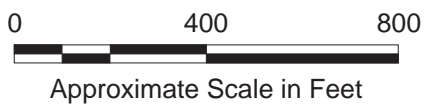
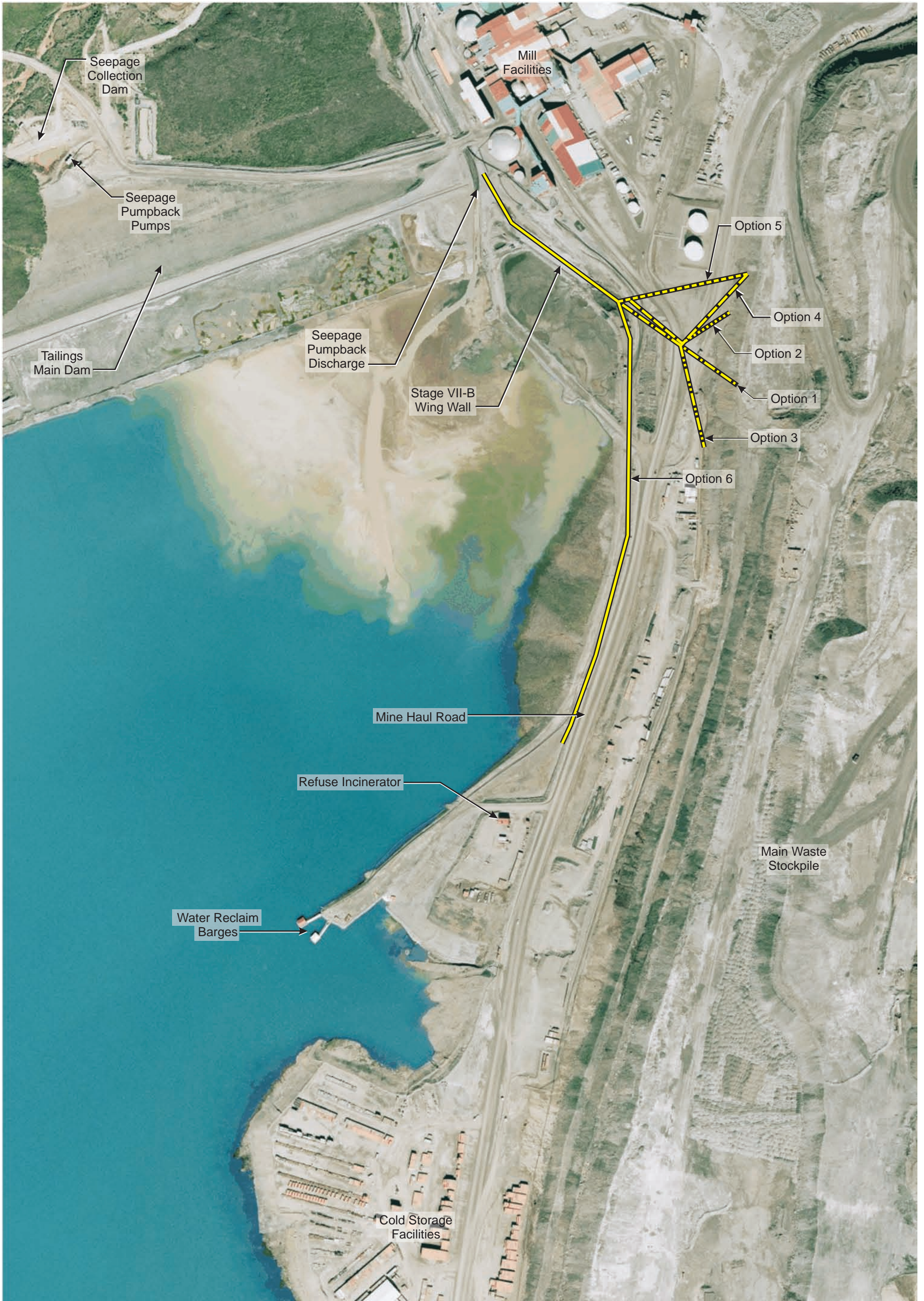
Source:
Teck Cominco Alaska, Inc. (TCAK) "Aerial Photograph", 2007

Job No. 33780401

Figure 1
Site Plan (Aerial View, 2007)



Updated Geotechnical Report
Red Dog Tailings Main Dam
Stage VIII Raise and Closure

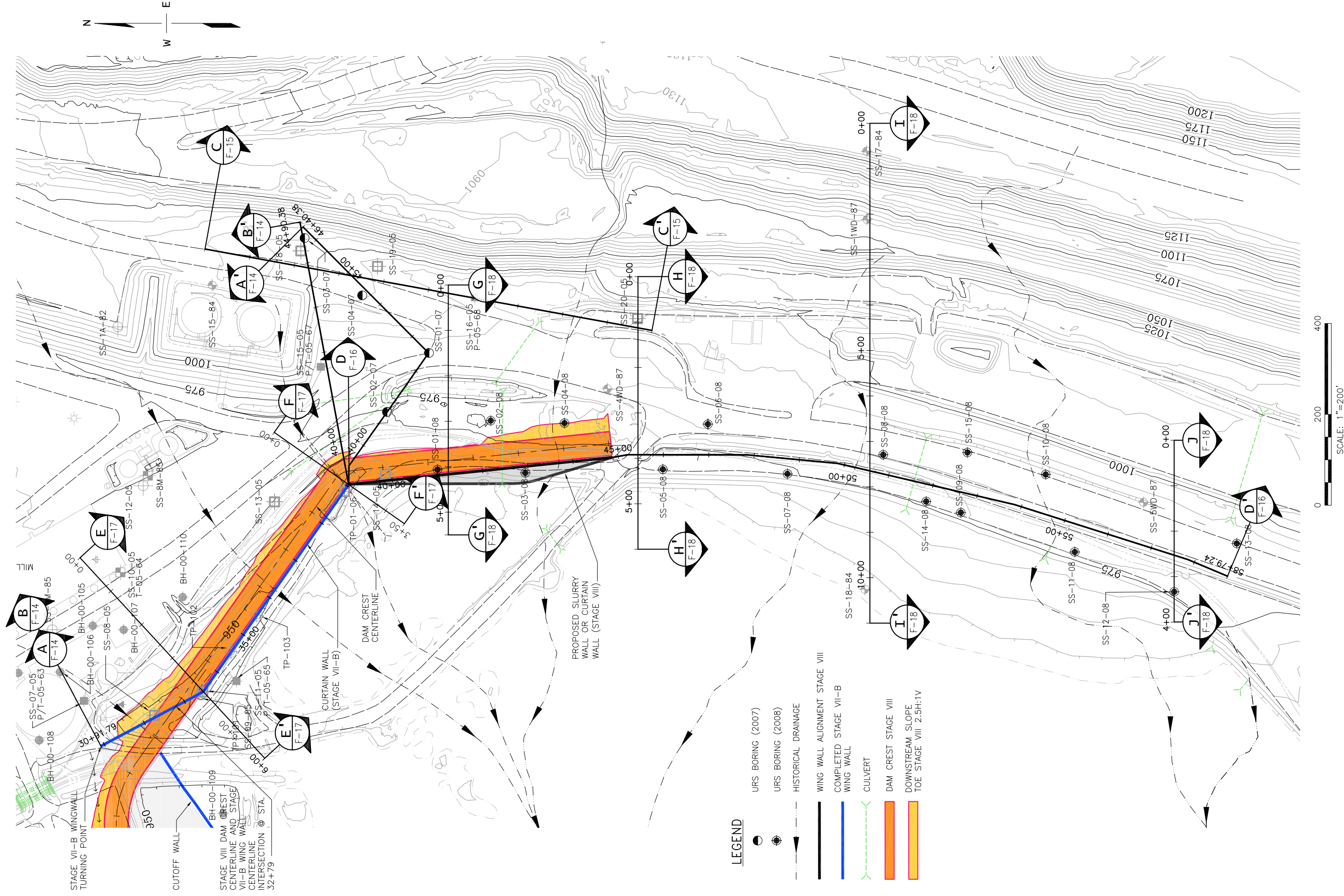


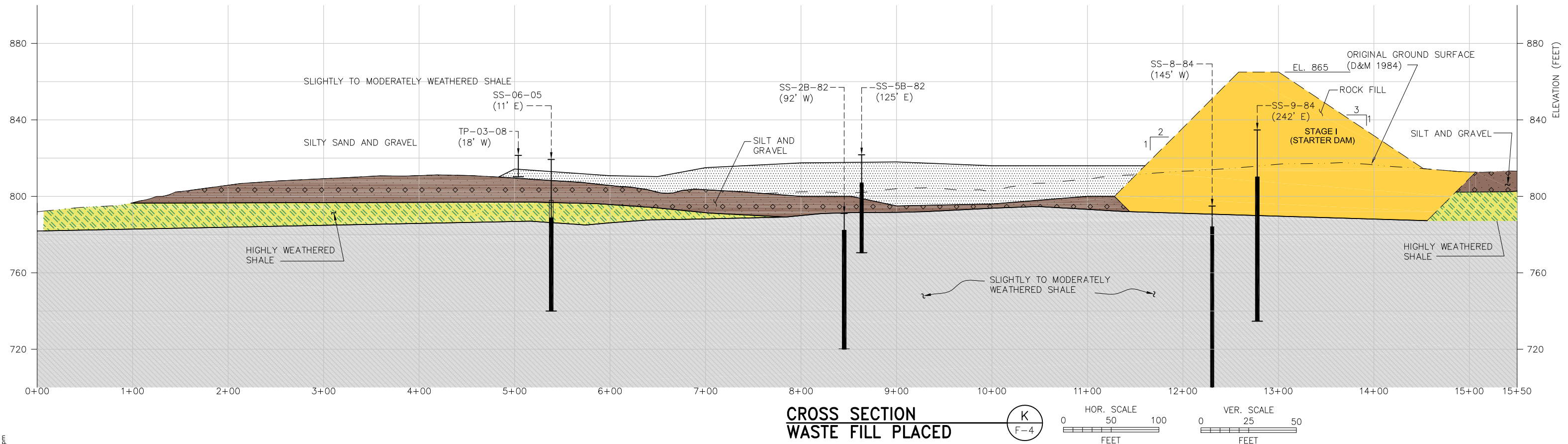
Job No. 33760401



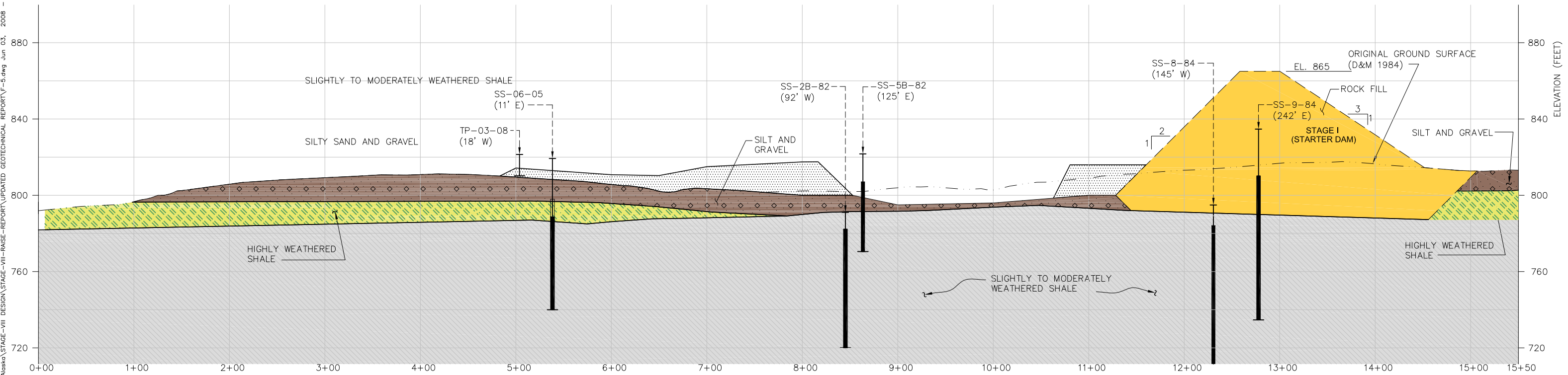
Figure 2
**Dam Plan View and
Wing Wall Options (Aerial View, 2007)**

Updated Geotechnical Report
Tailings Main Dam
Stage VIII Raise and Closure
Red Dog Mine, Alaska





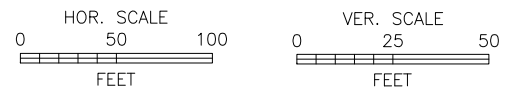
P:\ACAD\PROJECT\TechComm\Alaska\STAGE-VIII\DESIGN\STAGE-VIII-RAISE-REPORT\UPDATED GEOTECHNICAL REPORT\F-5.dwg Jun 03, 2008 - 3:53pm



- KEY:**
- GROUND SURFACE
 - SOIL
 - HIGHLY WEATHERED BEDROCK
 - BEDROCK

- LEGEND**
- ORIGINAL GROUND SURFACE (DAMES & MOORE 1984)
 - HIGHLY WEATHERED SHALE
 - SLIGHTLY TO MODERATELY WEATHERED SHALE
 - SILTY SANDY GRAVEL
 - WASTE FILL

**CROSS SECTION
WASTE FILL REMAINING**



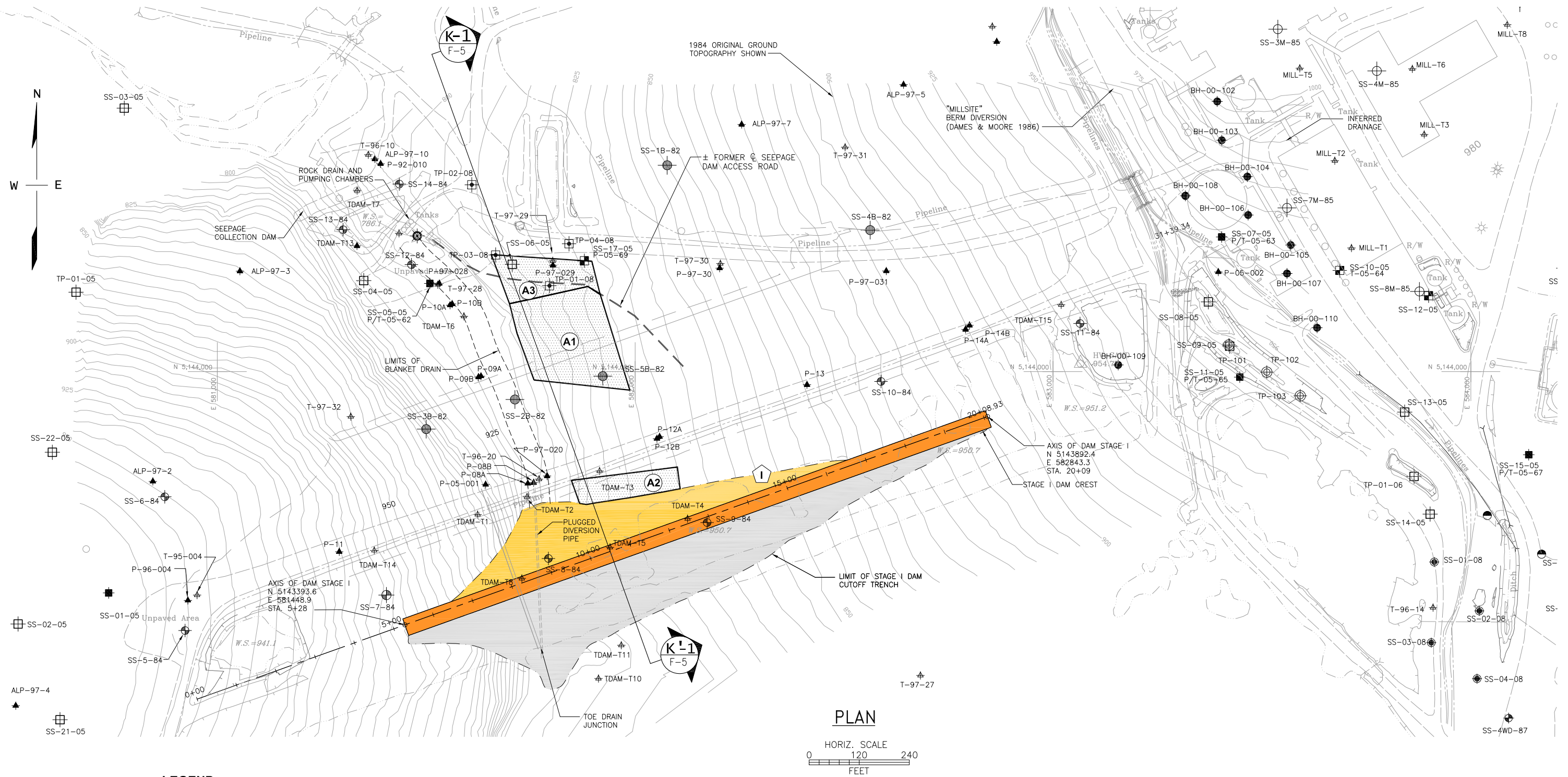
Cross Section of Stage I and Original Waste Fill in Stages II to VI

Job No. 33760401



Figure 5
Updated Geotechnical Report
Red Dog Mine Tailings Main Dam
Stage VIII Raise and Closure
Red Dog Mine, Alaska

P:\ACAD\PROJECT\TechComms\Alaska\STAGE-VIII-RAISE-REPORT\GEO\TECHNICAL REPORT\F-6.dwg Jun 06, 2008 - 11:13am



LEGEND

- DAMES & MOORE FOR TAILINGS DAM (1982)
- DAMES & MOORE FOR TAILINGS DAM (1984)
- DAMES AND MOORE FOR WASTE STORAGE (1984 & 1987)
- EBA ENGINEERING FOR MILL FACILITIES (2000)
- PND FOR RIGHT ABUTMENT WING WALL (2004)
- PIEZOMETERS (PRE-2005)
- THERMISTORS (PRE-2005)
- URS WITH PIEZOMETERS & THERMISTERS (2005-2006)
- URS WITH EITHER PIEZOMETERS OR THERMISTERS (2005-2006)
- URS WITH NO INSTRUMENTATION (2005-2006)
- SEEP DISCHARGE FROM UNDERDRAIN
- TEST PIT 2008
- URS BORING (2008)
- CULVERT LOCATION
- TOE OF SLOPE STAGE I TO VII
- WASTE FILL
- DOWNSTREAM SLOPE
- DAM CREST (EL. 865)
- UPSTREAM SLOPE

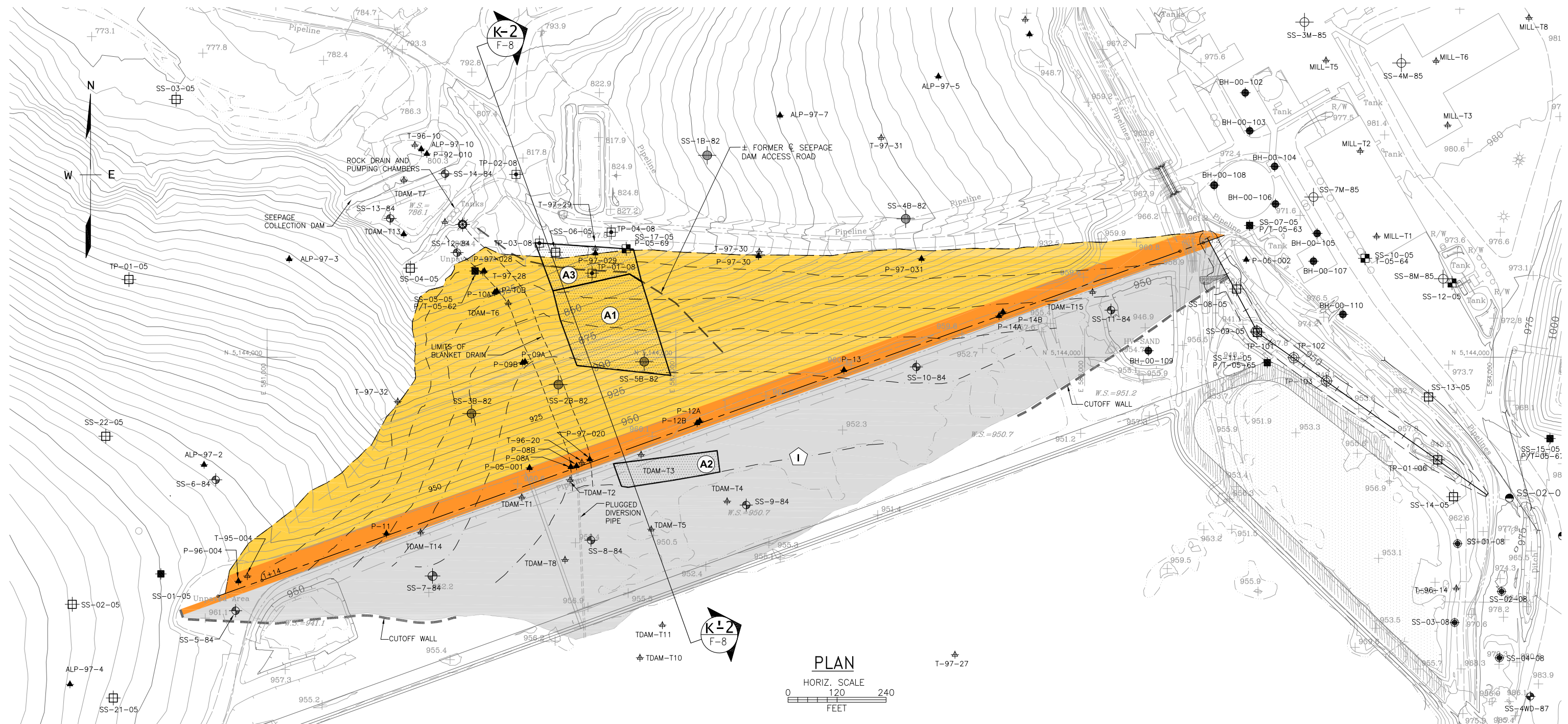
WASTE FILL	
AREA	VOLUME
(A1)	48,668 ft ² / 15,000 cy
(A2)	14,414 ft ² / 4,500 cy
(A3)	20,198 ft ² / 6,300 cy
TOTAL	83,280 ft² / 25,800 cy

Job No. 33760401



Figure 6
Plan View of Stage I and Remaining Waste Fill in Stages II to VI

Updated Geotechnical Report
Red Dog Tailings Main Dam
Stage VIII Raise and Closure
Red Dog Mine, Alaska



LEGEND

- DAMES & MOORE FOR TAILINGS DAM (1982)
- DAMES & MOORE FOR TAILINGS DAM (1984)
- DAMES AND MOORE FOR WASTE STORAGE (1984 & 1987)
- EBA ENGINEERING FOR MILL FACILITIES (2000)
- PND FOR RIGHT ABUTMENT WING WALL (2004)
- PIEZOMETERS (PRE-2005)
- THERMISTORS (PRE-2005)
- URS WITH PIEZOMETERS & THERMISTERS (2005-2006)
- URS WITH EITHER PIEZOMETERS OR THERMISTERS (2005-2006)
- URS WITH NO INSTRUMENTATION (2005-2006)
- SEEP DISCHARGE FROM UNDERDRAIN
- TEST PIT 2008
- URS BORING (2008)
- CULVERT LOCATION
- TOE OF SLOPE STAGE I TO VII
- WASTE FILL
- DOWNSTREAM SLOPE
- DAM CREST (EL. 960)
- UPSTREAM SLOPE

WASTE FILL	
AREA	VOLUME
A1	48,668 ft ² / 15,000 cy
A2	14,414 ft ² / 4,500 cy
A3	20,198 ft ² / 6,300 cy
TOTAL	83,280 ft² / 25,800 cy

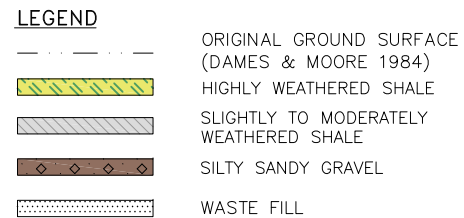
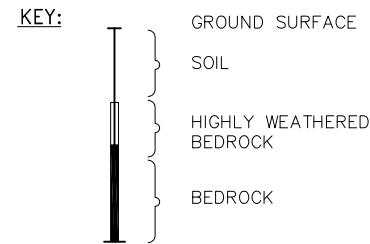
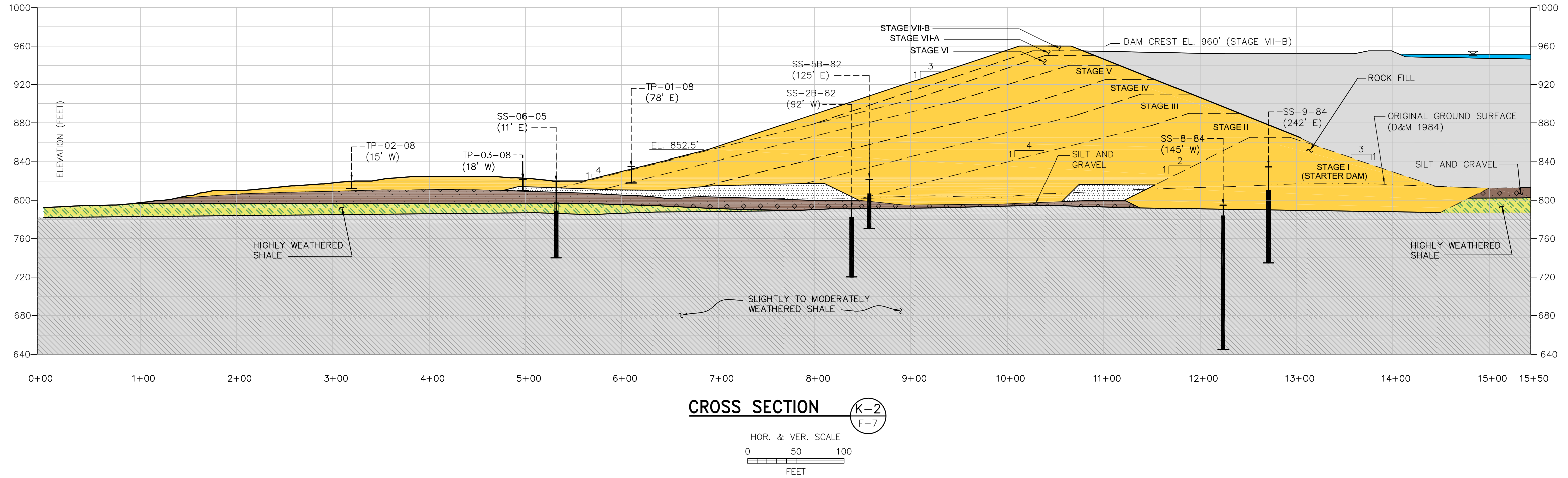
Job No. 33760401



Figure 7
Plan View of Stage VII Showing Extent of Waste Fill

Updated Geotechnical Report
Red Dog Tailings Main Dam
Stage VIII Raise and Closure
Red Dog Mine, Alaska

P:\ACAD\PROJECT\TeesKomincoAlaska\STAGE-VIII DESIGN\STAGE-VIII-RAISE-REPORT\GEOTECHNICAL REPORT\F-8.dwg Jun 06, 2008 - 11:12am

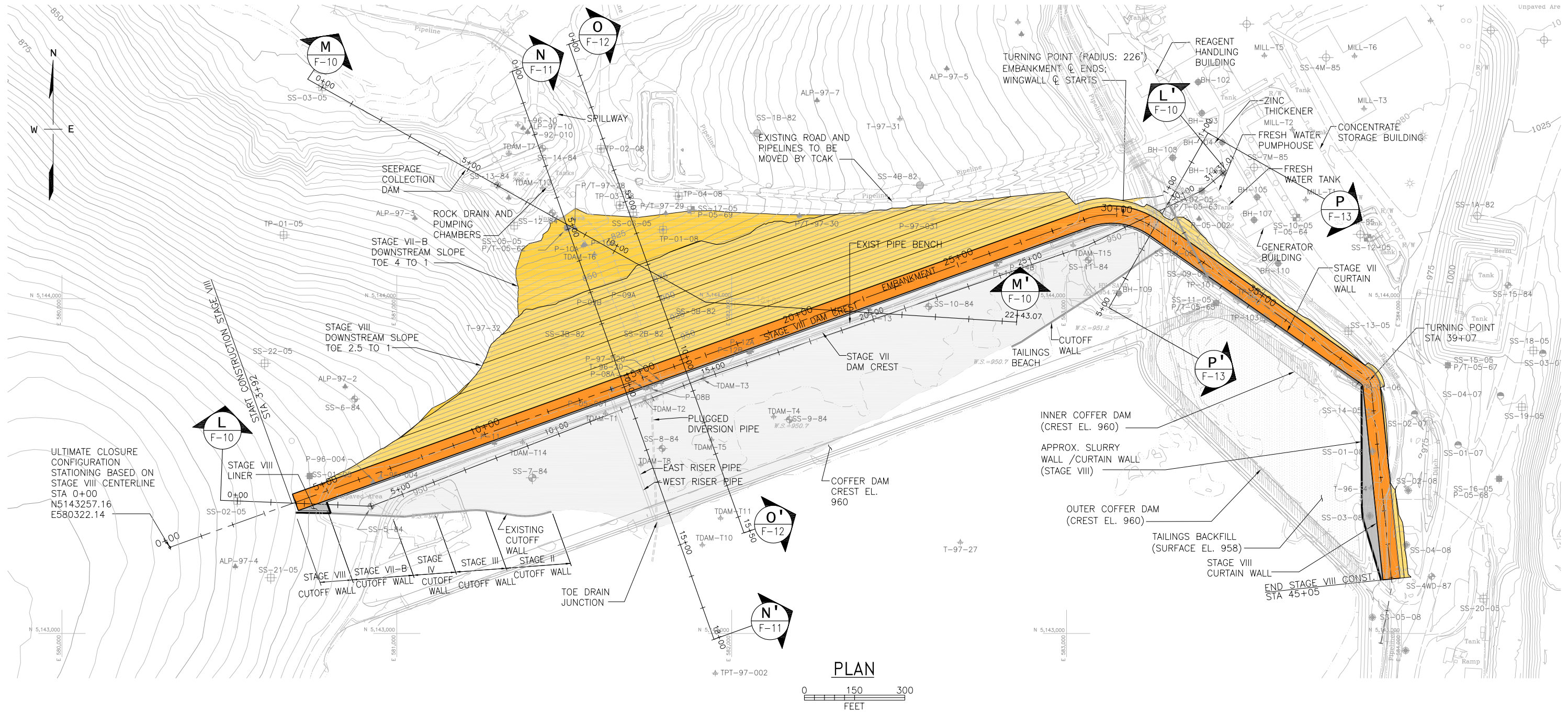


Job No. 33760401

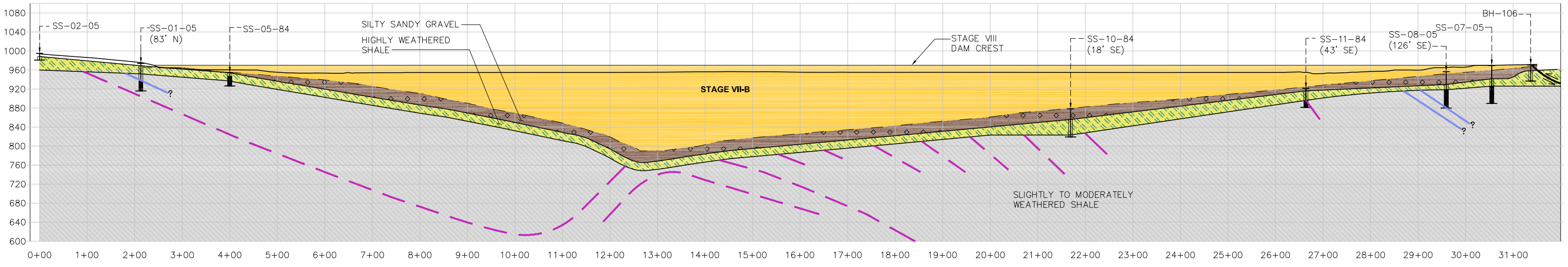


Figure 8
Cross Section of Stage VII-B Showing Extent of Waste Fill

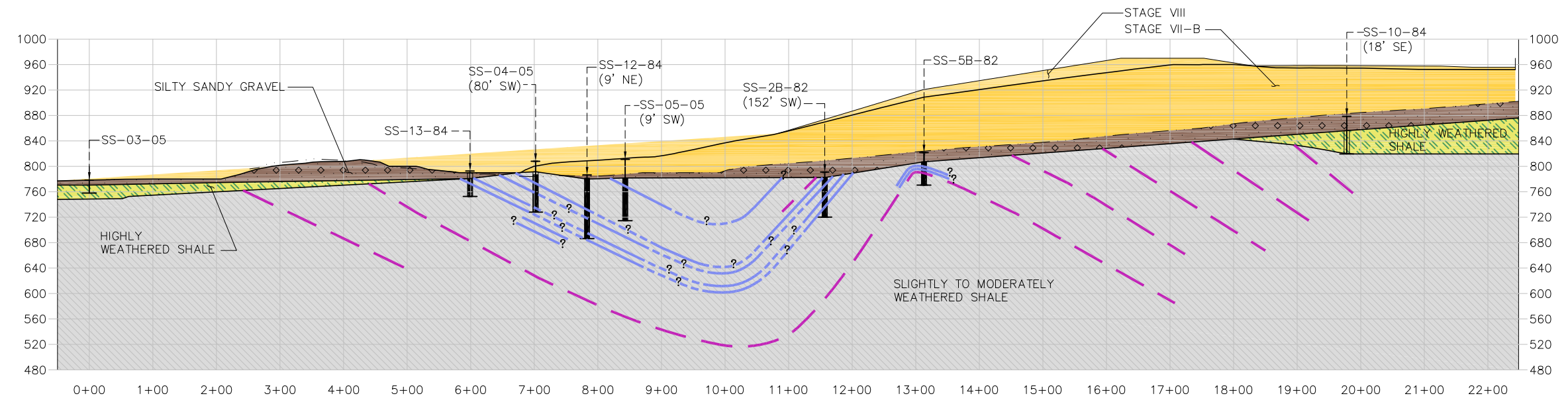
Updated Geotechnical Report
Red Dog Tailings Main Dam
Stage VIII Raise and Closure
Red Dog Mine, Alaska



NOTE:
ALL INSTRUMENTATION RISERS AND ACCESS PIPES SHALL BE PRESERVED AND EXTENDED AS NEEDED BY TCAK.



PROFILE (L) F-9
 HOR. & VER. SCALE
 0 100 200
 FEET



PROFILE (M) F-9
 HOR. & VER. SCALE
 0 100 200
 FEET

NOTE:
 BEDDING DIPS, GOUGE LAYERS AND FAULT INFORMATION IS BASED ON A STRIKE PROJECTION INTO THE LINE OF SECTION.

KEY:

- GROUND SURFACE
- SOIL
- HIGHLY WEATHERED BEDROCK
- BEDROCK
- BORING

LEGEND:

- ORIGINAL GROUND SURFACE (DAMES & MOORE 1984)
- GOUGE LAYER OR CLAY ZONE
- REPRESENTATIVE BEDDING
- FAULT
- HIGHLY WEATHERED SHALE
- SLIGHTLY TO MODERATELY WEATHERED SHALE
- SILTY SANDY GRAVEL
- PROPOSED FILL
- EXISTING EMBANKMENT

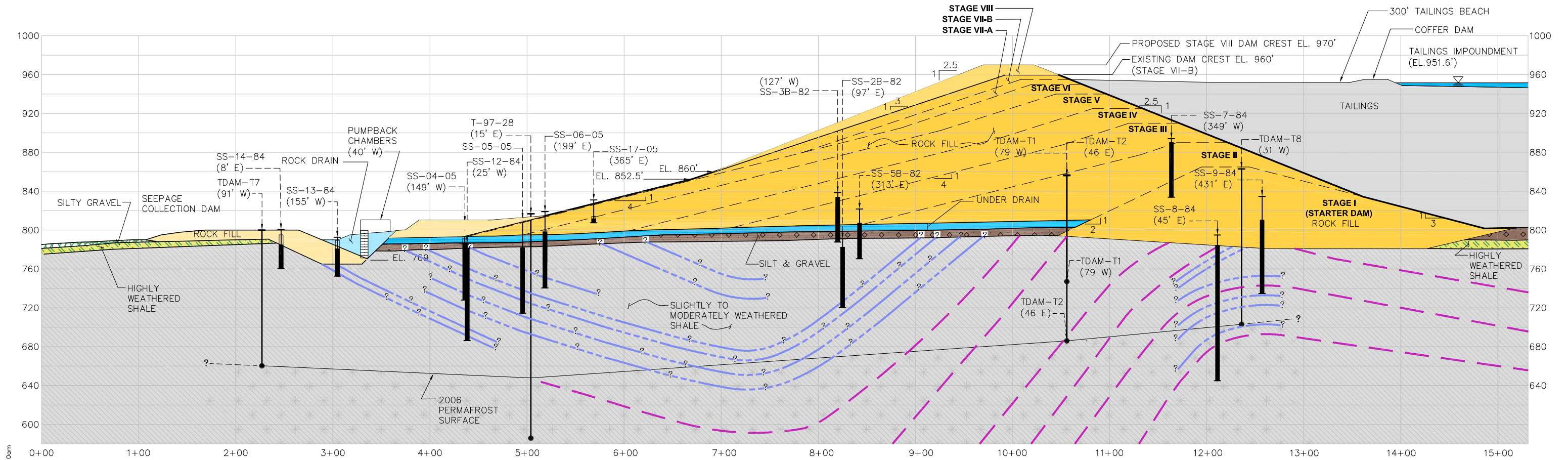
Job No. 33760401



Figure 10
Profiles Along Embankment

Updated Geotechnical Report
 Red Dog Tailings Main Dam
 Stage VIII Raise and Closure
 Red Dog Mine, Alaska

P:\ACAD\PROJECT\TechComincaAlaska\STAGE-VIII-RAISE-REPORT\GEO\STAGE-VIII-RAISE-REPORT\F-10.dwg Jun 05, 2008 - 11:11am



CROSS SECTION N
F-9

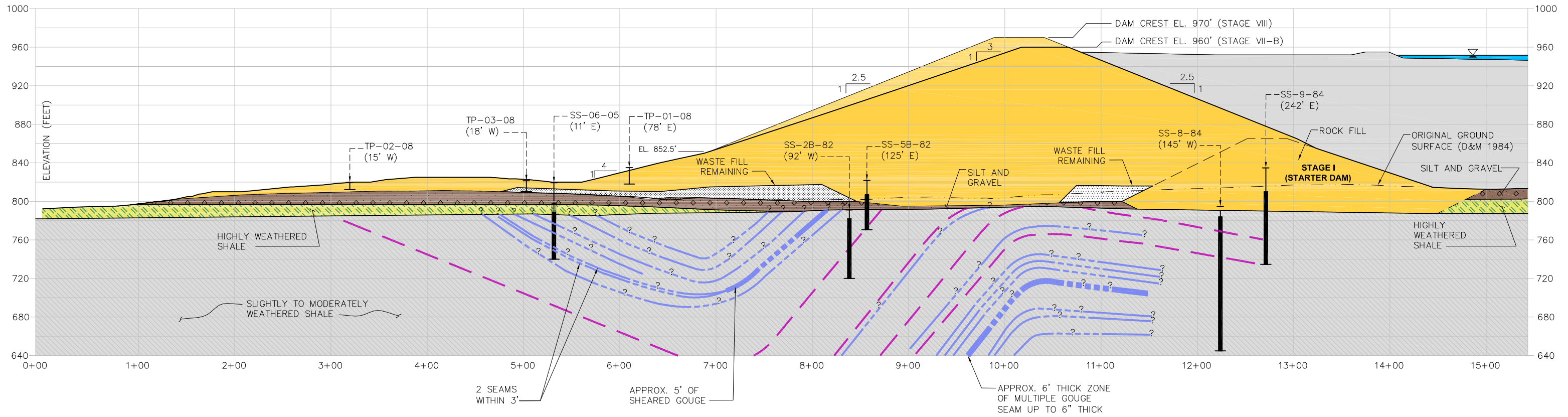
HOR. & VER. SCALE
0 50 100
FEET

KEY:

GROUND SURFACE SOIL HIGHLY WEATHERED BEDROCK BEDROCK <p>BORING</p>	SURFACE ELEVATION TIP ELEVATION <p>PIEZOMETER/THERMISTOR</p>	<p>LEGEND</p> GOUGE OR CLAY ZONE REPRESENTATIVE BEDDING PERMAFROST IN 2006 HIGHLY WEATHERED SHALE SLIGHTLY TO MODERATELY WEATHERED SHALE SILTY SANDY GRAVEL PROPOSED FILL EXISTING EMBANKMENT
---	---	---

- NOTE**
1. DEPICTS THE UNDERDRAIN, WHICH IS ACTUALLY OFF-SET INTO THE PAGE ALONG N-N' ALIGNMENT ≈ 76FT ON AVERAGE.
 2. PERMAFROST SURFACES ARE APPROXIMATE AND INTERPOLATED FROM BORINGS AND THERMISTORS.
 3. BEDDING DIPS, GOUGE LAYERS AND FAULT INFORMATION IS BASED ON A STRIKE PROJECTION INTO THE LINE OF SECTION.

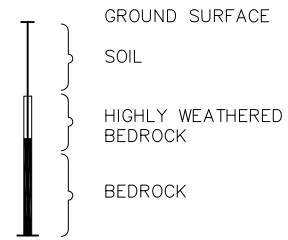
P:\ACAD\PROJECT\TechCominco\Alaska\STAGE-VIII-RAISE-REPORT\GEO\TECHNICAL REPORT\F-11.dwg Jun 06, 2008 - 11:10am



CROSS SECTION 0
F-9

HOR. & VER. SCALE
 0 50 100
 FEET

KEY:

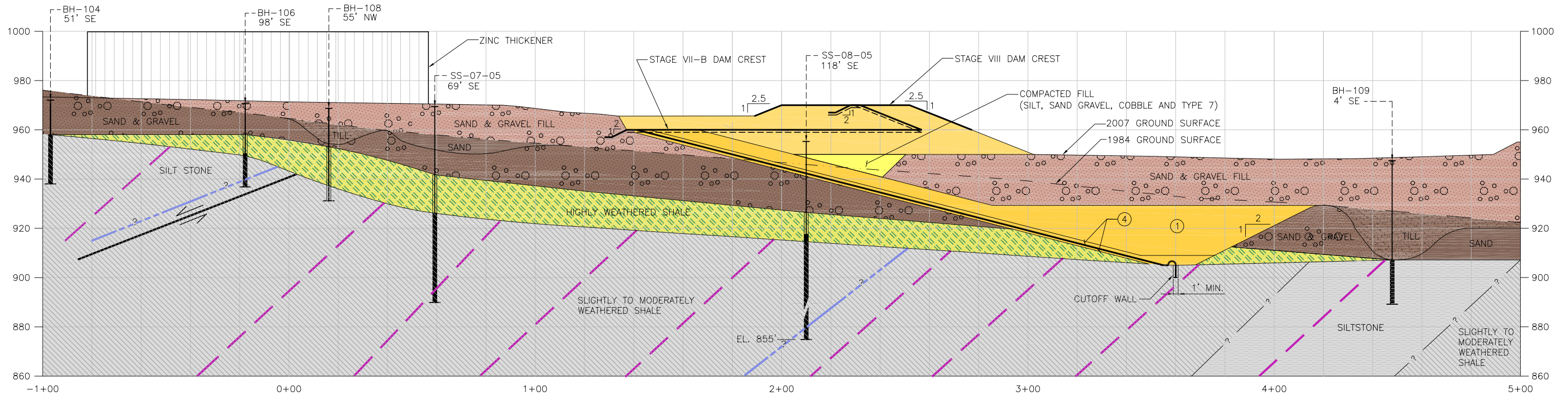


LEGEND

- ORIGINAL GROUND SURFACE (DAMES & MOORE 1984)
- GOUGE OR CLAY ZONE
- REPRESENTATIVE BEDDING
- HIGHLY WEATHERED SHALE
- SLIGHTLY TO MODERATELY WEATHERED SHALE
- SILTY SANDY GRAVEL
- PROPOSED FILL
- EXISTING EMBANKMENT
- WASTE FILL REMAINING

NOTE:

BEDDING DIPS, GOUGE LAYERS AND FAULT INFORMATION IS BASED ON A STRIKE PROJECTION INTO THE LINE OF SECTION.



CROSS SECTION (P) (F-9)
 HOR. & VER. SCALE
 0 20 40
 FEET

KEY:

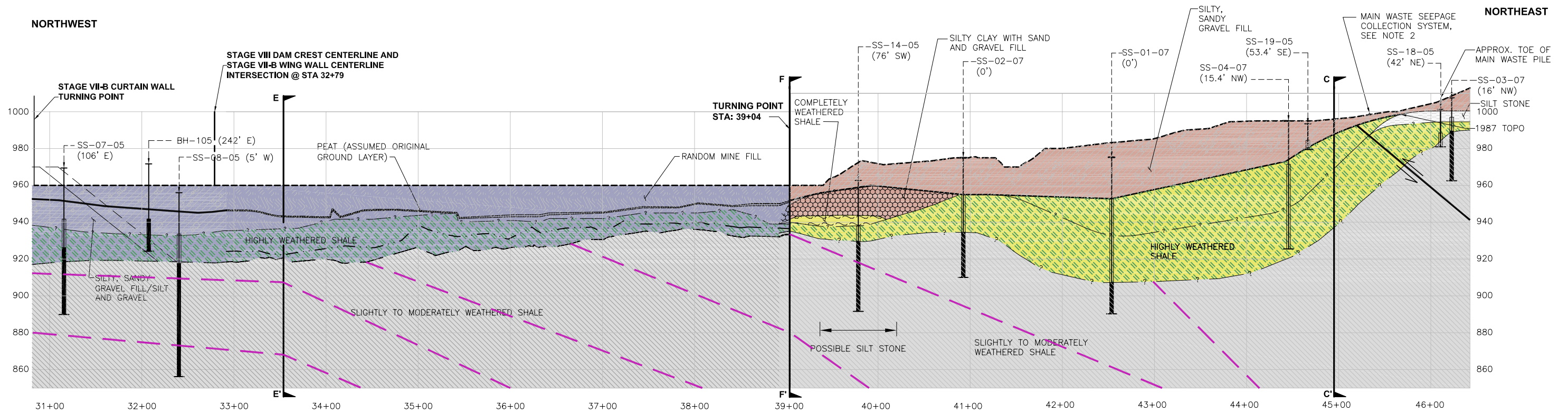
- GROUND SURFACE
- SOIL
- HIGHLY WEATHERED BEDROCK
- BEDROCK
- BORING

LEGEND

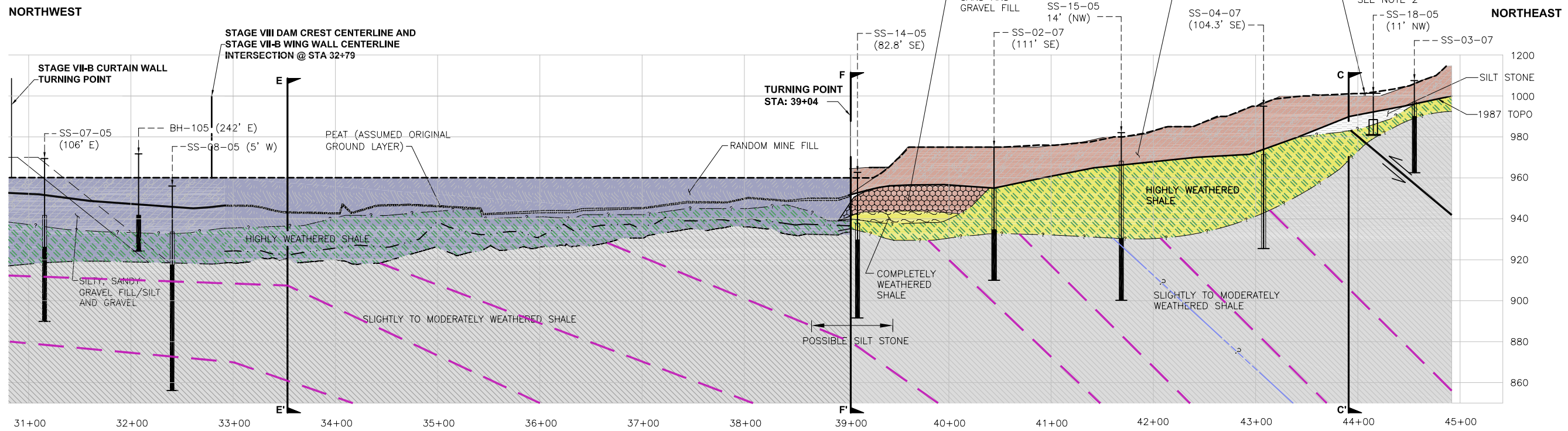
- STRATUM BOUNDARIES
- ORIGINAL GROUND SURFACE (DAMES & MOORE 1984)
- GOUGE LAYER OR CLAY ZONE
- REPRESENTATIVE BEDDING
- FAULT
- HIGHLY WEATHERED SHALE
- SLIGHTLY TO MODERATELY WEATHERED SHALE
- SILTY SANDY GRAVEL
- TILL
- SAND
- SAND AND GRAVEL FILL
- SAND AND GRAVEL UNDER ORIGINAL GROUND SURFACE
- PROPOSED FILL
- EXISTING EMBANKMENT
- COMPACTED FILL
- SILTSTONE

NOTE:
 BEDDING DIPS, GOUGE LAYERS AND FAULT INFORMATION IS BASED ON A STRIKE PROJECTION INTO THE LINE OF SECTION.

P:\ACAD\PROJECT\TechComincoAlaska\STAGE-VIII-RAISE-REPORT\GEO\GEO\REPORT\F-14.dwg Jun 11, 2008 - 2:41pm



**PROFILE
WING WALL OPTION 4**



- NOTES**
1. NO FROZEN GROUND NOTED DURING DRILLING IN 2005.
 2. 14" DIAMETER HEAT-TRACED HDPE PIPE.
 3. BEDDING DIPS, GOUGE LAYERS AND FAULT INFORMATION IS BASED ON A N320W STRIKE PROJECTION INTO THE LINE OF SECTION.
 4. BEDDING FROM STA. 31+00 TO 33+00 HAS AN APPARENT DIP OF 4 DEGREES AND HAS BEEN DRAWN AT 11 DEGREES TO ACCOUNT FOR 2V:1H SCALE EXAGGERATION
 5. BEDDING FROM STA. 33+00 TO 39+00 HAS AN APPARENT DIP OF 22 DEGREES AND HAS BEEN DRAWN AT 39 DEGREES TO ACCOUNT FOR 2V:1H SCALE EXAGGERATION
 6. BEDDING FROM STA. 39+00 TO 46+00 HAS AN APPARENT DIP OF 24 DEGREES AND HAS BEEN DRAWN AT 44 DEGREES TO ACCOUNT FOR 2V:1H SCALE EXAGGERATION

- LEGEND:**
- 2007 TOPOGRAPHY
 - 1987 TOPOGRAPHY
 - STAGE VII-B TRENCH BOTTOM
 - GOUGE OR CLAY ZONE
 - REPRESENTATIVE BEDDING
 - STRATUM BOUNDARIES
 - TOP CDF
 - SILTY SANDY GRAVEL FILL
 - RESIDUAL TO HIGHLY WEATHERED SHALE
 - INSTALLED STAGE VII-B CURTAIN WALL
 - FAULT

**PROFILE
WING WALL OPTION 5**



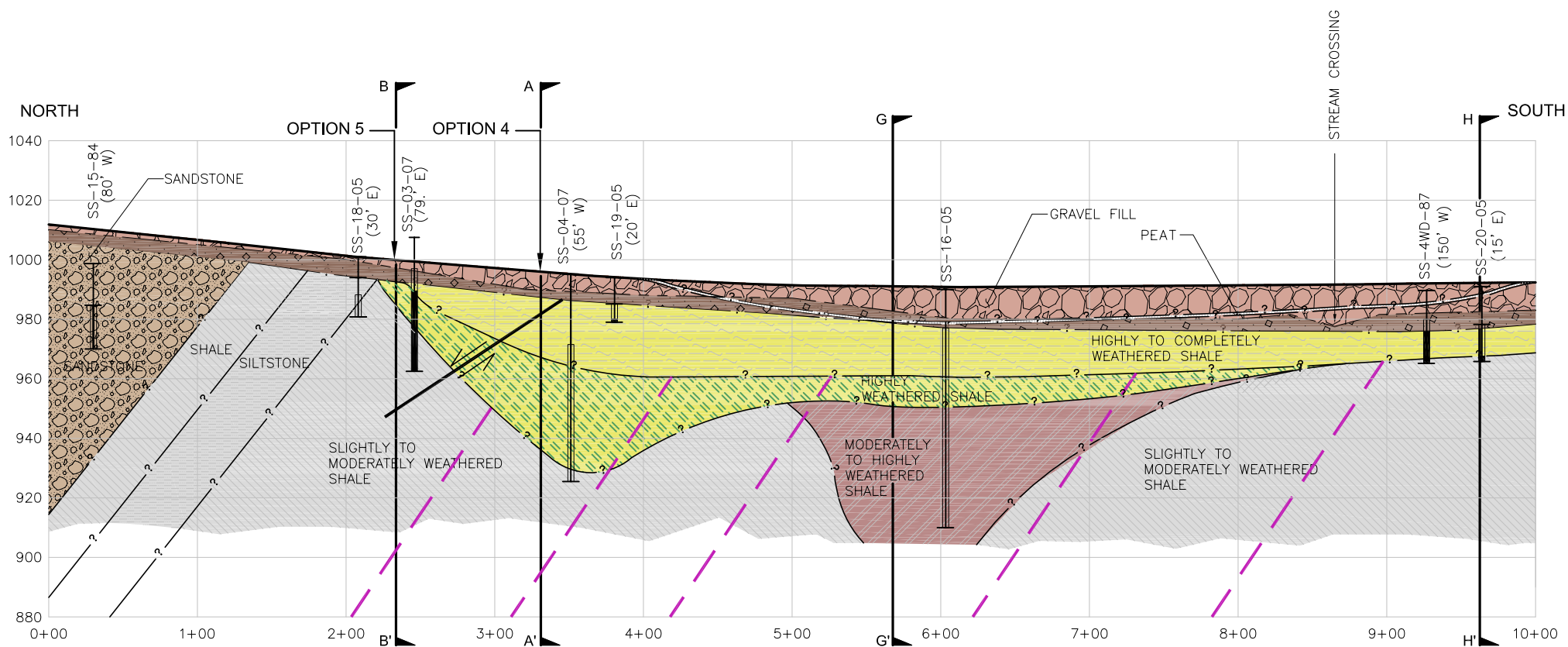
Job No. 33760401



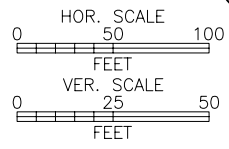
**Figure 14
Subsurface Profiles Along Options 4 and 5**

Updated Geotechnical Report
Red Dog Tailings Main Dam
Stage VIII Raise and Closure
Red Dog Mine, Alaska

P:\ACAD\PROJECT\TechComm\Alaska\STAGE-VIII-RAISE-REPORT\GEO\GEO\STAGE-VIII-RAISE-REPORT\F-15.dwg Jun 11, 2008 - 4:16pm



CROSS SECTION (C)
F-3



- LEGEND**
- 2007 TOPOGRAPHY
 - - - - - 1987 TOPOGRAPHY
 - ? - ? - STRATUM BOUNDARIES
 - ? - - - - ? GOUGE OR CLAY ZONE
 - - - - - REPRESENTATIVE BEDDING
 - ↔ FAULT
 - [Pattern] SANDSTONE
 - [Pattern] SILTSTONE
 - [Pattern] SILTY SAND AND GRAVEL
 - [Pattern] GRAVEL AND FILL
 - [Pattern] RESIDUAL TO HIGHLY WEATHERED SHALE
 - [Pattern] SLIGHTLY TO MODERATELY WEATHERED SHALE
 - [Pattern] MODERATELY TO HIGHLY WEATHERED SHALE
 - GROUND SURFACE
 - SOIL
 - HIGHLY WEATHERED BEDROCK
 - BEDROCK

- NOTES**
1. BEDDING DIPS, GOUGE LAYERS AND FAULT INFORMATION IS BASED ON A N320W STRIKE PROJECTION INTO THE LINE OF SECTION.
 2. BEDDING ALONG SECTION HAS AN APPARENT DIP OF 38 DEGREES AND HAS BEEN DRAWN AT 56 DEGREES TO ACCOUNT FOR 2V:1H SCALE EXAGGERATION

Job No. 33760401



Figure 15
Cross Sections Across Options 4 and 5

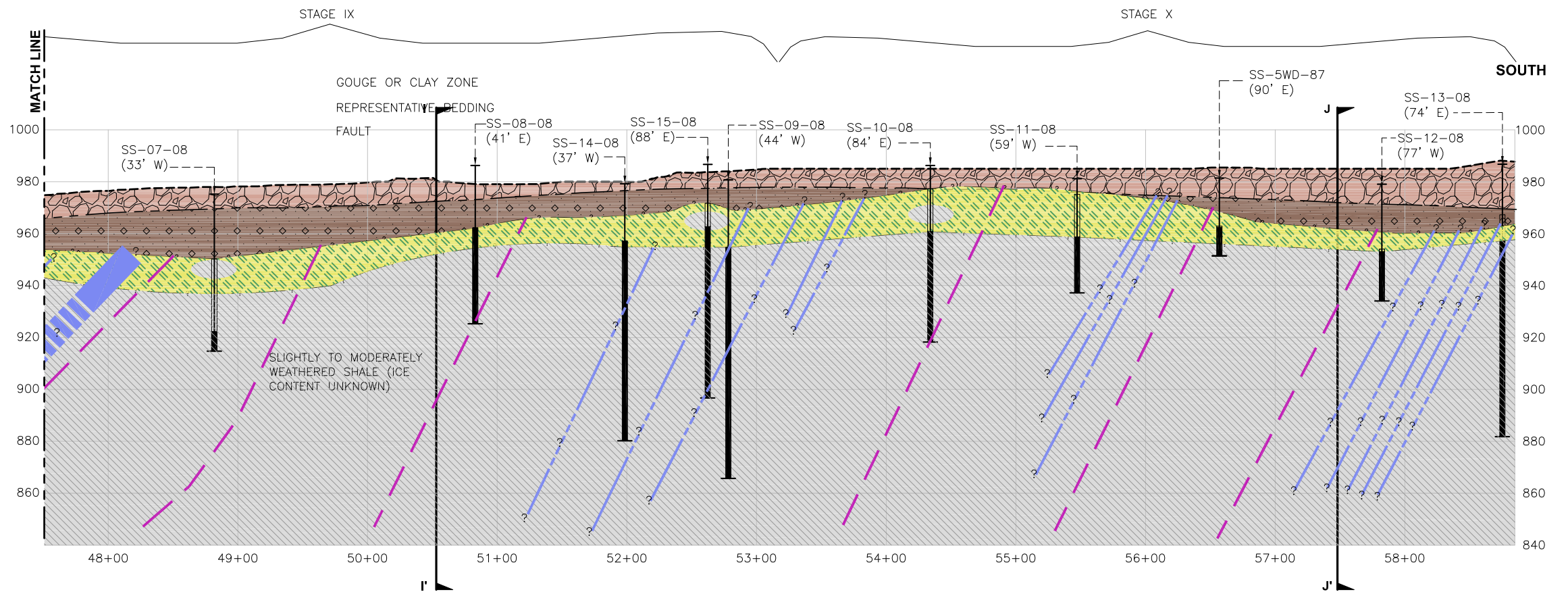
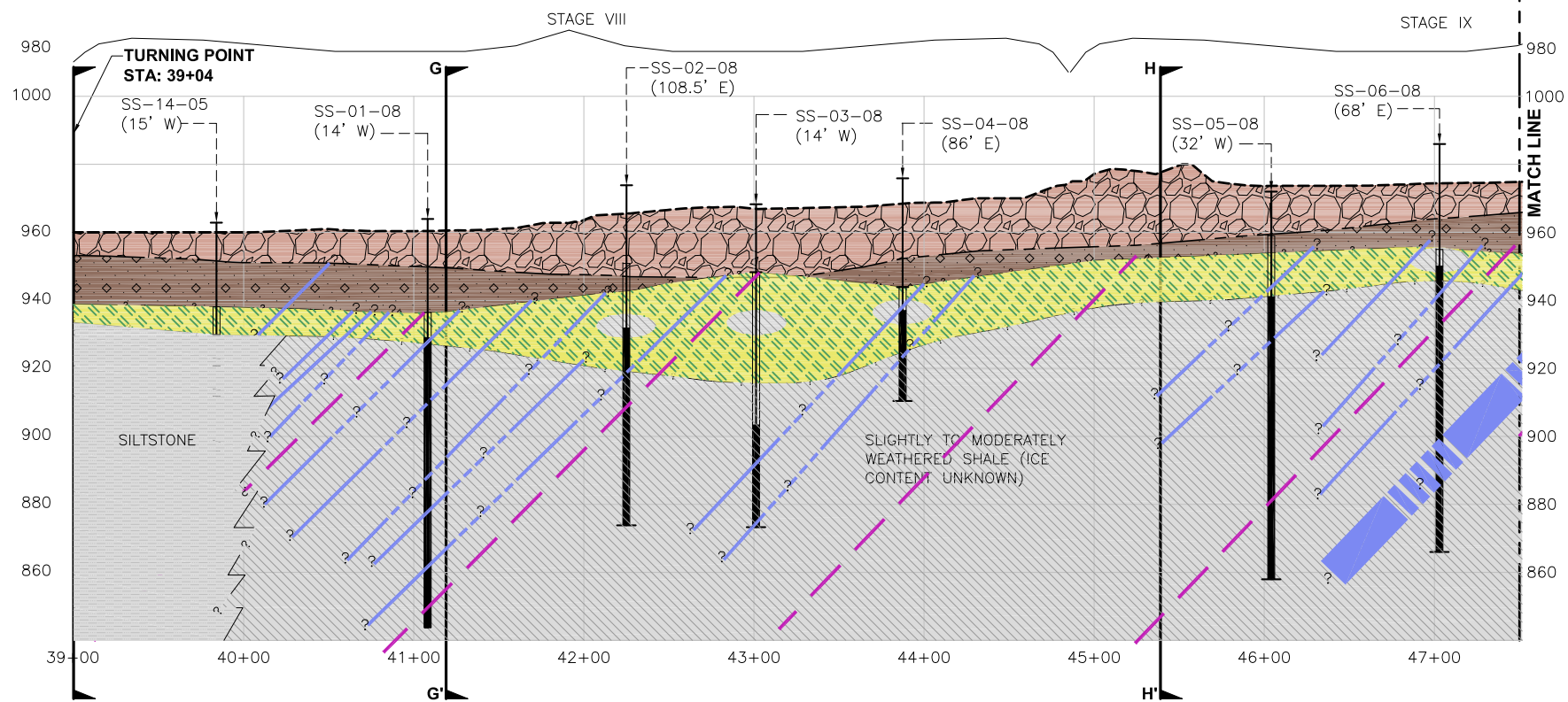
Updated Geotechnical Report
Red Dog Tailings Main Dam
Stage VIII Raise and Closure
Red Dog Mine, Alaska

NOTES

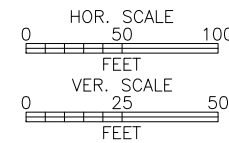
1. BEDDING DIPS, GOUGE LAYERS AND FAULT INFORMATION IS BASED ON A N320W STRIKE PROJECTION INTO THE LINE OF SECTION.
2. BEDDING FROM STA. 39+00 TO 50+00 HAS AN APPARENT DIP OF 26 DEGREES AND HAS BEEN DRAWN AT 45 DEGREES TO ACCOUNT FOR 2V:1H SCALE EXAGGERATION
3. BEDDING FROM STA. 50+00 TO 60+00 HAS AN APPARENT DIP OF 45 DEGREES AND HAS BEEN DRAWN AT 64 DEGREES TO ACCOUNT FOR 2V:1H SCALE EXAGGERATION

LEGEND:

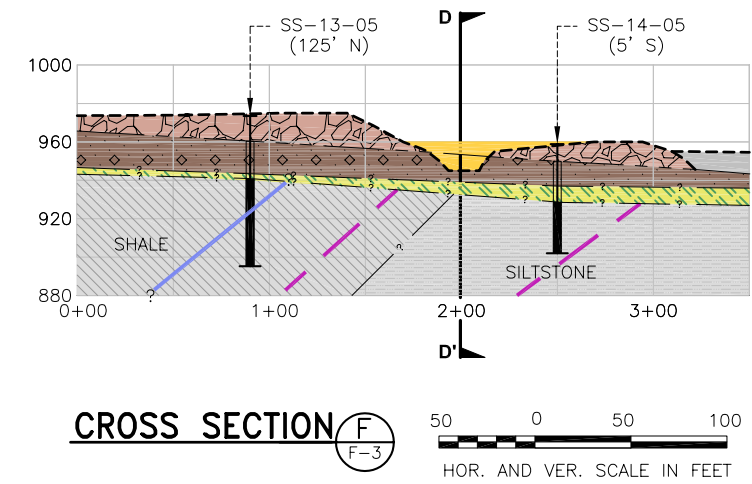
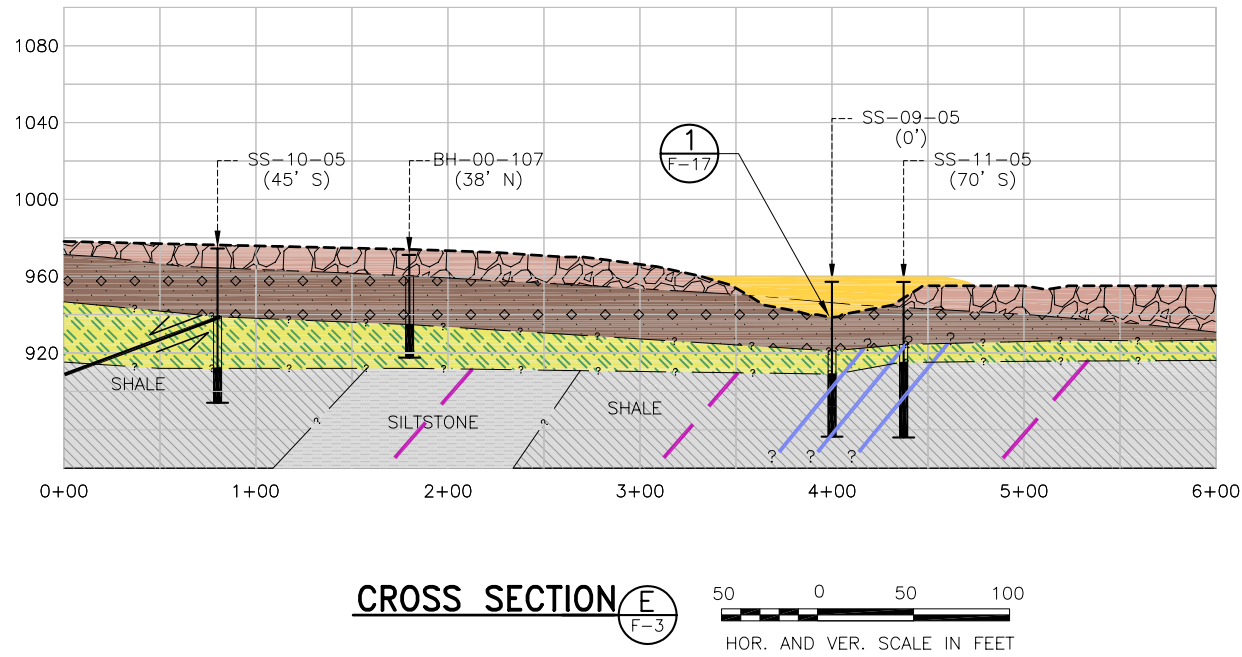
- 2007 TOPOGRAPHY
- 1987 TOPOGRAPHY
- - - - - STRATUM BOUNDARIES
- - - - - GOUGE OR CLAY ZONE
- REPRESENTATIVE BEDDING
- FAULT
- COMPLETED STAGE VII-B CURTAIN WALL
- SLIGHTLY TO MODERATELY WEATHERED SHALE
- RESIDUAL TO HIGHLY WEATHERED SHALE
- GRAVEL AND FILL
- SILTY SAND AND GRAVEL
- SILTSTONE
- MODERATELY WEATHERED SHALE LENS EMBEDDED IN RESIDUAL TO HIGHLY WEATHERED SHALE
- GROUND SURFACE
- SOIL
- HIGHLY WEATHERED BEDROCK
- BEDROCK



PROFILE WING WALL OPTION 6



P:\ACAD\PROJECT\TechCominco\Alaska\STAGE-VIII-RAISE-REPORT\GEO\TECHNICAL REPORT\F-16.dwg Jun 06, 2008 11:03am

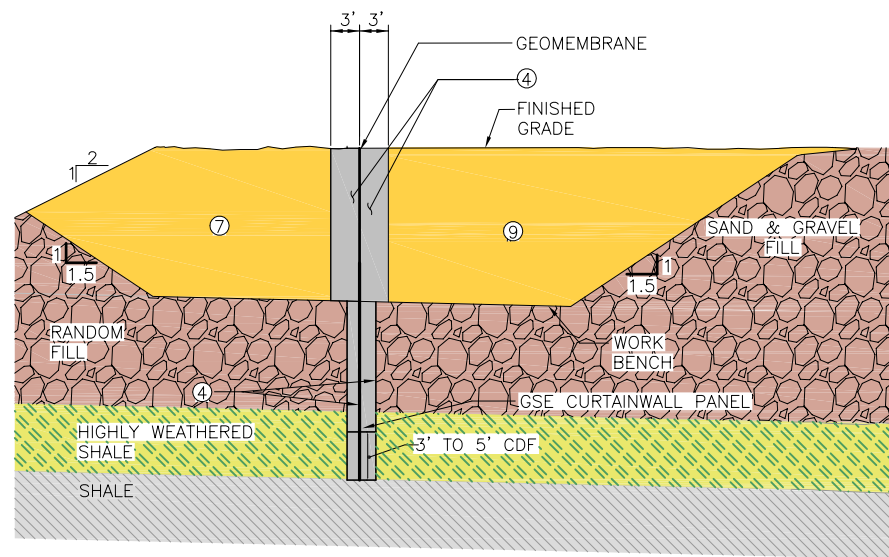


NOTES

1. BEDDING DIPS, GOUGE LAYERS AND FAULT INFORMATION IS BASED ON A N320W STRIKE PROJECTION INTO THE LINE OF SECTION.
2. BEDDING FOR SECTION E-E' HAS AN APPARENT DIP OF 44 DEGREES.
3. BEDDING FOR SECTION F-F' HAS AN APPARENT DIP OF 43 DEGREES.

LEGEND

- 2007 TOPOGRAPHY
 - - - 1987 TOPOGRAPHY
 - ? - ? - STRATUM BOUNDARIES
 - STAGE VII-B
 - SANDSTONE
 - SILTSTONE
 - SILTY SAND AND GRAVEL
 - GRAVEL AND FILL
 - RESIDUAL TO HIGHLY WEATHERED SHALE
 - SLIGHTLY TO MODERATELY WEATHERED SHALE
 - TAILINGS
 - - - ? - GOUGE OR CLAY ZONE
 - REPRESENTATIVE BEDDING
 - FAULT
- KEY:**
- GROUND SURFACE
 - SOIL
 - HIGHLY WEATHERED BEDROCK
 - BEDROCK



STAGE VII-B WING WALL TYPICAL SECTION
F-17
NTS

P:\ACAD\PROJECT\TechComm\Alaska\STAGE-VIII\DESIGN\STAGE-VIII-RAISE-REPORT\GEO\TECHNICAL\REPORT\F-17.dwg Jun 11, 2008 - 4:15pm

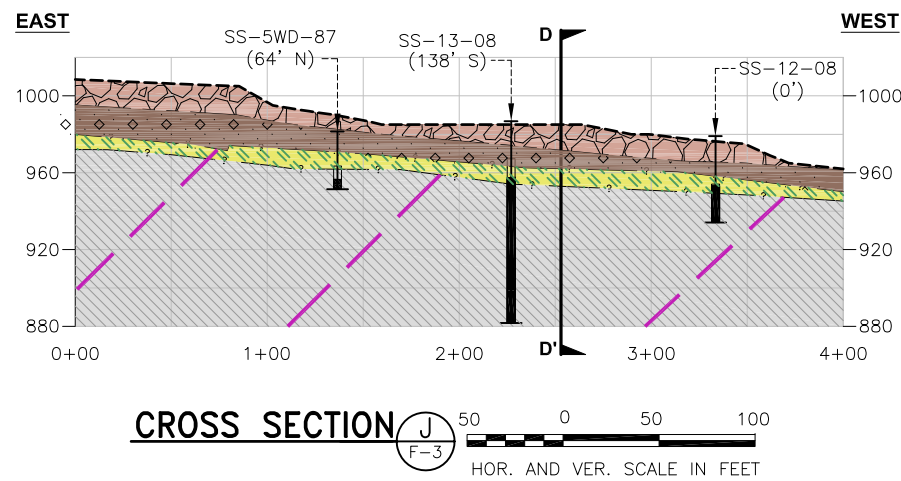
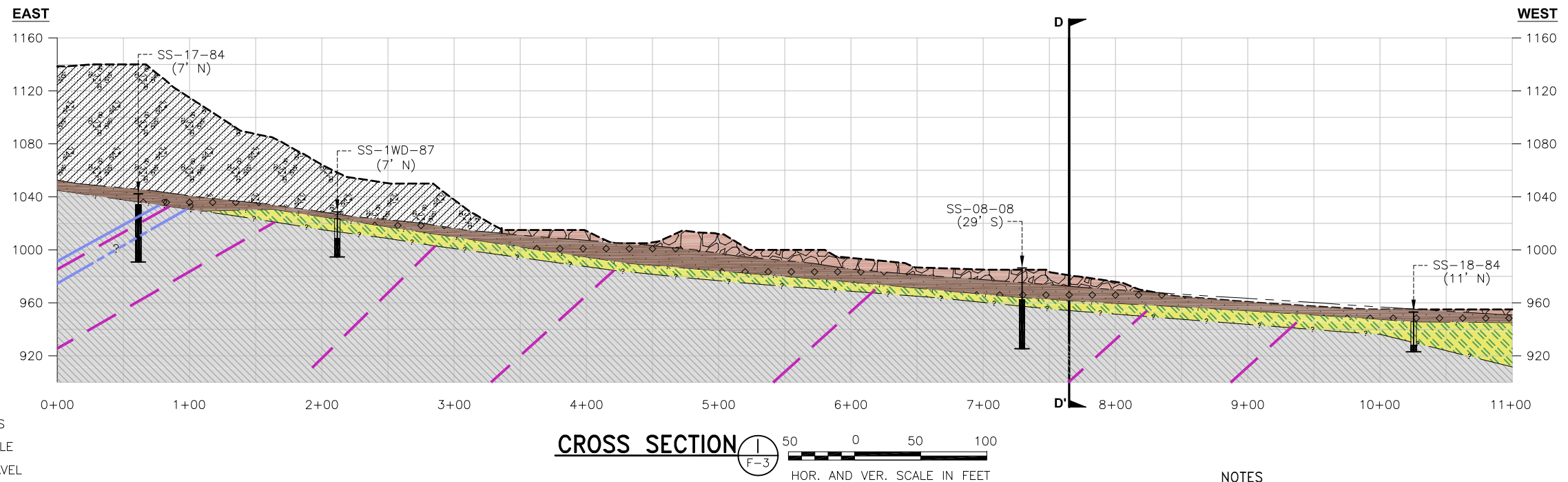
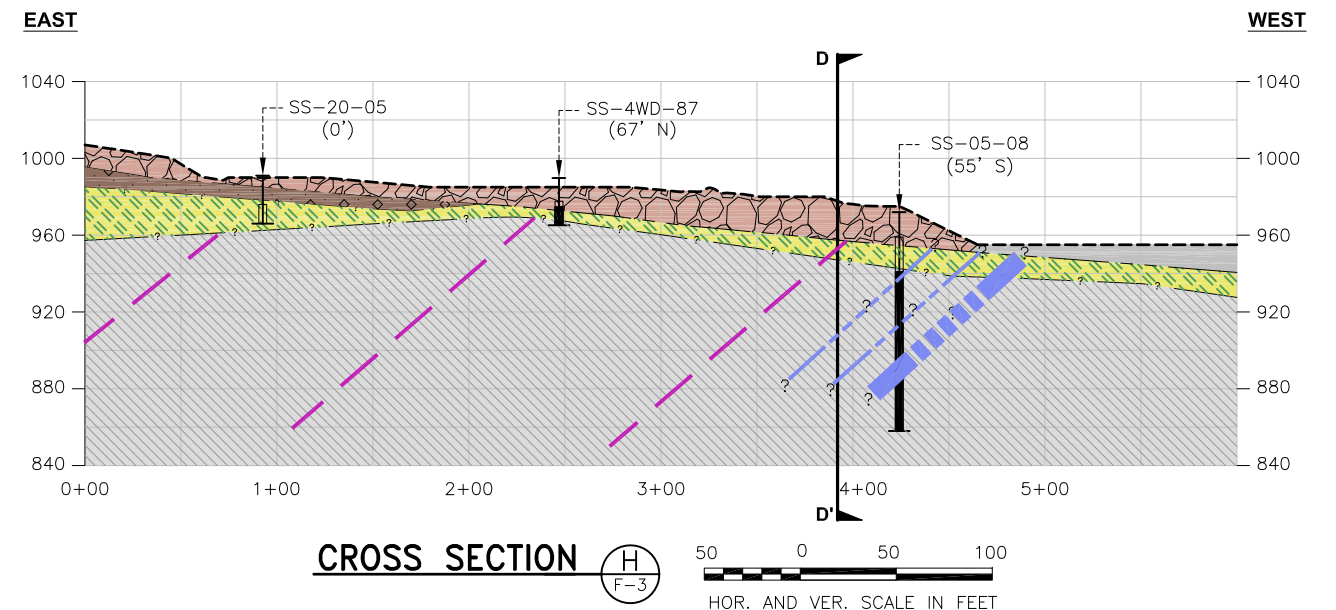
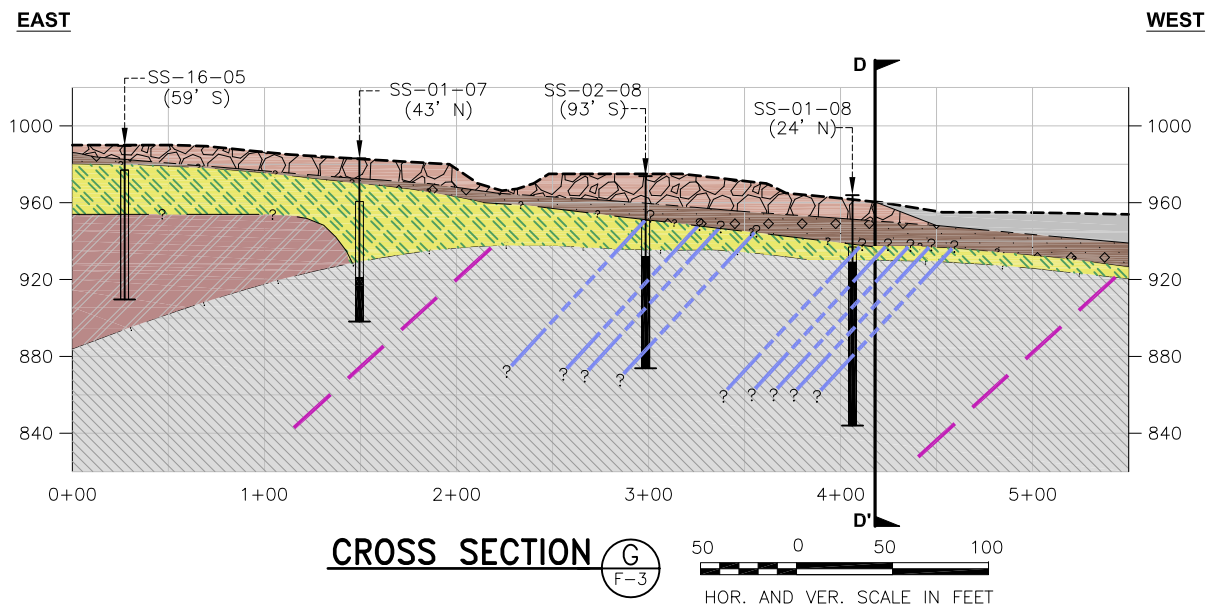
Job No. 33760401



Figure 17
Cross Sections Across Existing Stage VII-B Alignment

Updated Geotechnical Report
Red Dog Tailings Main Dam
Stage VIII Raise and Closure
Red Dog Mine, Alaska

P:\ACAD\PROJECT\TeekCominco\Alaska\STAGE-VIII\DESIGN\STAGE-VIII-RAISE-REPORT\GEOTECHNICAL\REPORT\F-18.dwg Jun 06, 2008 - 11:45am



LEGEND

- 2007 TOPOGRAPHY
- - - 1987 TOPOGRAPHY
- ? - ? - STRATUM BOUNDARIES
- [Hatched Box] MAIN WASTE STOCKPILE
- [Brown Box] SILTY SAND AND GRAVEL
- [Brown Box] GRAVEL AND FILL
- [Green Box] RESIDUAL TO HIGHLY WEATHERED SHALE
- [Grey Box] SLIGHTLY TO MODERATELY WEATHERED SHALE
- [Grey Box] TAILINGS
- [Red Box] MODERATELY TO HIGHLY WEATHERED SHALE
- [Blue Dashed Line] GOUGE OR CLAY ZONE
- [Pink Dashed Line] REPRESENTATIVE BEDDING
- [Double Arrow] FAULT
- [Vertical Line] GROUND SURFACE
- [Vertical Line] SOIL
- [Vertical Line] HIGHLY WEATHERED BEDROCK
- [Vertical Line] BEDROCK

KEY:

NOTES

1. BEDDING DIPS, GOUGE LAYERS AND FAULT INFORMATION IS BASED ON A N320W STRIKE PROJECTION INTO THE LINE OF SECTION.
2. BEDDING FOR SECTIONS G-G' AND H-H' HAS AN APPARENT DIP OF 41 DEGREES.
3. BEDDING FOR SECTIONS I-I' AND J-J' HAS AN APPARENT DIP OF 45 DEGREES WITH THE EXCEPTION OF THE EAST END OF I-I' WHICH HAS AN ASSUMED APPARENT DIP OF 30 DEGREES DUE TO INFORMATION INDICATED IN THE BORING LOG FOR SS-17-84.

Job No. 33760401



Figure 18
Cross Sections Across Option 6

Updated Geotechnical Report
 Red Dog Tailings Main Dam
 Stage VIII Raise and Closure
 Red Dog Mine, Alaska