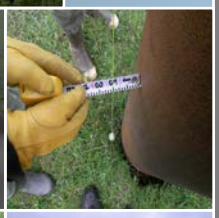
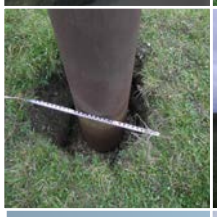
2013

2013 Alpine Pipeline River Crossing Monitoring

135894-MBJ-RPT-001



Prepared for

ConocoPhillips Alaska, Inc.

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Acronyms and Abbreviations

Baker	Michael Baker Jr., Inc.
BPMSL	British Petroleum Mean Sea Level
CPAI	ConocoPhillips Alaska, Inc.
ft/ft	feet per vertical foot
ft/yr	feet per year
HDD	Horizontal directional drilled
LCMF	UMIAQ, LLC
NPS	Nominal Pipe Size
VSM	Vertical Support Member(s)

1.0 Introduction

Originally constructed during the winter of 1998/1999, the Alpine Pipeline System crosses three rivers between the Alpine Development CD1 facility and the tie-in to the Kuparuk Pipeline. The three river crossings are the horizontal directionally drilled (HDD) above ground crossing of the Colville River East Channel; and the above ground crossings of the Kachemach River and the Miluveach River.

Monitoring of the pipeline crossings is required by the Right-of-Way Lease/Grant Stipulations and the ConocoPhillips Alaska, Inc. (CPAI) Alpine Surveillance and Monitoring Program. It is conducted to document the condition of the pipeline and the pipeline's effect on channel morphology at each river crossing. The record of monitoring allows for an annual comparison between observed conditions and the design criteria.

Michael Baker Jr., Inc. (Baker) conducted initial monitoring of the HDD crossing of the Colville River East Channel in 2001. Annual monitoring of this crossing has been performed since 2003. Bank migration surveys have been conducted annually by UMIAQ, LLC (LCMF) since 2003 and pile cap elevation surveys since 2004 (Baker 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, and 2012).

Initial monitoring of the Kachemach River and Miluveach River pipeline crossings was conducted in 2003. Annual monitoring was performed in 2004, 2005, and 2006; bank migration and pile cap elevation surveys were performed by LCMF. Over these four years of monitoring, no significant scour, erosion, or vertical support member (VSM) tilt were observed at these locations. In the fall of 2006, a five-year monitoring interval was recommended. Baker did not conduct pipeline crossing monitoring at the Kachemach or Miluveach sites in 2007; monitoring resumed at these locations in 2008. Annual monitoring has continued at the Kachemach and Miluveach Rivers since 2009. LCMF conducted bank migration surveys at the Kachemach and Miluveach river crossing sites in 2002 through 2008 and in 2012. The surveys are planned to be conducted again during the 2017 monitoring program. (Baker 2003b, 2004, 2005, 2006, 2008, 2009, 2010, 2011, and 2012). Results of the 2012 survey appear in the *2012 Alpine Pipeline River Crossings Monitoring Report* (Baker 2012).

Baker conducted the 2013 Alpine Pipeline river crossing monitoring. The 2013 monitoring activities included visual observations and pipeline tilt measurements at the three crossings, and LCMF bank erosion and pile cap elevation surveys at the HDD crossing of the Colville River East Channel. The 2013 Alpine Pipeline River Crossing monitoring sites are included in Figure 1.

1.1 2013 Monitoring Criteria

1.1.1 Data Collection

The following data were collected in 2013:

- Photographs of each crossing location
- Evaluation of the condition of VSM, including measured tilt and observable settling, scouring, or jacking with particular attention paid to the following:
    - Miluveach River – VSM Nos. 2047 A/B and 2048 A/B and other VSM within 15 feet of the channel;
    - Kachemach River – VSM Nos. 1714 and 1715 A/B and other VSM within 15 feet of the channel;

- Evaluation of bank erosion at the HDD crossing at least 50 feet upstream and downstream from the nominal pipe size (NPS) 14 oil pipeline ;
- Survey of the top and bottom bank elevations and identification of locations of bank caving at the HDD crossing (LCMF);
- Topographic survey from the Colville River bank to the HDD east pad to document bank and ground stability (LCMF);
- Measurement of depth and width of scour around VSM in the Kachemach and Miluveach river channels; and
- Observation of localized scour near all river crossings.

1.1.2 Physical Conditions Evaluated

The following physical conditions were evaluated during the site visits:

- Obstructions, ice dams, new river channels, or changes in flow in the channels;
- Signs of flooding threatening a facility or pipeline, or where water could not be diverted and there was:
    - Evidence of water concentrated longitudinally on or along the pipeline centerline
    - Gullying that threatened the buried pipeline at the HDD crossing
- Soil pressure ridges parallel to the pipe axis exceeding 1 foot in height and 60 feet in length;
- Ponding extending over the pipe axis deeper than 1 foot and more than 100 feet in length;
- Soil disturbances located within 10 feet of the pipeline centerlines at least 10 feet in length with vertical displacement exceeding 6 inches, or wider than 2 inches parallel to the pipe axis and longer than 60 feet;
- Depressions occurring longitudinally over the pipe axis deeper than 1 foot and more than 100 feet in length;
- Evidence of potential pipeline leaks;
- Presence or absence of erosion of the HDD facility gravel pads; and
- Evidence of any settlement and jacking of the HDD building foundation (LCMF).

ConocoPhillips Alaska

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2013 Alpine Pipeline

River Crossing

Monitoring Sites

FIGURE: 1

(SHEET 1 of 1)

2.0 Methods

Observations and photographs were collected at the pipeline crossing locations on the Kachemach River, Miluveach River, and HDD crossing of the Colville River East Channel during the 2013 spring breakup field work. On July 24 and 25, 2013, Baker personnel documented visual observations and VSM tilt measurements at the three river crossings. Channels were clear of ice and snow allowing full access to the channels and pipeline. Visual observations at the HDD crossing began from where the pipeline casings enter the ground and extended to the riverbanks. Observations at the Kachemach and Miluveach Rivers were conducted along the pipeline stream crossings to 15 feet outside the active channel banks on each side. The observations extended upstream and downstream several hundred feet on both banks. In addition to visual observations, aerial and ground photographs were taken and are provided in Appendix A. Observations and measurements were compared to established design criteria.

2.1 Bank Erosion

LCMF surveyed the local topography at the HDD crossing in July 2013. LCMF incorporated the data into figures and provided a tabulation of historical migration since 2001 for each bank. This is available in Appendix B for HDD West and Appendix C for HDD East. Arbitrary survey control points serve as the origin for the baseline stationing, beginning at 100 feet from the pipeline along each bank, and establish a means of comparing annual measurements. The HDD West top of bank setback allows for 105 feet of bank erosion, and the HDD East top of bank setback allows for 115 feet of bank erosion (Baker 2003a).

2.2 VSM Tilt

A plumb bob and pocket rod tape measure were used to measure the tilt of the VSM located in three river crossings (four monitoring locations) and within 15 feet from the river banks. Tilt was measured perpendicular to the pipeline (north [N]/south [S]) and parallel to the pipeline (east [E]/west [W]). The tilt of each VSM was documented by measuring the horizontal distance from the plumb bob in feet per vertical foot (ft/ft). The accuracy of this method is ± 0.001 ft/ft. Approximate conversions between ft/ft and inches per vertical foot are provided in Table 1**.**

The 2010 CPAI North Slope Foundation Design Specification (CPAI 2010) states that under sustained loads, “VSM pipe supports shall be limited to $\Delta v/l = 0.015$ and Δv =1-inch max.” Where Δv equals the horizontal deflection and l equals the vertical distance.

Taking into consideration the accuracy of the measurement method and the design specifications, the VSM axis was considered plumb and within tolerance if the tilt was measured to be less than or equal to 0.015 ± 0.001 ft/ft. Any calculations that were determined to be less than the survey accuracy are reported as such (<0.001 ft/ft). The direction of the tilt is given as either north [N] or south [S] and east [E] or west [W].

Table 1 VSM Tilt Unit Conversion (rounded to nearest thousandth)

Inches of deflection per 10 feet	ft/ft	Slope
1/8	***0.001***	***1:1000***
1/4	0.002	1:500
1/2	0.004	1:250
3/4	0.006	1:160
1	0.008	1:125
1-1/4	0.010	1:100
1-1/2	0.013	1:77
1-3/4	***0.015***	***1:66.6***
2	0.017	1:58

Survey Tolerance

Project Tolerance

2.3 VSM Scour

Streambed scour in the Miluveach and Kachemach rivers was evaluated using visual methods at each in-stream VSM. Scour is measured either at the VSM, or if a casing is present, at the inside and outside of the casing. As presented in the *Mechanical Analysis of Aboveground Pipeline and Aboveground River Crossings* (Baker 2003c), the VSM within the floodplain of the Kachemach and Miluveach river crossings were designed to withstand both local pier scour and channel scour during a 200-year flood. Scour limits for VSM located in the floodplain and in the active channel are shown in Table 2. These values include both local pier scour and anticipated channel scour.

Table 2 VSM Design Scour Limits

River Crossing	Minimum Scour Hole Elevations (feet – BPMSL)	
	Floodplain	Main Channel
Kachemach	9.5	6.9
Miluveach	36.7	35.1

2.4 Foundation Settlement and Jacking (HDD West)

LCMF surveyed the elevation of the HDD building foundation piles (bottom of pile cap) and developed tabulations of historic elevations for each pile. Data presented in the 2008 monitoring report (Baker 2008) reflected an adjustment to the vertical datum at HDD West of -0.35 feet, which was made to reflect actual elevations based on differential levels carried by LCMF from CD1 (Alpine) in August 2007. According to LCMF, this adjustment was eliminated to avoid confusion about elevation values. Therefore, the values for each pile cap as presented in Appendix B reflect the original datum.

2.5 Polygon Trough Subsidence (HDD East)

As in past years, a polygon trough located between the Colville River and the HDD East gravel pad was also monitored for subsidence. Historic profiles and tabulated elevations of selected cross sections over the length of the trough are presented in Appendix C.

3.0 2013 Results

3.1 HDD West Bank

The west bank of the Colville River HDD crossing was evaluated by visual observation using ground and aerial photography (Photo A.1 through Photo A.13 in Appendix A) and field and topographic surveys.

The 2013 Colville River spring breakup floodwaters reached, but did not overtop the west bank of the channel. Some erosion was evident along the west bank. One distinct debris line composed of sticks and small pieces of drift wood was observed at the toe of the bluff (Photo A.9).

3.1.1 Bank and Pad Erosion (HDD West)

The greatest bank erosion observed between the 2012 and 2013 pipeline monitoring events along the HDD West bank was 1.1 feet, occurring at Station 3+60 approximately 110 feet downstream (north) of the oil pipeline centerline as identified on the LCMF topographic survey. The oil pipeline centerline is located at Station (STA) 2+50 on the topographic survey (Appendix B).

A maximum cumulative erosion of 18.8 feet, between April 2002 and July 2013, was measured along the top of the bank at Station 3+70 located 120 feet north of the oil pipeline centerline (STA 2+50). There was no change in in the erosion values at this station between 2012 and 2013. The 2013 erosion value yields a maximum average rate of 1.7 feet per year (ft/yr) at this location over the monitoring period. This is a decrease in the average erosion rate of 1.8 ft/yr in 2012.

The average rate of erosion for the 2012-2013 monitoring period along the 440-foot top of bank was measured to be 0.03 ft/yr. This value averages both erosion and deposition. The 2012-2013 average rate of erosion is less than the observed long-term historic average rate of 0.36 ft/yr, and less than the estimated maximum erosion rate used for design of 2.3 ft/yr (Baker 2003a). A graphic and tabular summary of the LCMF survey results for the HDD West crossing is presented in Appendix B.

In 1997, Baker established a survey control point at the centerline of the NPS 14 oil pipeline, as shown on HDD Bank Monitoring HDD Site-West and provided in Appendix B. Based on a comparison of the 1997 survey control point to the 2013 LCMF survey data, approximately 9.0 feet of bank erosion has occurred over the 16-year period (0.56 ft/yr). This bank erosion comprises approximately 9% of the total 105-foot design setback. The west bank erosion has not yet reached the 50% design setback. If in the future, the bank “migrates 50% of the design setback, erosion rates or possible mitigation measures will be evaluated” (Baker 2003c).

Based on visual observations, bank erosion between 2012 and 2013 does not appear to be significant. Channel morphology and flow direction within the channel remains largely unchanged. The pipelines appeared to be in good condition with no apparent leaks.

3.1.2 VSM Tilt (HDD West)

The VSM investigated near HDD West are adequately supporting the pipeline. All six VSM adjacent to the HDD West pad and crossing were plumb and within project tolerance based on tilt measurements and project method accuracy. A summary of the HDD West Bank VSM tilt survey results is presented in Table 3.

Table 3 HDD West VSM Tilt Measurement Results (2013)

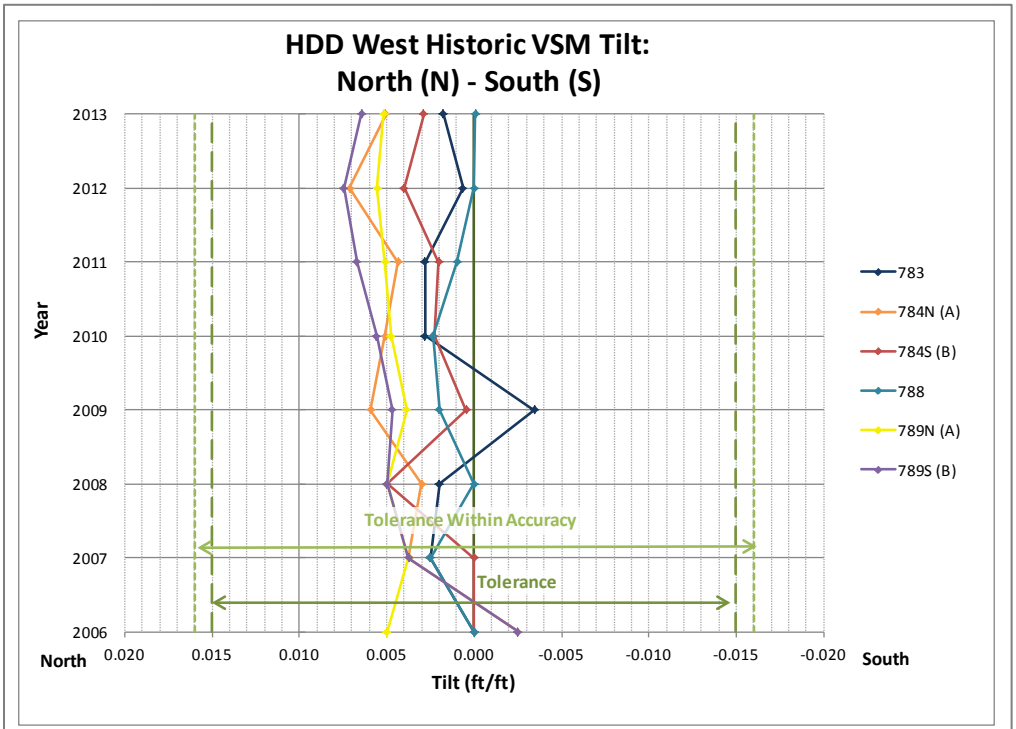
HDD West VSM Number	Tilt Measurement Orientation (ft/ft)		Comment
	North/South	East/West	
783	0.0018 N	0.0019 W	Plumb
784N (A)	0.0051 N	<0.0010	Plumb
784S (B)	0.0029 N	0.0024 W	Plumb
788	<0.0010	0.0020 E	Plumb
789N (A)	0.0052 N	0.0012 W	Plumb
789S (B)	0.0064 N	0.0016 W	Plumb

Table 4 presents the change in tilt measurements collected between the 2012 (Baker 2012) and 2013 monitoring events.

Table 4 HDD West VSM Change in Tilt, 2012 to 2013

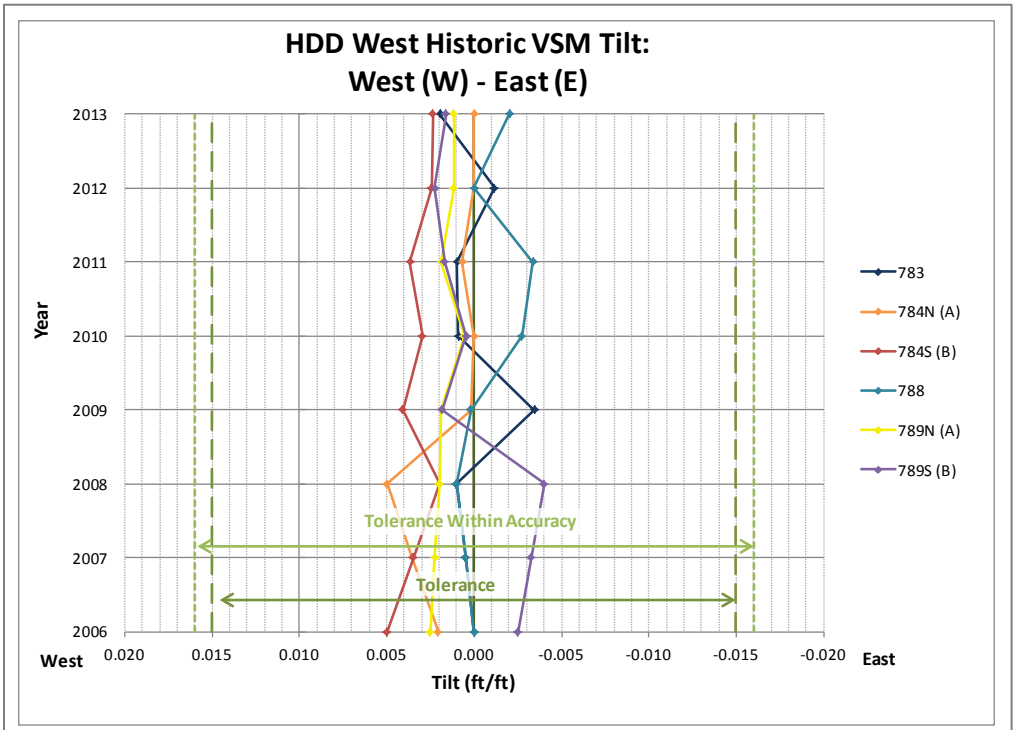
HDD West VSM Number	Change in Tilt Measurement Orientation (ft/ft)	
	North/South	East/West
783	0.0011 N	0.0031 W
784N (A)	0.0020 S	<0.0010
784S (B)	0.0011 S	<0.0010
788	<0.0010	0.0020 E
789N (A)	<0.0010	<0.0010
789S (B)	0.0010 S	<0.0010

Graph 1 and Graph 2 present the historical VSM change in tilt by orientation between 2006 and 2013 (Baker 2006, 2007, 2008, 2009, 2010, 2011, and 2012).



Notes: 1. Positive tilt indicates north (N), negative tilt indicates south (S)
2. Project tilt tolerance for VSM is +/- 0.015 ft/ft.
3. Survey accuracy of this project is +/-0.001 ft/ft.
4. Historical tilt directions were corrected based on review of all past measurements; the magnitude remains unchanged.

Graph 1 HDD West VSM Historic Change in Tilt, North/South



Notes: 1. Positive tilt indicates west (W), negative tilt indicates east (E)
2. Project tilt tolerance for VSM is +/- 0.015 ft/ft.
3. Survey accuracy of this project is +/-0.001 ft/ft.
4. Historical tilt directions were corrected based on review of all past measurements; the magnitude remains unchanged.

Graph 2 HDD West VSM Historic Change in Tilt, East/West

3.1.3 Foundation Pile Cap Survey (HDD West)

LCMF has conducted pile cap elevation surveys annually since 2004. Based on the surveys, no single pile cap has experienced a cumulative change of more than 0.035 feet of movement vertically over the 9-year span. The average cumulative change is 0.022 feet vertically over the 9-year span. The maximum incremental change from the 2012 to the 2013 survey is 0.018 feet vertically. A summary of the LCMF survey results for the HDD West Bank crossing is presented in Appendix B.

3.2 HDD East Bank

The east bank of the Colville River HDD crossing was evaluated by visual observation using ground and aerial photography (Photo A.14 through Photo A.25, in Appendix A) and field and topographic surveys. Extensive flooding accompanying the 2013 spring breakup, which overtopped the HDD East bank, inundating the overbank areas surrounding the HDD East gravel pad.

3.2.1 Bank and Pad Erosion (HDD East)

The greatest bank erosion observed between the 2012 and 2013 monitoring events was 8.2 feet occurring at Station 2+90, approximately 10 feet north of the NPS 14 oil pipeline centerline (STA 2+80). Appendix C includes a drawing of the bank migration survey in addition to tabular data. An exposed ice wedge was observed in the bank at this location (Photo A.20). Thawing of the exposed ice wedge from water and air contact will inevitably result in further, near-term, erosion at this location.

Between August 2001 and July 2013, a maximum cumulative erosion of 33.2 feet along the top of bank was measured at Station 4+15. This location is approximately 135 feet north of the oil pipeline centerline (STA 2+80). There was no change in in the erosion values at this station between 2012 and 2013.The 2013 erosion value yields a maximum average rate of 2.8 ft/yr at this location over the monitoring period. This is a decrease in the average erosion rate of 3.0 ft/yr in 2012.

The average rate of erosion for the 2012-2013 monitoring period, as measured along the entire 450-foot top of bank, is approximately 0.6 ft/yr. This value averages both erosion and deposition. The 2012-2013 average rate of erosion is less than the observed long-term historical average rate of 1.10 ft/yr, and less than the estimated maximum design erosion rate of 2.5 ft/yr (Baker 2003a). A graphic and tabular summary of the LCMF surveying results for the HDD East Bank crossing is presented in Appendix C**.**

In 1997, Baker established a survey control point at the centerline of the NPS 14 oil pipeline, as shown on HDD Bank Monitoring HDD Site-East and provided in Appendix C. Based on a comparison of the 1997 survey control point to the 2013 LCMF survey data, approximately 13.7 feet of bank erosion has occurred over the 16 year period (0.86 ft/yr). As of 2013, the observed bank erosion at this location comprises 11.9% of the 115-foot design setback. The east bank erosion has not yet reached the 50% design setback. If in the future, the bank “migrates 50% of the design setback, erosion rates or possible mitigation measures will be evaluated” (Baker 2003c).

Additional erosion and sloughing has occurred along the east bank north of the NPS 14 oil pipeline and at the polygon trough near the NPS 12 seawater pipeline. Exposed sandbags and Styrofoam were evident at the toe of the polygon trough, similar to site conditions encountered during the 2012 field visit (Photo A.23). While the date of placement is not known, it is understood by Baker that the sandbags and Styrofoam were installed in the bank to combat further erosion.

The HDD East gravel pad did not sustain any visible erosion or sloughing as a result of the high floodwater during the 2013 spring breakup. Based on visual observations, bank erosion between 2012 and 2013 does not appear to be significant. Channel morphology and flow direction within the channel remains largely unchanged. The pipelines appeared to be in good condition with no apparent leaks.

3.2.2 Polygon Trough Subsidence (HDD East)

In addition to bank erosion surveys, subsidence monitoring has been conducted since 2001 by LCMF at eight cross sections of the polygon trough west of the HDD East gravel pad (cross section A through cross section H). The cumulative subsidence measured at any of the cross sections was less than 3.6 feet. Maximum cumulative subsidence at cross section E was 3.5 feet. The maximum incremental change since 2012 was at cross section A with a decrease of 1.4 feet. A graphic and tabular summary of these cross sections is provided in Appendix C, a photograph of the troughs (Photo A.22) is in Appendix A.

3.2.3 VSM Tilt (HDD East)

The VSM investigated near HDD East are adequately supporting the pipeline. All five VSM directly adjacent to the HDD East pad and crossing were plumb and within project tolerance based on tilt measurements and project method accuracy. A summary of the HDD East Bank VSM tilt survey results is presented in Table 5.

Table 5 HDD East VSM Tilt Measurement Results (2013)

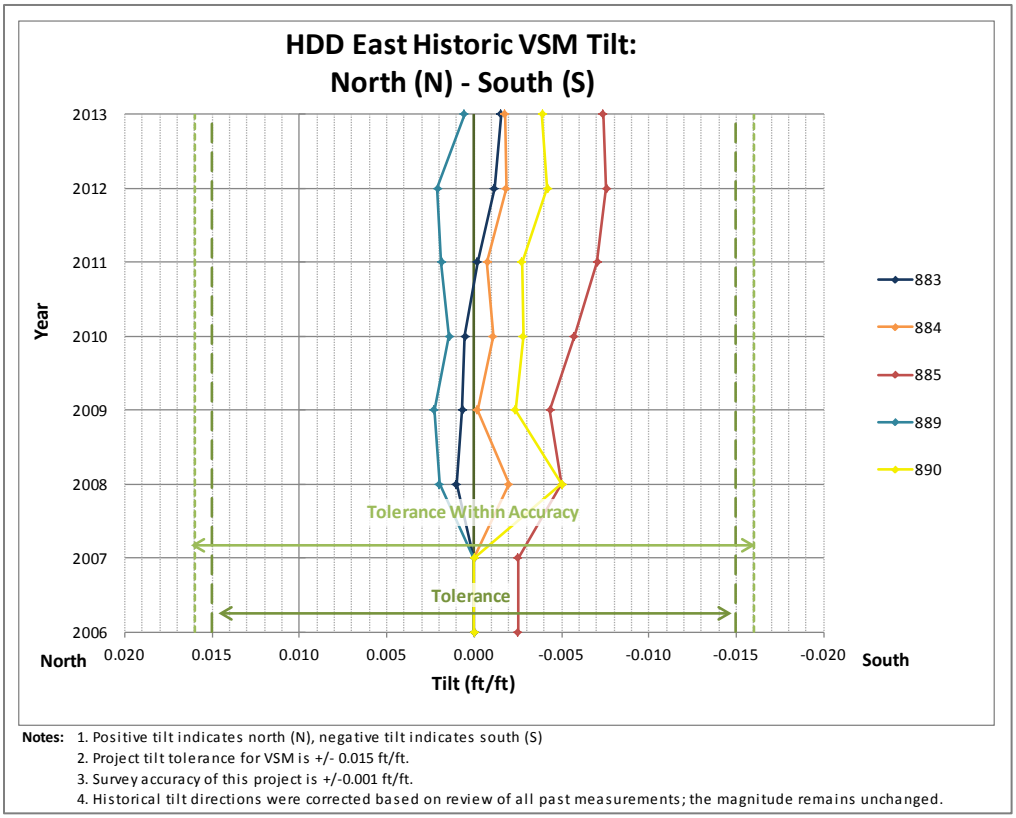
HDD East VSM Number	Tilt Measurement Orientation (ft/ft)		Comment
	North/South	East/West	
883	0.0015 S	<0.0010	Plumb
884	0.0018 S	0.0010 W	Plumb
885	0.0074 S	0.0048 W	Plumb
889	<0.0010	<0.0010	Plumb
890	0.0039 S	<0.0010	Plumb

Table 6 presents the difference in tilt measurements collected during the 2012 (Baker 2012) and 2013 monitoring events.

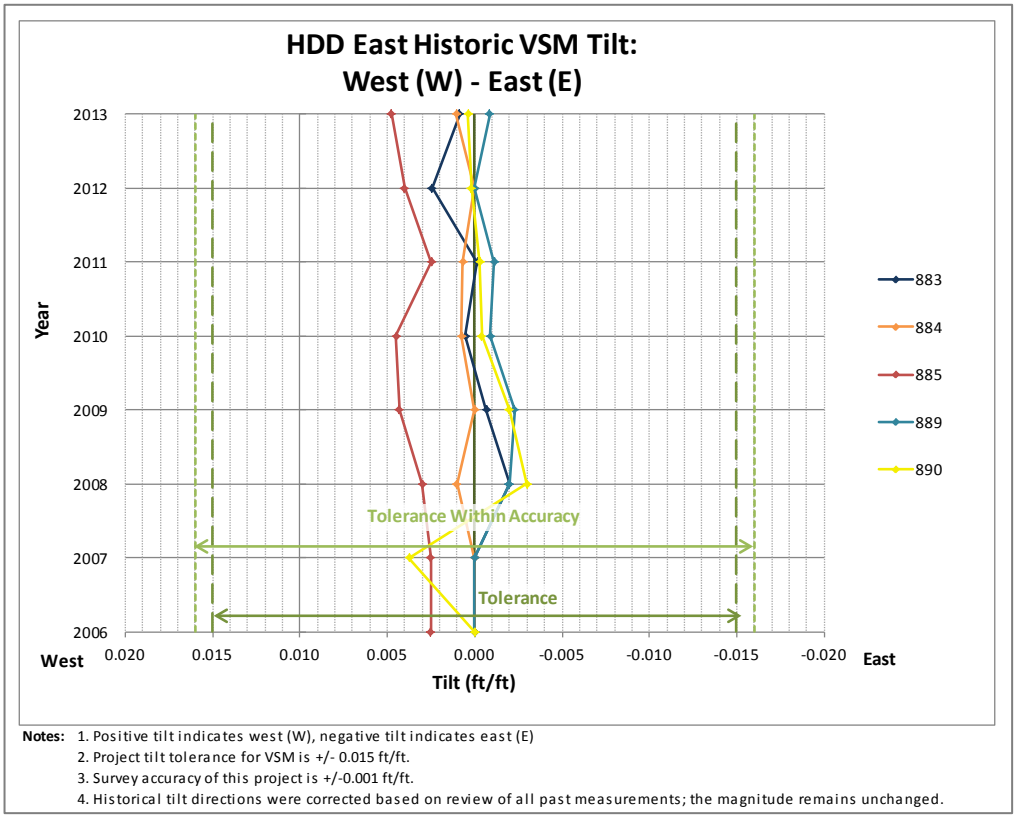
Table 6 HDD East VSM Change in Tilt, 2012 to 2013

HDD East VSM Number	Change in Tilt Measurement Orientation (ft/ft)	
	North/South	East/West
883	<0.0010	0.0016 E
884	<0.0010	0.0010 W
885	<0.0010	<0.0010
889	0.0015 S	<0.0010
890	<0.0010	<0.0010

Graph 3 and Graph 4 present the historical VSM change in tilt by orientation between 2006 and 2013 (Baker 2006, 2007, 2008, 2009, 2010, 2011, and 2012).



Graph 3 HDD East VSM Historic Change in Tilt, North/South



Graph 4 HDD East VSM Historic Change in Tilt, East/West

3.3 Kachemach River

The Kachemach River crossing was evaluated by visual observation, ground and aerial photography (Photo A.26 through Photo A.31; Appendix A), and field surveys**.** At the time of the field visit, flow was observed across the entire gravel channel at the pipeline crossing location. The channel is approximately 75 feet wide with a maximum depth of approximately 2.5 feet. Spring breakup observations in 2013 suggest flow was confined to the active gravel bed channel and did not reach the overbank regions adjacent to the river crossing.

3.3.1 Bank Erosion

Based on visual observations, no significant bank erosion was evident at the crossing nor immediately upstream or downstream from the pipelines. Channel morphology and flow direction within the channel remains largely unchanged. The pipelines appeared to be in good condition with no apparent leaks.

3.3.2 VSM Tilt

The VSM investigated near the Kachemach River crossing are adequately supporting the pipeline. Five of the six VSM located within the vicinity of the Kachemach River were plumb and within project tolerance based on tilt measurements and project method accuracy. A summary of the 2013 Kachemach River VSM tilt survey results is presented in Table 7.

VSM 1714, 1714A (abandoned), 1715A, 1715B, and 1716 were plumb. The tilt of VSM 1715C (abandoned) was measured to be east 0.0155 ft/ft, exceeding the project tolerance, but not by more than the survey method accuracy.

Table 7 Kachemach River VSM Tilt Measurement Results (2013)

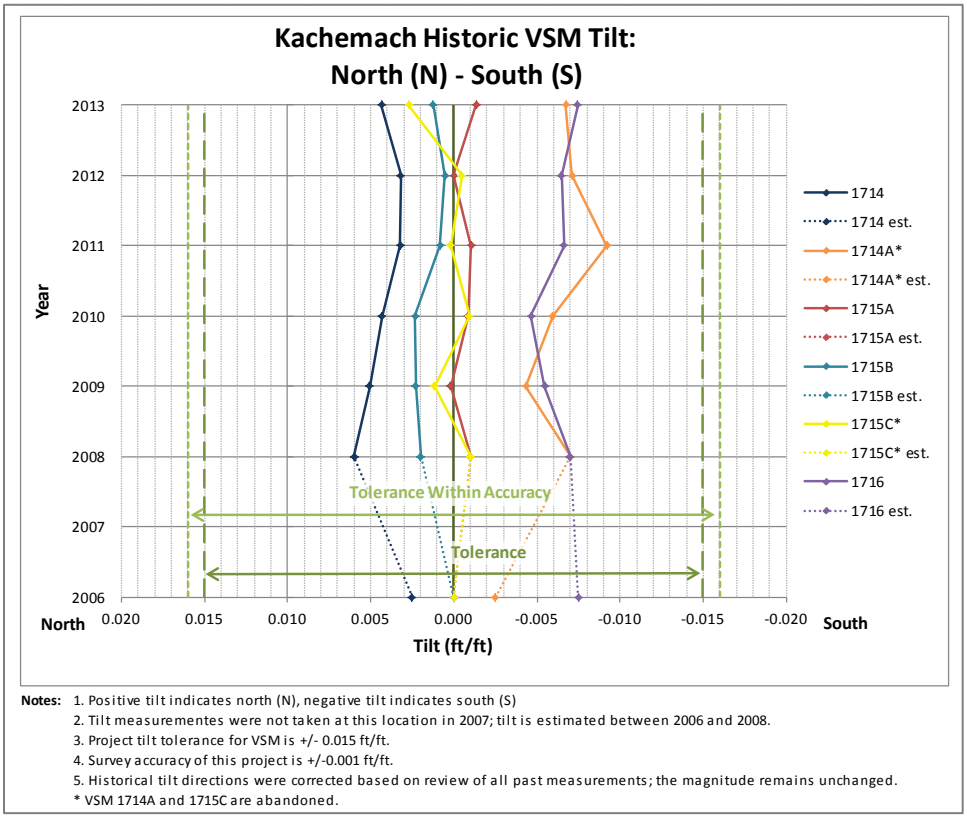
Kachemach VSM Number	Tilt Measurement Orientation (ft/ft)		Comments
	North/South	East/West	
1714	0.0043 N	0.0043 E	Plumb
1714A (Abandoned)	0.0067 S	0.0126 E	Plumb
1715A	0.0013 S	<0.0010	Plumb
1715B	0.0013 N	0.0012 W	Plumb
1715C (Abandoned)	0.0027 N	0.0155 E	E/W: exceeded project tolerance but not by more than survey method accuracy
1716	0.0075 S	0.0075 E	Plumb

Table 8 presents the difference in tilt measurements collected during the 2012 (Baker 2012) and 2013 monitoring events.

Table 8 Kachemach River VSM Change in Tilt, 2012 to 2013

Kachemach VSM Number	Change in Tilt Measurement Orientation (ft/ft)	
	North/South	East/West
1714	0.0011 N	<0.0010
1714A (Abandoned)	<0.0010	0.0011 E
1715A	0.0013 S	<0.0010
1715B	<0.0010	0.0013 E
1715C (Abandoned)	0.0032 N	0.0011 W
1716	<0.0010	0.0022 E

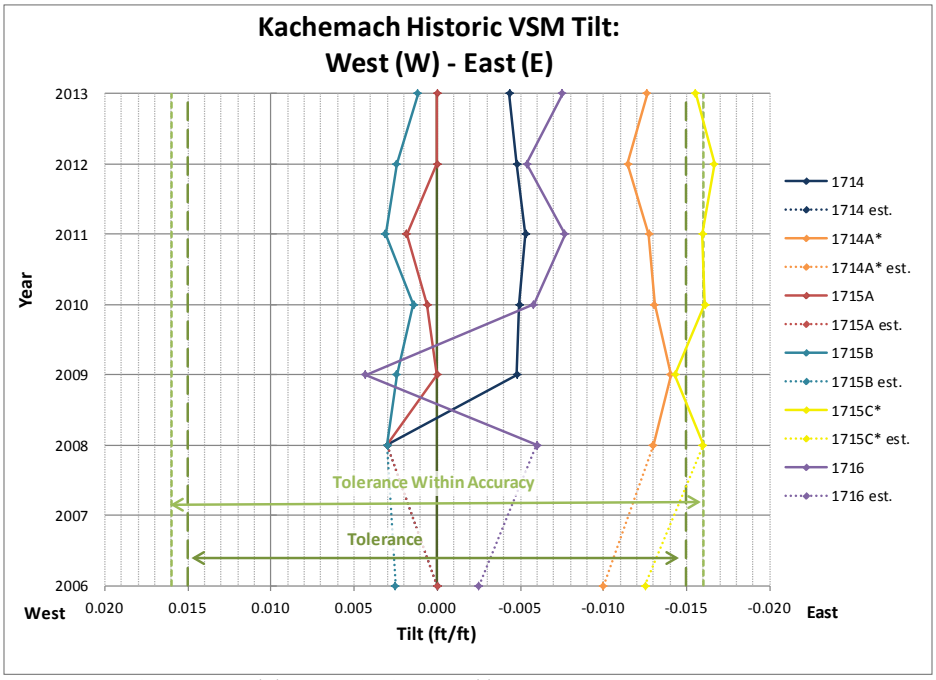
Graph 5 and Graph 6 present the historical VSM change in tilt by orientation between 2006 and 2013 (Baker 2006, 2007, 2008, 2009, 2010, 2011, and 2012).



Notes:
1. Positive tilt indicates north (N), negative tilt indicates south (S)
2. Tilt measurementes were not taken at this location in 2007; tilt is estimated between 2006 and 2008.
3. Project tilt tolerance for VSM is +/- 0.015 ft/ft.
4. Survey accuracy of this project is +/-0.001 ft/ft.
5. Historical tilt directions were corrected based on review of all past measurements; the magnitude remains unchanged.

* VSM 1714A and 1715C are abandoned.

Graph 5 Kachemach River VSM Historic Change in Tilt, North/South



Notes:
1. Positive tilt indicates west (W), negative tilt indicates east (E)
2. Tilt measurementes were not taken at this location in 2007; tilt is estimated between 2006 and 2008.
3. Project tilt tolerance for VSM is +/- 0.015 ft/ft.
4. Survey accuracy of this project is +/-0.001 ft/ft.
5. Historical tilt directions were corrected based on review of all past measurements; the magnitude remains unchanged.

* VSM 1714A and 1715C are abandoned.

Graph 6 Kachemach River VSM Historic Change in Tilt, East/West

3.3.3 VSM Scour

Visual observations and measurements were collected to evaluate pier scour for the VSMs located within the active Kachemach River channel. VSM 1715A and 1715B have permanent steel casings installed as a countermeasure to control local scour. The observed depth of scour on the inside of the casing was greater than on the outside at both VSM. No excessive scour was observed at the base of any VSM located within the channel or nearby floodplain. The design scour limit for the main channel of the Kachemach River is 6.9 feet BP mean sea level (BPMSL) (Baker 2003c). No quantitative scour survey was conducted during this monitoring cycle. The last topographic scour survey conducted by LCMF in 2004 (Baker 2004). Table 9 contains observed scour conditions during the 2013 field visit. Ground depressions observed at the base of VSM 1714 and 1715C are likely the result of consolidated backfill material and are not attributed to hydraulic events.

Table 9 Kachemach River VSM Scour (2013)

VSM	Location Description	Depth of Scour	Notes
1714	Grassy floodplain	2.0 feet below adjacent ground	A ground depression at the base of the VSM is approximately 3.0 feet in diameter
1714A	Channel	2.5 feet below water surface	Abandoned VSM
1715A	Channel	2.7 feet below water surface in casing; 4.2 feet below water surface out of casing	Scour hole measured on upstream side
1715B	Channel	3.0 feet below water surface in casing; 4.0 feet below water surface out of casing	Scour hole measured on upstream side
1715C	Grassy floodplain	1.0 feet below adjacent ground	Abandoned VSM. Ground depression at the base of the VSM is approximately 1.5 feet in diameter
1716	Grassy floodplain	No scour hole	

3.4 Miluveach River

The Miluveach River crossing was evaluated by visual observation, review of ground and aerial photography (Photo A.32 through Photo A.39; Appendix A), and field surveys. At the time of the field visit, flow with a maximum depth of 1.5 feet was observed across the majority of the channel at the pipeline crossing location. Spring breakup observations in 2013 suggest flow was confined to the active gravel bed channel and did not reach the overbank regions adjacent to the river crossing.

3.4.1 Bank Erosion

Based on visual observations, no bank erosion was evident at the crossing nor immediately upstream or downstream from the pipelines. Channel morphology and flow direction within the channel remains largely unchanged. The pipelines appeared to be in good condition with no apparent leaks.

3.4.2 VSM Tilt

The VSM investigated near the Miluveach River crossing are adequately supporting the pipeline. All four of the VSM within the vicinity of the Miluveach River were plumb and within project tolerance based on tilt measurements and project method accuracy. A summary of the 2013 Miluveach River VSM tilt survey results are presented in Table 10.

Table 10 Miluveach River VSM Tilt Measurement Results (2013)

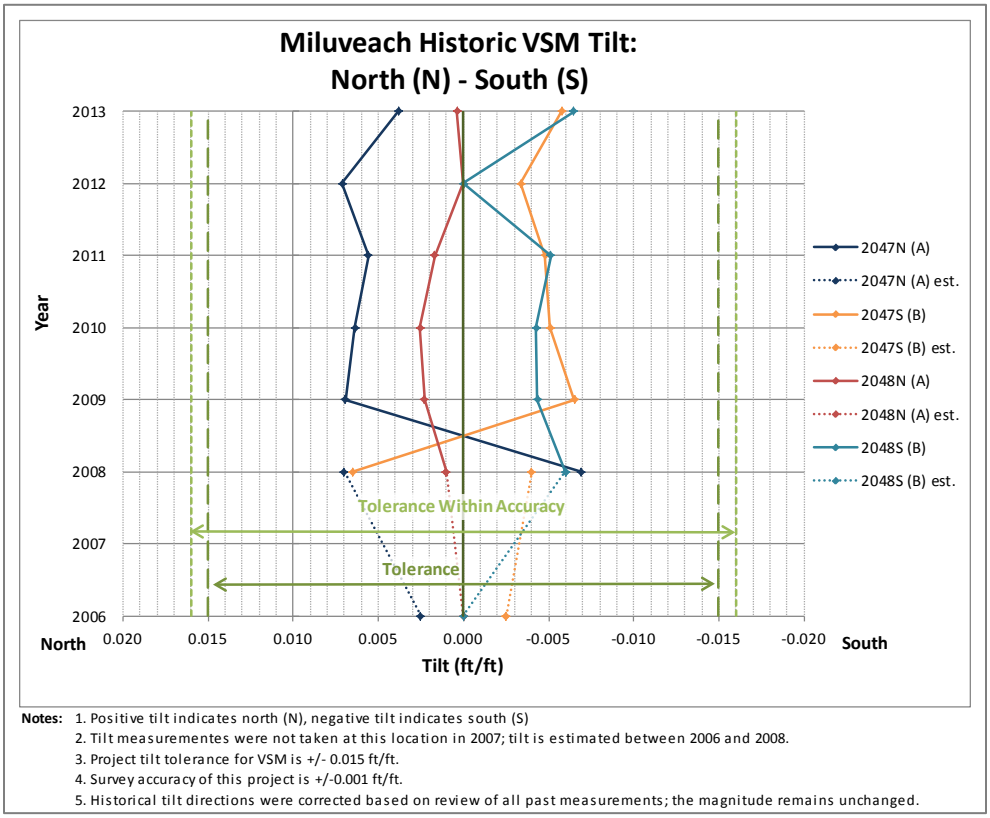
Miluveach VSM Number	Tilt Measurement Orientation (ft/ft)		Comment
	North/South	East/West	
2047N (A)	0.0038 N	0.0026 E	Plumb
2047S (B)	0.0058 S	0.0015 E	Plumb
2048N (A)	<0.0010	0.0026 W	Plumb
2048S (B)	0.0065 S	0.0112 E	Plumb

Table 11 presents the difference in tilt measurements collected during the 2012 (Baker 2012) and 2013 monitoring events.

Table 11 Miluveach River VSM Change in Tilt from 2012 to 2013

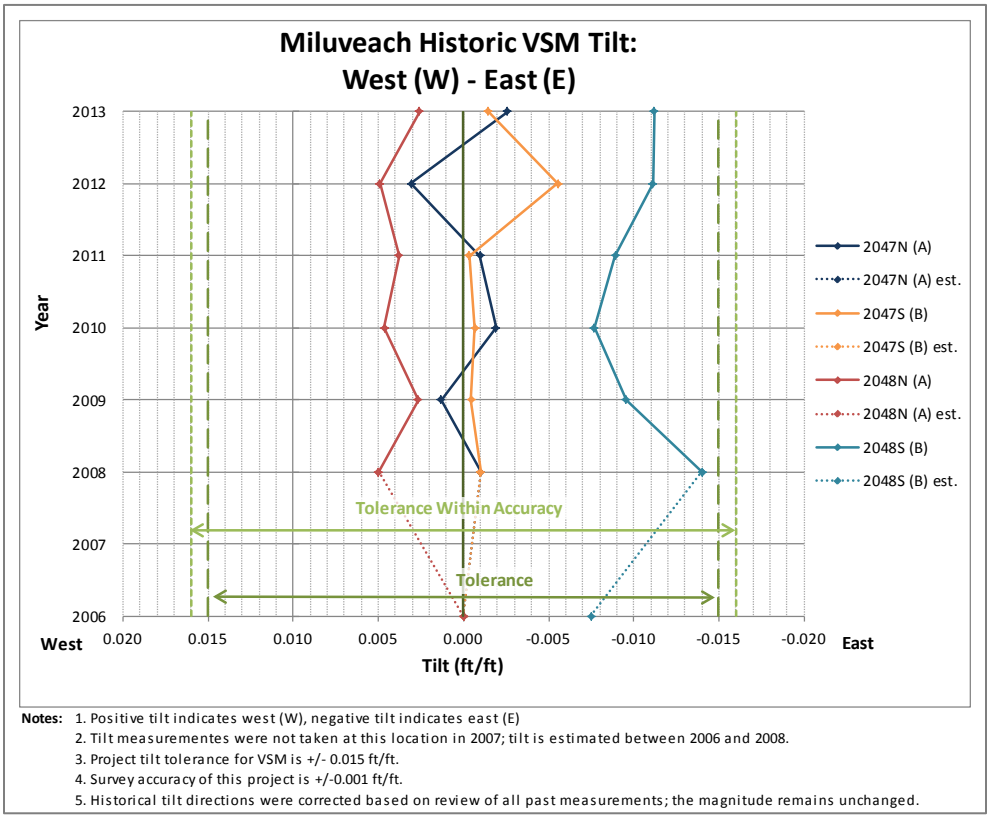
Miluveach VSM Number	Change in Tilt Measurement Orientation (ft/ft)	
	North/South	East/West
2047N (A)	0.0033 S	0.0056 E
2047S (B)	0.0024 S	0.0041 W
2048N (A)	<0.0010	0.0023 E
2048S (B)	0.0065 S	<0.0010

Graph 7 and Graph 8 present the historical VSM change in tilt by orientation between 2006 and 2013 (Baker 2006, 2007, 2008, 2009, 2010, 2011, and 2012).



Notes:
1. Positive tilt indicates north (N), negative tilt indicates south (S)
2. Tilt measurementes were not taken at this location in 2007; tilt is estimated between 2006 and 2008.
3. Project tilt tolerance for VSM is +/- 0.015 ft/ft.
4. Survey accuracy of this project is +/-0.001 ft/ft.
5. Historical tilt directions were corrected based on review of all past measurements; the magnitude remains unchanged.

Graph 7 Miluveach River VSM Historic Change in Tilt, North/South



Notes:
1. Positive tilt indicates west (W), negative tilt indicates east (E)
2. Tilt measurementes were not taken at this location in 2007; tilt is estimated between 2006 and 2008.
3. Project tilt tolerance for VSM is +/- 0.015 ft/ft.
4. Survey accuracy of this project is +/-0.001 ft/ft.
5. Historical tilt directions were corrected based on review of all past measurements; the magnitude remains unchanged.

Graph 8 Miluveach River VSM Historic Change in Tilt, East/West

3.4.3 VSM Scour

Visual observations and measurements were collected to evaluate pier scour for the VSM located within the active Miluveach River channel. No excessive scour was observed at the base of any VSM located within the channel or nearby floodplain. The design scour limit for the main channel of the Miluveach River is 35.1 feet BPMSL (Baker 2003c). No quantitative survey was conducted during this monitoring cycle. The last topographic scour survey was conducted by LCMF in 2004 (Baker 2004). Table 12 contains observed scour conditions during the 2013 field visit.

Table 12 Miluveach River VSM Scour (2013)

VSM	Location Description	Depth of Scour Hole	Notes
2047N (A)	Gravel Bed	0.8 feet below water surface	Scour hole approximately 2.7 feet in diameter. Maximum scour occurring on south side of VSM.
2047S (B)	Grassy Mud – Bank/Channel Interface	No scour hole	Water in area, no flow.
2048N (A)	Gravel Bed	0.5 feet below water surface	Scour hole approximately 3.0 feet in diameter. Maximum scour occurring on east side of VSM.
2048S (B)	Gravel Bed	1.4 feet below water surface	Scour hole approximately 9.0 feet in diameter. Symmetric, ponded depression.

4.0 Conclusions

The HDD West and East gravel pads did not sustain any visible erosion or sloughing as a result of the high breakup floodwater. No significant erosion or scour occurred at any of the other Alpine Pipeline System river crossing sites based on visual observations. The pipelines appeared to be in good, stable condition with no leaks. No ponding, cracks, depressions, or pressure ridges were evident over the pipeline axis as defined by the monitoring criteria. Based on visual observations, measurements, and field survey results, settling or jacking of the VSM was not apparent.

All but one VSM, Kachemach 1715C, are within project tolerances and are considered plumb. For all monitored VSM, tilt has fluctuated annually, generally with consistency of direction. Annual fluctuation of VSM tilt measurements are presented in Graph 1 through Graph 8.

At the HDD East and HDD West crossing sites, natural erosion continues along the banks and was noted to be within design estimates and not negatively impacting the safe operation of the pipeline.

4.1 HDD West Bank

The HDD West bank gravel pad is largely free from erosion. Since the 2012 monitoring event, the HDD West bank crossing eroded at an average rate of 0.03 ft/yr. This rate is less than both the long-term historic (0.36 ft/yr) and design erosion (2.3 ft/yr) rates. The observed erosion of the west bank, as measured at the NPS 14 oil centerline (STA 2+50), represents approximately 9% of the 105-foot design setback over 47% (14 years) of the original 30-year design life.

All VSM at HDD West were found to be within project tilt tolerances.

The LCMF survey shows no single pile cap has experienced a cumulative change of more than 0.035 feet of movement vertically over the span of 9 years.

4.2 HDD East Bank

The HDD East bank gravel pad is largely free from erosion. Since the 2012 monitoring event, the HDD East bank crossing eroded at an average rate of 0.60 ft/yr. This rate is less than both the long-term historic (1.10 ft/yr) and design erosion (2.5 ft/yr) rates. The observed erosion of the east bank at the NPS 14 oil centerline represents 11.9% of the 115-foot design setback over 47% (14 years) of the original 30-year design life. An exposed ice wedge was observed in the bank approximately 10 feet north of the NPS 14 oil pipeline centerline. Melting of the ice wedge will result in additional erosion and sloughing of the bank at this location.

The cumulative subsidence measured at any of the cross sections along the polygon trough was less than 3.6 feet. Maximum cumulative subsidence at cross section E was 3.5 feet. Cross section A saw the maximum incremental change since 2012 with a drop of 1.4 feet. A polygon trough does pass over the seawater casing axis; however, features of the trough do not meet or exceed the allowable physical conditions listed in the 2013 Monitoring Criteria.

All VSM at HDD East were found to be within project tilt tolerances. Pile caps were not monitored at this location.

4.3 Kachemach River

Based on visual inspection, the VSM do not affect the Kachemach River channel at the crossing location. VSM 1715C (abandoned) exceeded the project tilt tolerance in the eastward direction, but not by more than the survey method accuracy. VSM 1715C (abandoned) has consistently fluctuated around the project tilt tolerance for the past six years, as shown in Graph 6. All other VSM were within project tolerances. No significant bank erosion or scour was observed at the Kachemach River crossing.

4.4 Miluveach River

Based on visual inspection, the VSM do not affect the Miluveach River channel at the crossing location. All VSM at the Miluveach River remain within project tolerances. No significant bank erosion or scour was observed at the Miluveach River crossing.

5.0 References

ConocoPhillips Alaska (CPAI). 2010. Foundation Design Specification. SPC-SS-NS-80502. December 2010.

Michael Baker, Jr., Inc. (Baker). 2012. 2012 Alpine Pipeline River Crossings Monitoring Report. Prepared for ConocoPhillips Alaska. 135894-MBJ-RPT-001. August 2013.

—— 2011. Alpine Pipeline River Crossings 2011 Monitoring Report. Prepared for ConocoPhillips Alaska. 123744-MBJ-RPT-001. September 2011.

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—— 2006. Alpine Pipeline River Crossings 2006 Monitoring Report. Prepared for ConocoPhillips Alaska. 108710-MBJ-RPT-001. October 2006.

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—— 2003b. 2003 Alpine Pipeline River Crossing Monitoring. Prepared for ConocoPhillips Alaska. 101376-MBJ-001. July 2003.

—— 2003c. Mechanical Analysis of Aboveground Pipeline & Aboveground River Crossings. Prepared for ARCO Alaska Inc. 23100-MBJ-RP-001. October 1997. Rev 7. 2003.

—— 2002. HDD Transition Zones Civil Surveillance Trip Report – 2001. Prepared for Phillips Alaska Inc. 25114-217-MBJ-001. January 2002.

Appendix A Site Photographs

Photo A.1 HDD West bank pre breakup, looking north; May 27, 2013

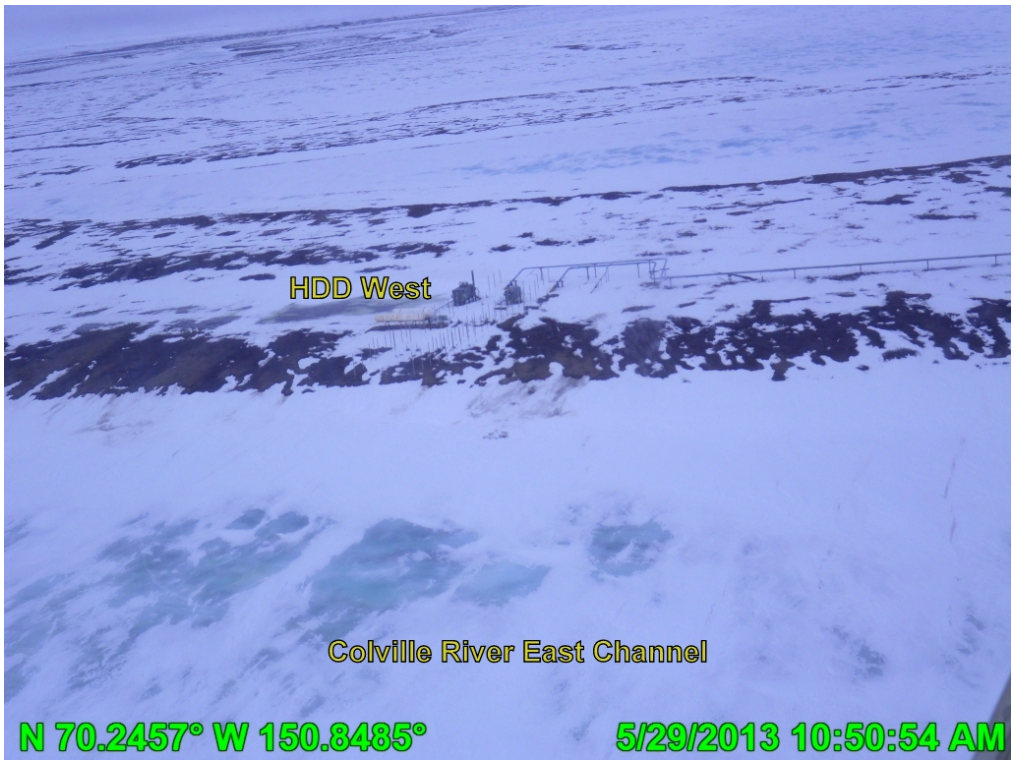


Photo A.2 HDD West bank pre breakup, looking west; May 29, 2013

Photo A.3 HDD West during breakup, looking southwest; June 1, 2013

Photo A.4 HDD West during breakup, looking north; June 4, 2013

Photo A.5 HDD West during breakup, looking southeast; June 4, 2013

Photo A.6 HDD West post breakup, looking south; July 25, 2013

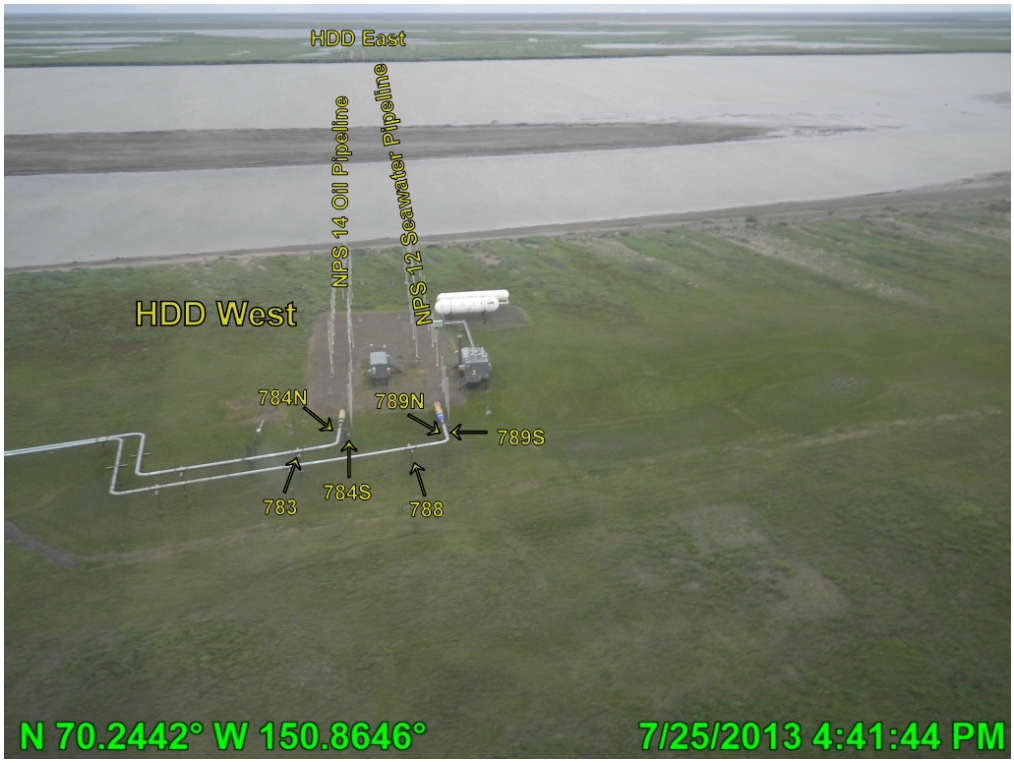


Photo A.7 HDD West post breakup, looking east; July 25, 2013

Photo A.8 HDD West post breakup, looking northwest; July 25, 2013

Photo A.9 HDD West bank, looking south; July 25, 2013

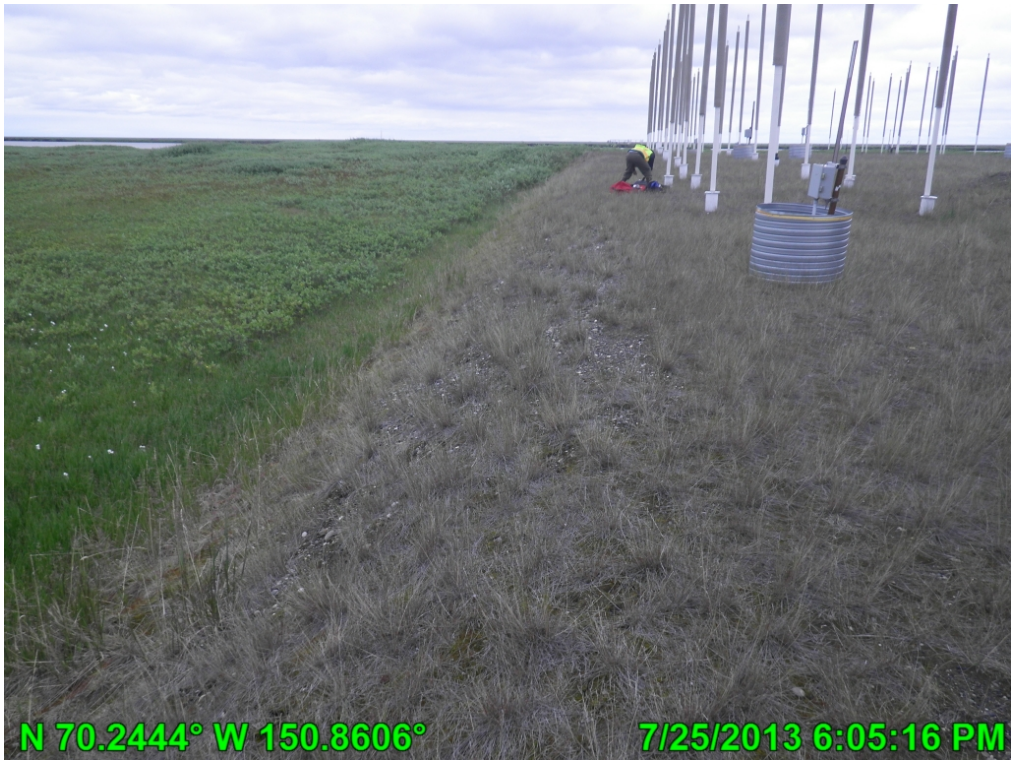


Photo A.10 HDD West north side gravel pad, looking east; July 25, 2013

Photo A.11 HDD West pipeline entrance, looking northwest; July 25, 2013

Photo A.12 HDD West sloughing of gravel pad; July 25, 2013

Photo A.13 HDD West, looking west through thermo-siphons; July 25, 2013

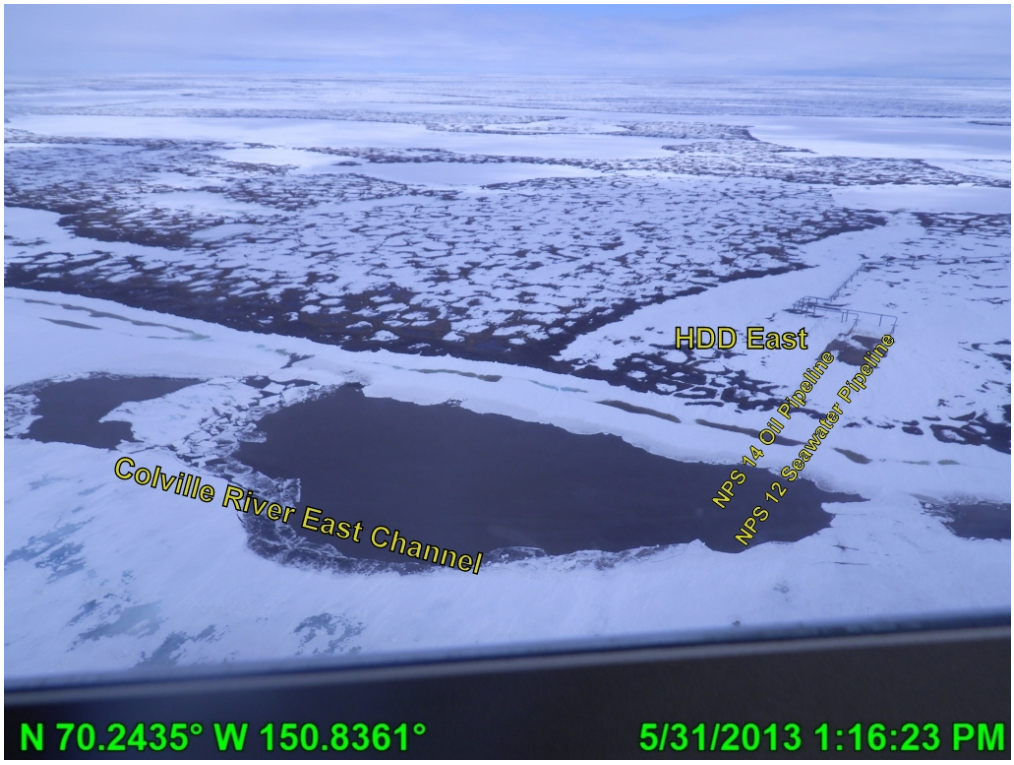


Photo A.14 HDD East pre breakup, looking northeast; May 31, 2013

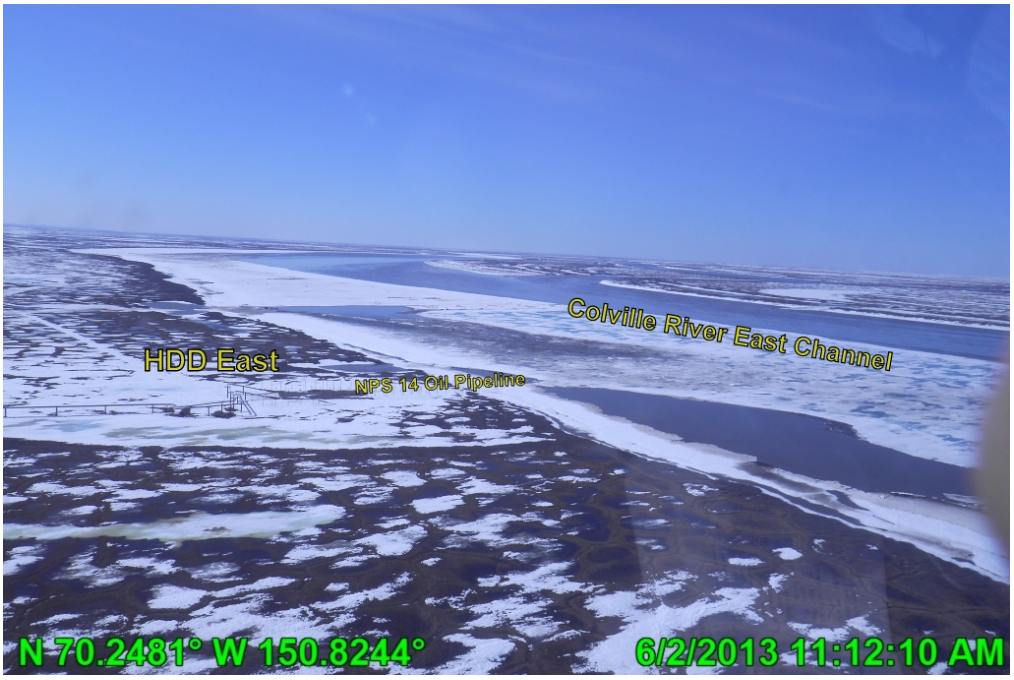


Photo A.15 HDD East bank during breakup, looking southeast; June 2, 2013

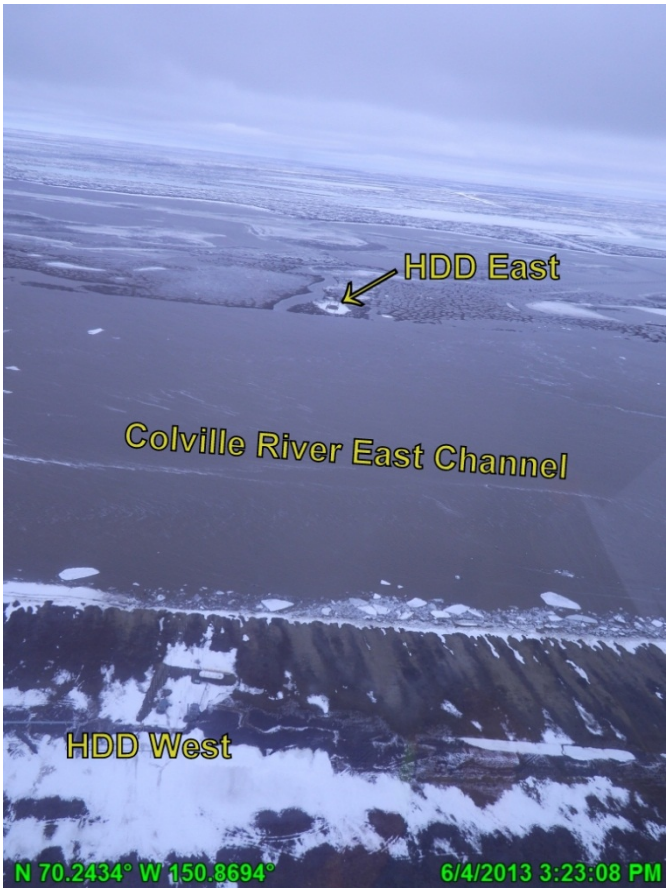


Photo A.16 HDD East during breakup, looking east; June 4, 2013

Photo A.17 HDD East post breakup, looking south; July 26, 2013

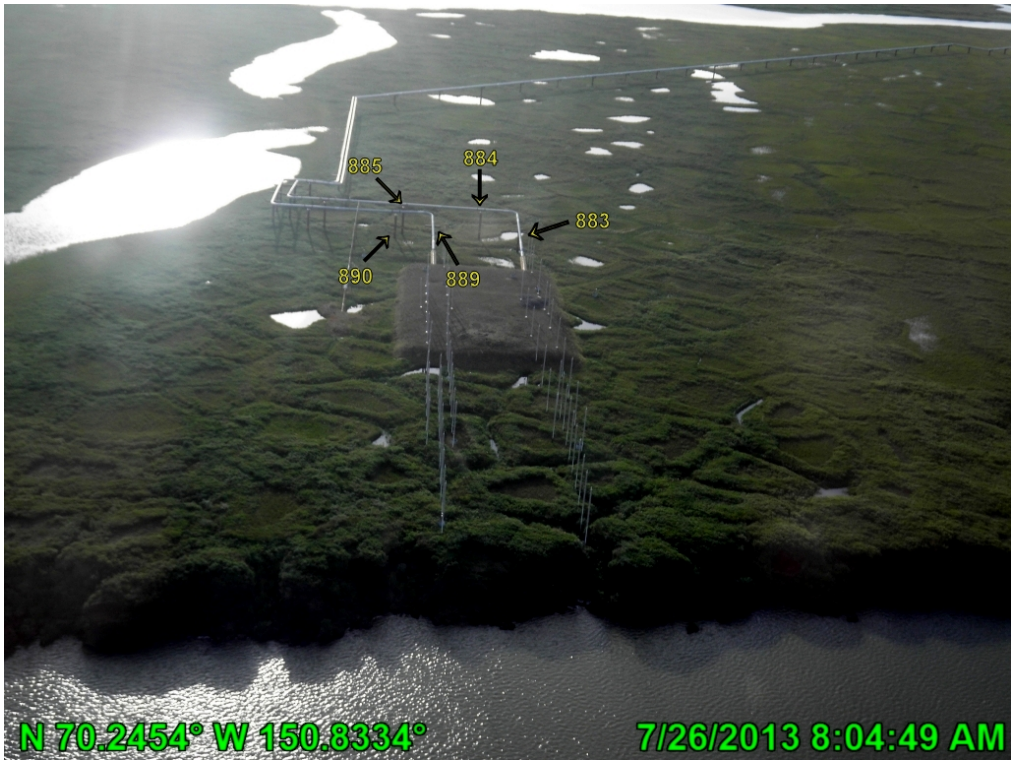


Photo A.18 HDD East post breakup, looking east; July 26, 2013

Photo A.19 HDD East bank, looking south; July 26, 2013

Photo A.20 HDD East bank exposed ice, looking southeast; July 26, 2013

Photo A.21 HDD East north side gravel pad, looking west; July 26, 2013

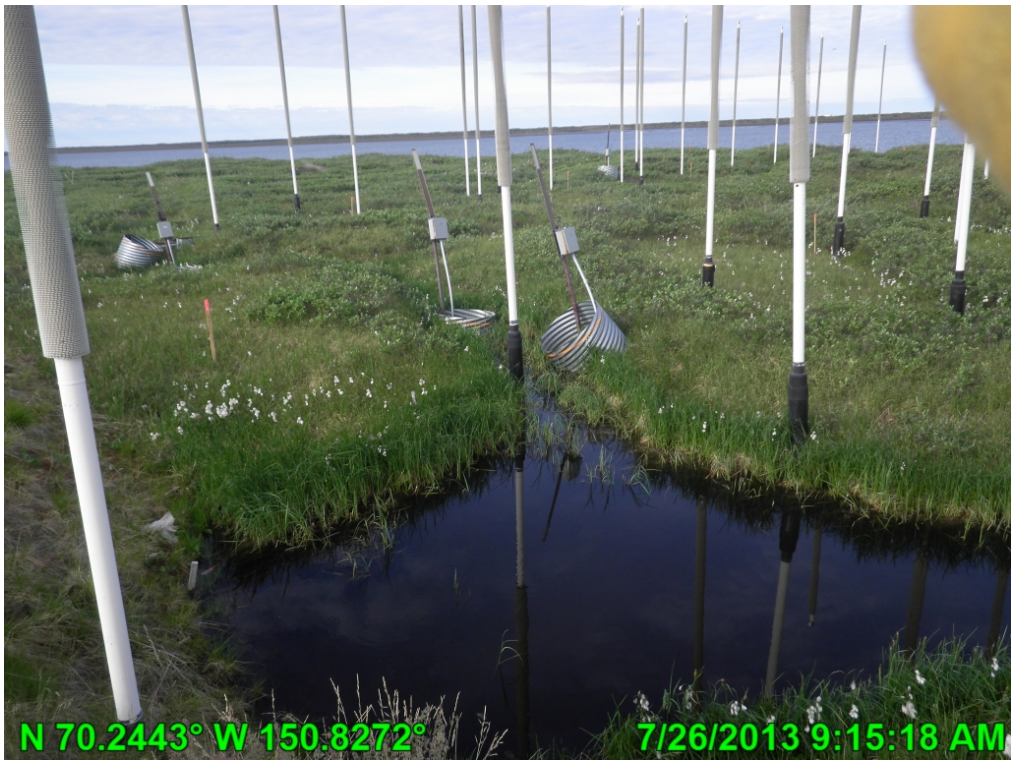


Photo A.22 HDD East polygon trough, looking southeast; July 26, 2013

Photo A.23 HDD East exposed sandbags on bank; July 26, 2013

Photo A.24 HDD East sloughing of gravel pad; July 26, 2013

Photo A.25 HDD East, looking west through thermo-siphons; July 26, 2013

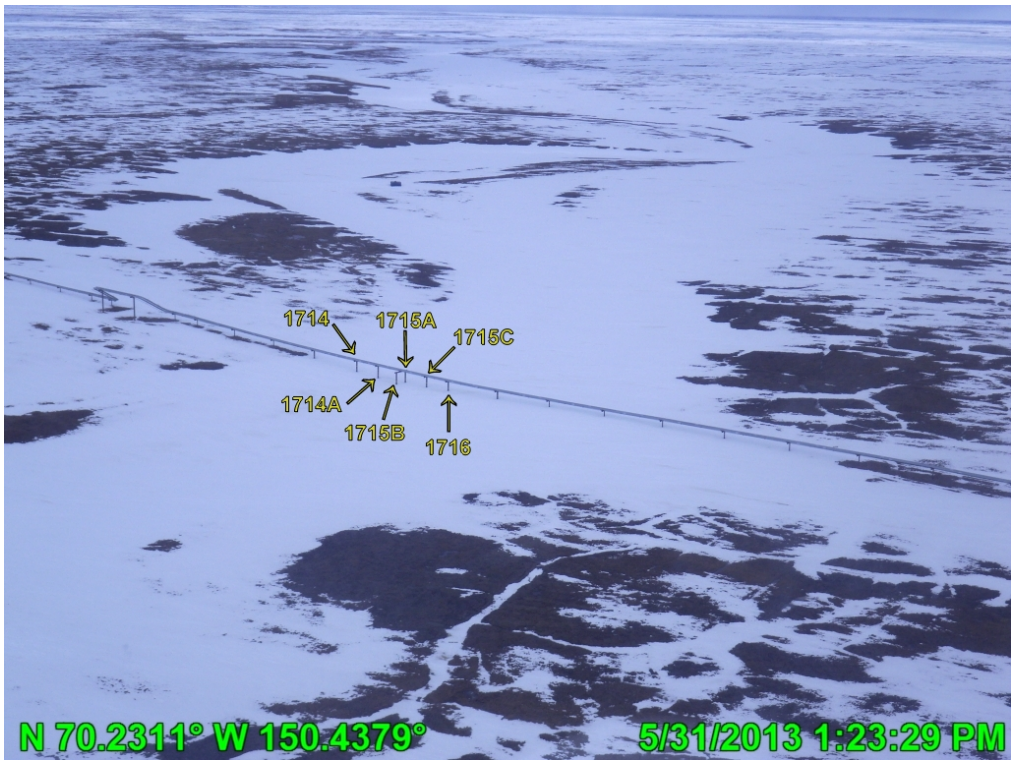


Photo A.26 Kachemach River pre breakup, looking northwest; May 31, 2013

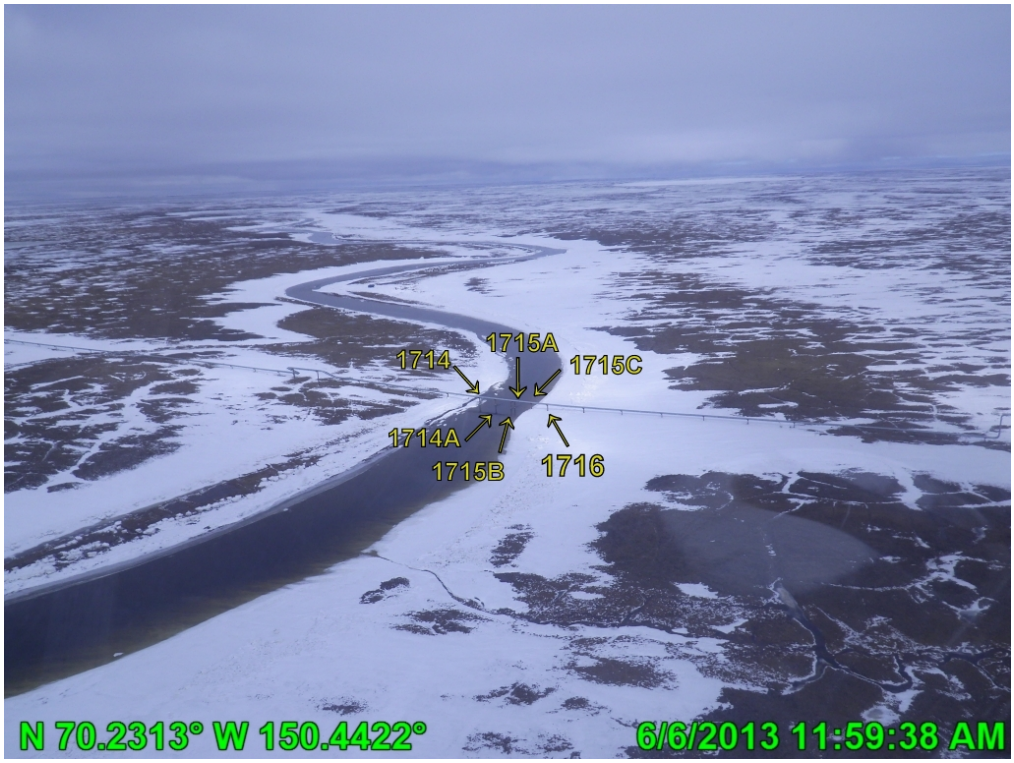


Photo A.27 Kachemach River during breakup, looking northwest; June 6, 2013

Photo A.28 Kachemach River post breakup, looking southwest; July 25, 2013

Photo A.29 Kachemach River post breakup, looking north; July 25, 2013

Photo A.30 Kachemach River post breakup, looking north; July 25, 2013

Photo A.31 Kachemach River post breakup, looking east; July 25, 2013

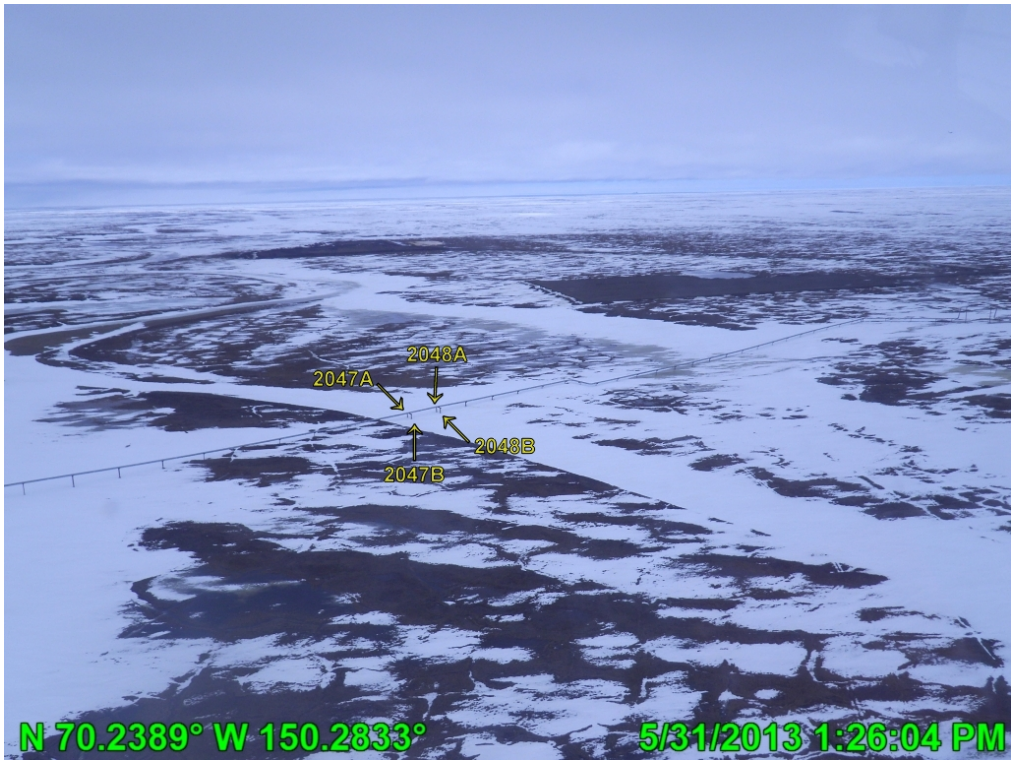


Photo A.32 Miluveach River pre breakup, looking north; May 31, 2013

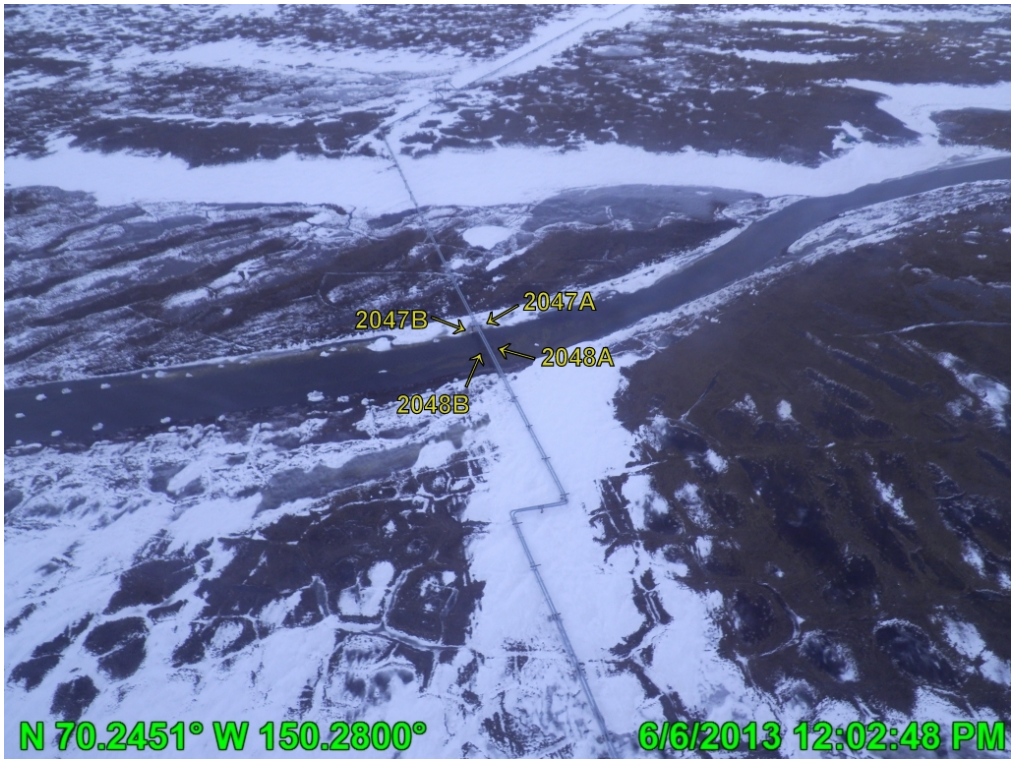


Photo A.33 Miluveach River during breakup, looking west; June 6, 2013

Photo A.34 Miluveach River post breakup, looking south; July 25, 2013

Photo A.35 Miluveach River post breakup, looking east; July 25, 2013

Photo A.36 Miluveach River post breakup, looking northwest; July 25, 2013

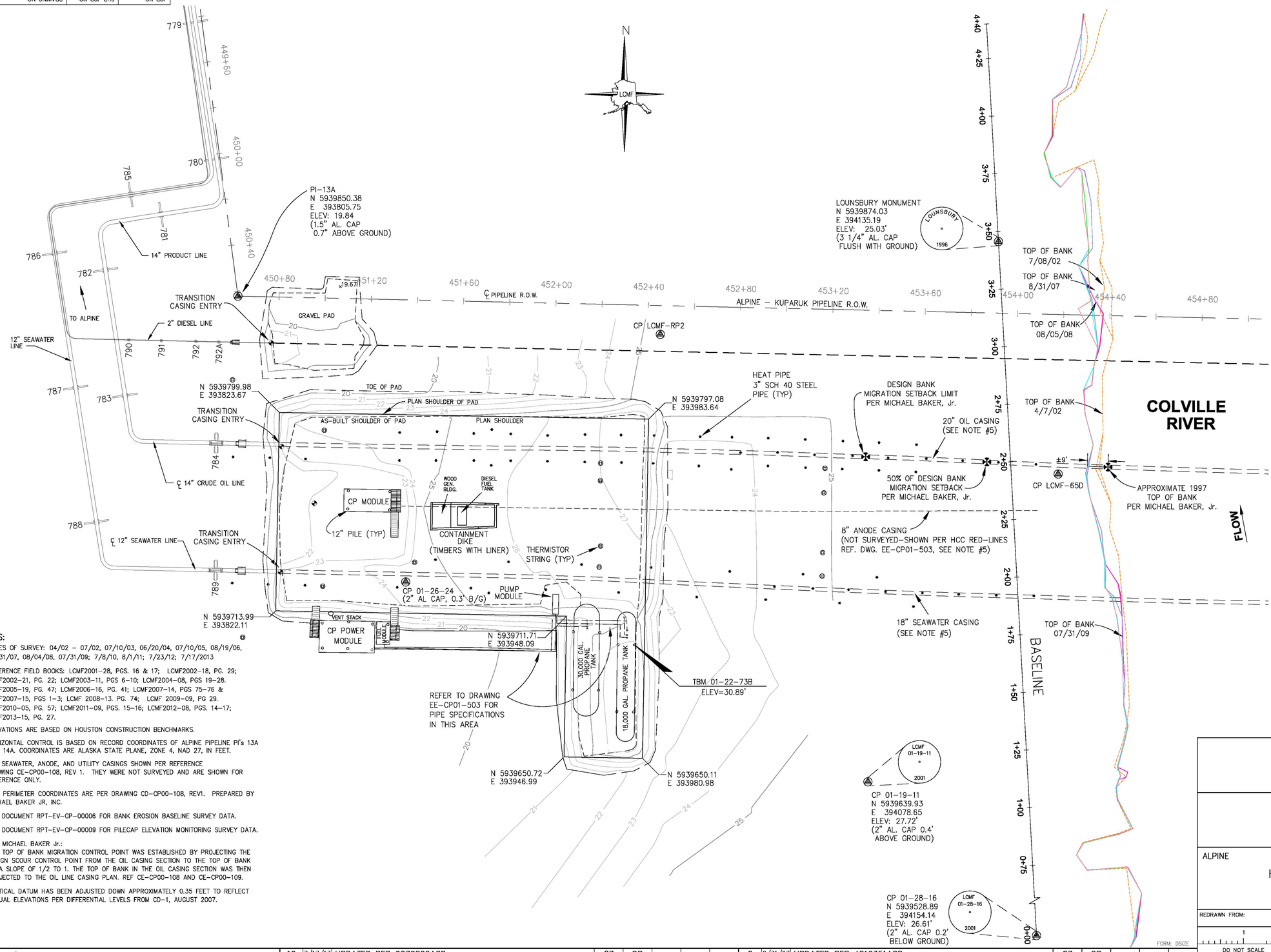
Photo A.37 Miluveach River bank; July 25, 2013

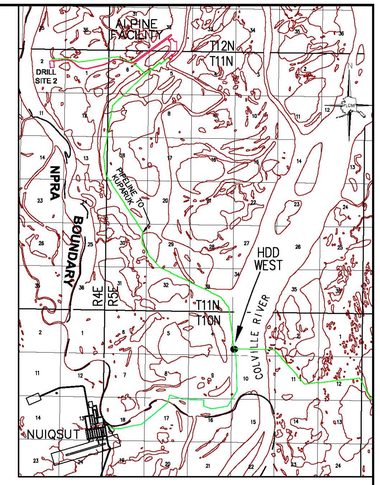
Photo A.38 Miluveach River post breakup, looking south; July 25, 2013

Photo A.39 Miluveach River post breakup, looking southwest; July 25, 2013

Appendix B HDD West Bank Erosion Survey

JOB NO: 02-205 | SUB JOB NO: | DRAWING NO: CE-CP00-143





VICINITY MAP
NO SCALE

LEGEND

- HEAT PIPE
- THERMISTOR STRING
- TRANSITION CASING ENTRY POINT
- 1' CONTOUR LINES
- PILE
- SURVEY CONTROL
- MICHAEL BAKER Jr. MIGRATION POINT
- TOE OF PAD
- SHOULDER OF PAD
- TOP OF BANK 7/8/02
- TOP OF BANK 8/05/08
- TOP OF BANK 7/31/09
- TOP OF BANK 7/08/10
- TOP OF BANK 8/01/11
- TOP OF BANK 7/23/12
- TOP OF BANK 7/17/13

NOTES:

1. DATES OF SURVEY: 04/02 – 07/02, 07/10/03, 06/20/04, 07/10/05, 08/19/06, 08/31/07, 08/04/08, 07/31/09; 7/8/10, 8/1/11; 7/23/12; 7/17/2013
2. REFERENCE FIELD BOOKS: LCMF2001-28, PGS. 16 & 17; LCMF2002-18, PG. 29; LCMF2002-21, PG. 22; LCMF2003-11, PGS 6-10; LCMF2004-08, PGS 19-28. LCMF2005-19, PG. 47; LCMF2006-16, PG. 41; LCMF2007-14, PGS 75-76 & LCMF2007-15, PGS 1-3; LCMF 2008-13. PG. 74; LCMF 2009-09, PG 29. LCMF2010-05, PG. 57; LCMF2011-09, PGS. 15-16; LCMF2012-08, PGS. 14-17; LCMF2013-15, PG. 27.
3. ELEVATIONS ARE BASED ON HOUSTON CONSTRUCTION BENCHMARKS.
4. HORIZONTAL CONTROL IS BASED ON RECORD COORDINATES OF ALPINE PIPELINE PI's 13A AND 14A. COORDINATES ARE ALASKA STATE PLANE, ZONE 4, NAD 27, IN FEET.
5. OIL, SEAWATER, ANODE, AND UTILITY CASINGS SHOWN PER REFERENCE DRAWING CE-CP00-108, REV 1. THEY WERE NOT SURVEYED AND ARE SHOWN FOR REFERENCE ONLY.
6. PAD PERIMETER COORDINATES ARE PER DRAWING CD-CP00-108, REV1. PREPARED BY MICHAEL BAKER JR, INC.
7. SEE DOCUMENT RPT-EV-CP-00006 FOR BANK EROSION BASELINE SURVEY DATA.
8. SEE DOCUMENT RPT-EV-CP-00009 FOR PILECAP ELEVATION MONITORING SURVEY DATA.
9. PER MICHAEL BAKER Jr.:
   THE TOP OF BANK MIGRATION CONTROL POINT WAS ESTABLISHED BY PROJECTING THE DESIGN SCOUR CONTROL POINT FROM THE OIL CASING SECTION TO THE TOP OF BANK AT A SLOPE OF 1/2 TO 1. THE TOP OF BANK IN THE OIL CASING SECTION WAS THEN PROJECTED TO THE OIL LINE CASING PLAN. REF CE-CP00-108 AND CE-CP00-109.
10. VERTICAL DATUM HAS BEEN ADJUSTED DOWN APPROXIMATELY 0.35 FEET TO REFLECT ACTUAL ELEVATIONS PER DIFFERENTIAL LEVELS FROM CD-1, AUGUST 2007.

GRAPHIC SCALE
20 0 10 20 40
(IN FEET)
1 inch = 20 ft.

KUUKPIK LCMF LLC
Alpine Survey Office

ConocoPhillips Alaska, Inc.

ALPINE | MODULE: CP00 | UNIT: CP

HDD BANK EROSION MONITORING
HDD SITE – WEST
ALPINE FACILITY

REDRAWN FROM: | CONSTRUCTION SHEET OF

1 2 3 4 5 6

DO NOT SCALE | ABOVE SCALE FOR REFERENCE ONLY

DATE: 11/5/02	DRAWN: CZ	DESIGN:	ECM NO: 1870227ACS
SCALE: 1"=20'	CHECKED: JZ		CC NO:
JOB NO: 02-205 SUB JOB NO:	APPROVAL: ML		CADD FILE NO. 01-12-05-1WEST
	DRAWING NO: CE-CP00-143		PART: 1 OF 1 REV: 12

REFERENCE DWG NO/SHT NO:

REV	DATE	REVISIONS	BY	CHK	JOB ENGR	PROJ ENGR	CUST APP
12	7/17/13	UPDATED PER 9670829ACS	CZ	DB			
11	7/23/12	UPDATED PER 9101901ACS	AG	DB			
10	8/3/11	UPDATED PER 8292382ACS	AG	DB			
9	7/10/10	UPDATED PER 7224503ACS	CZ	GD			
8	7/31/09	UPDATED PER 6370813ACS	AG	DB			
7	8/7/08	UPDATED PER 5538034ACS	CZ	GD			
6	8/31/07	UPDATED PER 4810351ACS	CZ	DB			
5	8/21/06	UPDATED PER 4116808ACS	AG	GD			
4	7/10/05	UPDATED PER 3391755ACS	CZ	DB			
3	6/25/04	UPDATED PER 2390460ACS	CZ	BD			
2	11/15/03	ISSUED PER 2094387ACS	GD	JZ			
1	11/5/02	ISSUED PER 1870227ACS	CZ	JZ			

FORM: DSIZE

Alpine CP 00
HDD West Site
Streambank Monitor

Baseline Station	Streambank Monitor - Top of Bank Locations											Description
	See Drawing CE-CP00-143 Rev 12 for Survey Baseline Location											
	7/23/2012	7/17/2013	Future	Future	Future	Future	Future	Future	Future	Future	Future	Date
0+00	39.6	39.6										Baseline Offset (In Feet)
	0.2	0.0										Incremental Change
	0.1	0.1										Cumulative Change
0+05	37.8	37.8										Baseline Offset (In Feet)
	0.1	0.0										Incremental Change
	-1.5	-1.5										Cumulative Change
0+10	38.8	38.8										Baseline Offset (In Feet)
	0.1	0.0										Incremental Change
	-0.5	-0.5										Cumulative Change
0+20	40.1	40.1										Baseline Offset (In Feet)
	0.4	0.0										Incremental Change
	-5.6	-5.6										Cumulative Change
0+25	37.9	37.9										Baseline Offset (In Feet)
	0.3	0.0										Incremental Change
	-3.7	-3.7										Cumulative Change
0+30	38.1	38.1										Baseline Offset (In Feet)
	0.2	0.0										Incremental Change
	0.3	0.3										Cumulative Change
0+40	41.8	41.8										Baseline Offset (In Feet)
	0.2	0.0										Incremental Change
	-0.1	-0.1										Cumulative Change

Alpine CP 00
HDD West Site
Streambank Monitor

Baseline Station	Streambank Monitor - Top of Bank Locations											Description
	See Drawing CE-CP00-143 Rev 12 for Survey Baseline Location											
	7/23/2012	7/17/2013	Future	Future	Future	Future	Future	Future	Future	Future	Future	Date
0+50	44.3	44.3										Baseline Offset (In Feet)
	0.3	0.0										Incremental Change
	2.3	2.3										Cumulative Change
0+60	46.3	46.3										Baseline Offset (In Feet)
	0.0	0.0										Incremental Change
	4.9	4.9										Cumulative Change
0+70	42.1	42.1										Baseline Offset (In Feet)
	0.0	0.0										Incremental Change
	1.4	1.4										Cumulative Change
0+75	21.4	21.4										Baseline Offset (In Feet)
	0.0	0.0										Incremental Change
	0.0	0.0										Cumulative Change
0+80	20.3	20.3										Baseline Offset (In Feet)
	0.0	0.0										Incremental Change
	0.1	0.1										Cumulative Change
0+85	30.7	30.7										Baseline Offset (In Feet)
	0.4	0.0										Incremental Change
	1.7	1.7										Cumulative Change
0+90	43.6	43.6										Baseline Offset (In Feet)
	0.2	0.0										Incremental Change
	0.8	0.8										Cumulative Change

Alpine CP 00
HDD West Site
Streambank Monitor

Baseline Station	Streambank Monitor - Top of Bank Locations											Description
	See Drawing CE-CP00-143 Rev 12 for Survey Baseline Location											
	7/23/2012	7/17/2013	Future	Future	Future	Future	Future	Future	Future	Future	Future	Date
1+00	39.1	39.1										Baseline Offset (In Feet)
	0.1	0.0										Incremental Change
	0.4	0.4										Cumulative Change
1+05	38.2	38.2										Baseline Offset (In Feet)
	0.2	0.0										Incremental Change
	0.3	0.3										Cumulative Change
1+10	39.4	39.4										Baseline Offset (In Feet)
	0.2	0.0										Incremental Change
	-2.0	-2.0										Cumulative Change
1+15	39.5	39.5										Baseline Offset (In Feet)
	0.2	0.0										Incremental Change
	1.3	1.3										Cumulative Change
1+20	40.7	40.7										Baseline Offset (In Feet)
	0.2	0.0										Incremental Change
	1.3	1.3										Cumulative Change
1+25	42.3	42.3										Baseline Offset (In Feet)
	0.2	0.0										Incremental Change
	0.9	0.9										Cumulative Change
1+30	43.8	43.8										Baseline Offset (In Feet)
	0.2	0.0										Incremental Change
	0.7	0.7										Cumulative Change

Alpine CP 00
HDD West Site
Streambank Monitor

Baseline Station	Streambank Monitor - Top of Bank Locations											Description
	See Drawing CE-CP00-143 Rev 12 for Survey Baseline Location											
	7/23/2012	7/17/2013	Future	Future	Future	Future	Future	Future	Future	Future	Future	Date
1+35	44.3	44.3										Baseline Offset (In Feet)
	0.2	0.0										Incremental Change
	0.1	0.1										Cumulative Change
1+40	43.7	43.7										Baseline Offset (In Feet)
	0.2	0.0										Incremental Change
	-1.6	-1.6										Cumulative Change
1+45	43.4	43.4										Baseline Offset (In Feet)
	0.1	0.0										Incremental Change
	-2.3	-2.3										Cumulative Change
1+50	43.5	43.5										Baseline Offset (In Feet)
	0.1	0.0										Incremental Change
	-2.2	-2.2										Cumulative Change
1+60	43.6	43.6										Baseline Offset (In Feet)
	-0.1	0.0										Incremental Change
	-2.2	-2.2										Cumulative Change
1+65	43.5	43.5										Baseline Offset (In Feet)
	-0.1	0.0										Incremental Change
	-2.4	-2.4										Cumulative Change
1+75	42.8	42.8										Baseline Offset (In Feet)
	0.1	0.0										Incremental Change
	-3.1	-3.1										Cumulative Change

Alpine CP 00
HDD West Site
Streambank Monitor

Baseline Station	Streambank Monitor - Top of Bank Locations See Drawing CE-CP00-143 Rev 12 for Survey Baseline Location											Description
	7/23/2012	7/17/2013	Future	Future	Future	Future	Future	Future	Future	Future	Future	Date
1+90	40.0	40.0										Baseline Offset (In Feet)
	-0.1	0.0										Incremental Change
	-5.1	-5.1										Cumulative Change
1+95	38.2	38.2										Baseline Offset (In Feet)
	0.3	0.0										Incremental Change
	-6.7	-6.7										Cumulative Change
2+00	38.6	38.6										Baseline Offset (In Feet)
	0.3	0.0										Incremental Change
	-6.1	-6.1										Cumulative Change
2+05	38.6	38.6										Baseline Offset (In Feet)
	0.3	0.0										Incremental Change
	-5.9	-5.9										Cumulative Change
2+10	37.9	37.9										Baseline Offset (In Feet)
	0.3	0.0										Incremental Change
	-5.8	-5.8										Cumulative Change
2+20	36.3	36.3										Baseline Offset (In Feet)
	0.2	0.0										Incremental Change
	-5.2	-5.2										Cumulative Change
2+25	35.2	35.2										Baseline Offset (In Feet)
	0.1	0.0										Incremental Change
	-6.8	-6.8										Cumulative Change

Alpine CP 00
HDD West Site
Streambank Monitor

Baseline Station	Streambank Monitor - Top of Bank Locations											Description
	See Drawing CE-CP00-143 Rev 12 for Survey Baseline Location											
	7/23/2012	7/17/2013	Future	Future	Future	Future	Future	Future	Future	Future	Future	Date
2+30	34.2	34.2										Baseline Offset (In Feet)
	0.0	0.0										Incremental Change
	-8.2	-8.2										Cumulative Change
2+35	33.3	33.3										Baseline Offset (In Feet)
	0.2	0.0										Incremental Change
	-7.7	-7.7										Cumulative Change
2+45	33.5	33.5										Baseline Offset (In Feet)
	0.2	0.0										Incremental Change
	-4.8	-4.8										Cumulative Change
2+50	34.8	34.8										Baseline Offset (In Feet)
	0.1	0.0										Incremental Change
	-4.3	-4.3										Cumulative Change
2+55	36.0	36.0										Baseline Offset (In Feet)
	0.0	0.0										Incremental Change
	-3.8	-3.8										Cumulative Change
2+60	35.3	35.3										Baseline Offset (In Feet)
	0.1	0.0										Incremental Change
	-5.4	-5.4										Cumulative Change
2+65	34.2	34.2										Baseline Offset (In Feet)
	0.1	0.0										Incremental Change
	-6.7	-6.7										Cumulative Change

Alpine CP 00
HDD West Site
Streambank Monitor

Baseline Station	Streambank Monitor - Top of Bank Locations											Description
	See Drawing CE-CP00-143 Rev 12 for Survey Baseline Location											
	7/23/2012	7/17/2013	Future	Future	Future	Future	Future	Future	Future	Future	Future	Date
2+70	33.4	33.4										Baseline Offset (In Feet)
	0.1	0.0										Incremental Change
	-7.8	-7.8										Cumulative Change
2+75	33.3	33.3										Baseline Offset (In Feet)
	0.0	0.0										Incremental Change
	-8.0	-8.0										Cumulative Change
2+80	34.5	34.5										Baseline Offset (In Feet)
	0.9	0.0										Incremental Change
	-7.1	-7.1										Cumulative Change
2+85	37.7	37.7										Baseline Offset (In Feet)
	1.6	0.0										Incremental Change
	-4.0	-4.0										Cumulative Change
2+90	38.5	38.5										Baseline Offset (In Feet)
	-0.1	0.0										Incremental Change
	-5.0	-5.0										Cumulative Change
3+00	39.3	39.3										Baseline Offset (In Feet)
	-1.0	0.0										Incremental Change
	-7.7	-7.7										Cumulative Change
3+10	35.0	35.0										Baseline Offset (In Feet)
	-4.2	0.0										Incremental Change
	-12.1	-12.1										Cumulative Change

Alpine CP 00
HDD West Site
Streambank Monitor

Baseline Station	Streambank Monitor - Top of Bank Locations											Description
	See Drawing CE-CP00-143 Rev 12 for Survey Baseline Location											
	7/23/2012	7/17/2013	Future	Future	Future	Future	Future	Future	Future	Future	Future	Date
3+15	33.5	33.5										Baseline Offset (In Feet)
	-5.4	0.0										Incremental Change
	-13.9	-13.9										Cumulative Change
3+25	38.3	38.3										Baseline Offset (In Feet)
	1.6	0.0										Incremental Change
	-9.0	-9.0										Cumulative Change
3+30	38.2	38.2										Baseline Offset (In Feet)
	3.1	0.0										Incremental Change
	-7.1	-7.1										Cumulative Change
3+35	38.2	38.2										Baseline Offset (In Feet)
	2.6	0.0										Incremental Change
	-5.3	-5.3										Cumulative Change
3+40	38.9	38.9										Baseline Offset (In Feet)
	0.1	0.0										Incremental Change
	-5.9	-5.9										Cumulative Change
3+45	38.8	38.7										Baseline Offset (In Feet)
	0.0	-0.1										Incremental Change
	-6.4	-6.6										Cumulative Change
3+50	38.7	38.2										Baseline Offset (In Feet)
	0.0	-0.5										Incremental Change
	-6.2	-6.7										Cumulative Change

Alpine CP 00
HDD West Site
Streambank Monitor

Baseline Station	Streambank Monitor - Top of Bank Locations											Description
	See Drawing CE-CP00-143 Rev 12 for Survey Baseline Location											
	7/23/2012	7/17/2013	Future	Future	Future	Future	Future	Future	Future	Future	Future	Date
3+60	38.4	37.3										Baseline Offset (In Feet)
	0.0	-1.1										Incremental Change
	-5.7	-6.8										Cumulative Change
3+70	26.0	26.0										Baseline Offset (In Feet)
	-0.2	0.0										Incremental Change
	-18.8	-18.8										Cumulative Change
3+75	23.6	23.6										Baseline Offset (In Feet)
	-0.2	0.0										Incremental Change
	0.1	0.1										Cumulative Change
3+85	23.0	23.0										Baseline Offset (In Feet)
	0.0	0.0										Incremental Change
	-0.1	-0.1										Cumulative Change
4+00	26.4	26.4										Baseline Offset (In Feet)
	0.1	0.0										Incremental Change
	-1.9	-1.9										Cumulative Change
4+10	32.1	32.1										Baseline Offset (In Feet)
	-0.1	0.0										Incremental Change
	-5.3	-5.3										Cumulative Change
4+25	38.0	38.0										Baseline Offset (In Feet)
	-0.1	0.0										Incremental Change
	-7.9	-7.9										Cumulative Change

Alpine CP 00
HDD West Site
Streambank Monitor

Baseline Station	Streambank Monitor - Top of Bank Locations											Description
	See Drawing CE-CP00-143 Rev 12 for Survey Baseline Location											
	7/23/2012	7/17/2013	Future	Future	Future	Future	Future	Future	Future	Future	Future	Date
4+30	39.5	39.5										Baseline Offset (In Feet)
	-0.1	0.0										Incremental Change
	-7.8	-7.8										Cumulative Change
4+35	40.9	40.9										Baseline Offset (In Feet)
	-0.1	0.0										Incremental Change
	-7.9	-7.9										Cumulative Change
4+40	41.6	41.6										Baseline Offset (In Feet)
	0.0	0.0										Incremental Change
	-9.3	-9.3										Cumulative Change

*****Note:** Survey completed on 4/7/02 was used for baseline data to compute Incremental/Cumulative Change. Negative numbers indicate erosion.

Alpine CP 00
HDD West Site
Pilecap Monitor

Pile Cap Designation	Pile Cap Monitor - Bottom of Pile Cap Locations									Description
	7/17/2013	Future	Future	Future	Future	Future	Future	Future	Future	Date
W-01 NE Cor	26.420									Bottom of Pile Cap (In Feet)
	0.000									Incremental Change
	0.031									Cumulative Change
W-02 NE Cor	26.422									Bottom of Pile Cap (In Feet)
	0.002									Incremental Change
	0.031									Cumulative Change
W-03 NE Cor	26.422									Bottom of Pile Cap (In Feet)
	0.002									Incremental Change
	0.031									Cumulative Change
W-04 NE Cor	26.419									Bottom of Pile Cap (In Feet)
	0.004									Incremental Change
	0.030									Cumulative Change
W-05 NE Cor	26.413									Bottom of Pile Cap (In Feet)
	0.003									Incremental Change
	0.030									Cumulative Change
W-06 NE Cor	26.422									Bottom of Pile Cap (In Feet)
	0.006									Incremental Change
	0.027									Cumulative Change
W-07 NE Cor	26.426									Bottom of Pile Cap (In Feet)
	0.003									Incremental Change
	0.029									Cumulative Change

Alpine CP 00
HDD West Site
Pilecap Monitor

Pile Cap Designation	Pile Cap Monitor - Bottom of Pile Cap Locations									Description
	7/17/2013	Future	Future	Future	Future	Future	Future	Future	Future	Date
W-08 NE Cor	26.430									Bottom of Pile Cap (In Feet)
	0.008									Incremental Change
	0.027									Cumulative Change
W-09 NE Cor	31.303									Bottom of Pile Cap (In Feet)
	0.006									Incremental Change
	0.012									Cumulative Change
W-10 NE Cor	31.266									Bottom of Pile Cap (In Feet)
	0.003									Incremental Change
	0.000									Cumulative Change
W-11 NE Cor	31.310									Bottom of Pile Cap (In Feet)
	0.008									Incremental Change
	0.011									Cumulative Change
W-12 NE Cor	31.302									Bottom of Pile Cap (In Feet)
	0.004									Incremental Change
	0.001									Cumulative Change
W-13 NE Cor	27.409									Bottom of Pile Cap (In Feet)
	0.001									Incremental Change
	0.032									Cumulative Change
W-14 NE Cor	27.463									Bottom of Pile Cap (In Feet)
	0.001									Incremental Change
	0.035									Cumulative Change

Alpine CP 00
HDD West Site
Pilecap Monitor

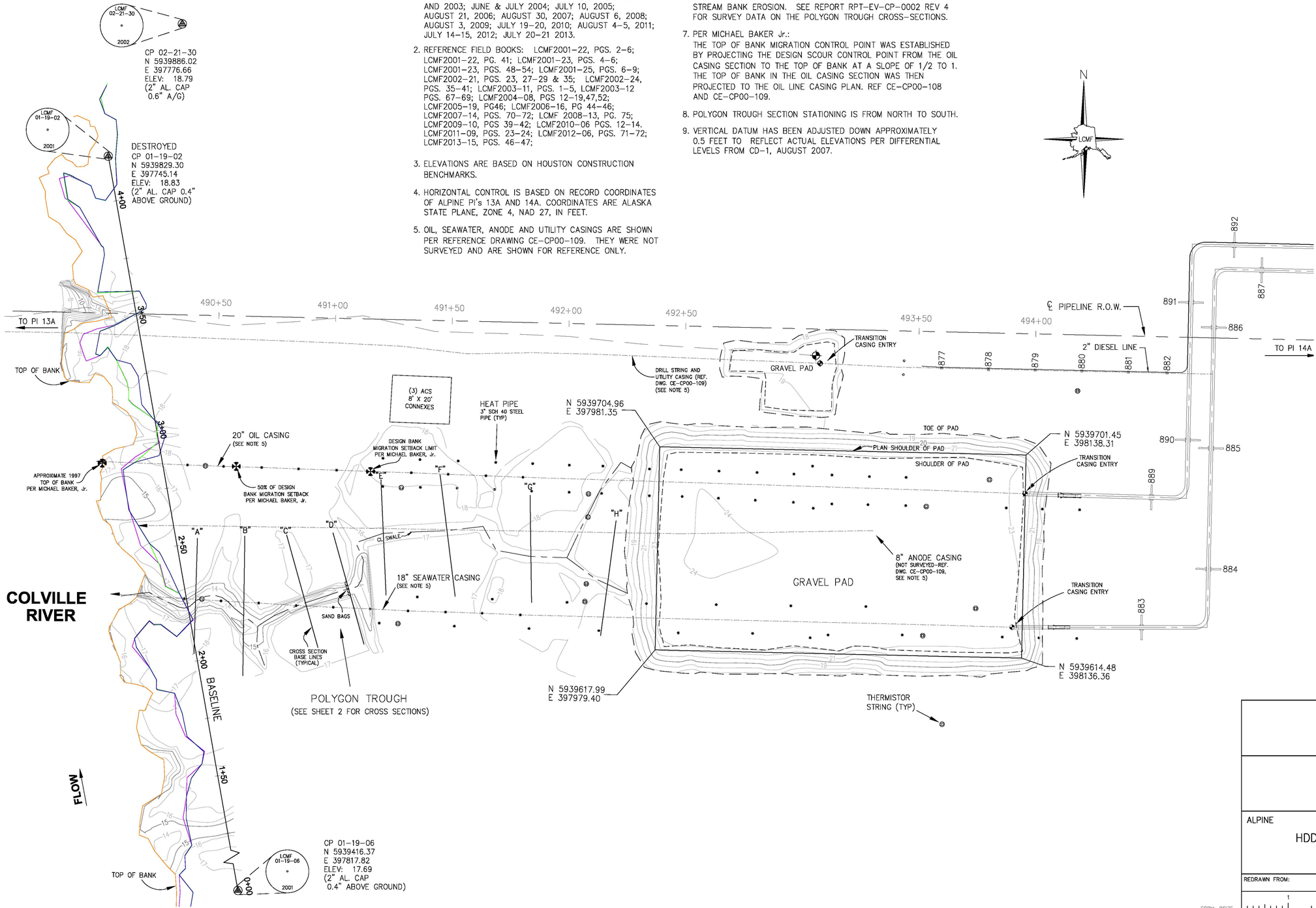
Pile Cap Designation	Pile Cap Monitor - Bottom of Pile Cap Locations									Description
	7/17/2013	Future	Future	Future	Future	Future	Future	Future	Future	Date
W-15 NE Cor	27.448									Bottom of Pile Cap (In Feet)
	0.006									Incremental Change
	0.035									Cumulative Change
W-16 NE Cor	27.421									Bottom of Pile Cap (In Feet)
	0.000									Incremental Change
	0.032									Cumulative Change
W-17 NE Cor	28.957									Bottom of Pile Cap (In Feet)
	0.014									Incremental Change
	0.017									Cumulative Change
W-18 NE Cor	28.982									Bottom of Pile Cap (In Feet)
	0.010									Incremental Change
	0.017									Cumulative Change
W-19 NE Cor	28.970									Bottom of Pile Cap (In Feet)
	0.018									Incremental Change
	0.011									Cumulative Change
W-20 NE Cor	28.973									Bottom of Pile Cap (In Feet)
	0.009									Incremental Change
	0.009									Cumulative Change
Note: Survey completed on 6/20/2004 was used to compute Incremental/Cumulative Change. Positive numbers indicate subsidence.										
All Pile Caps are 0.083' Thick. Add Cap thickness to shown elevations for Top of Pile Cap Elevations										

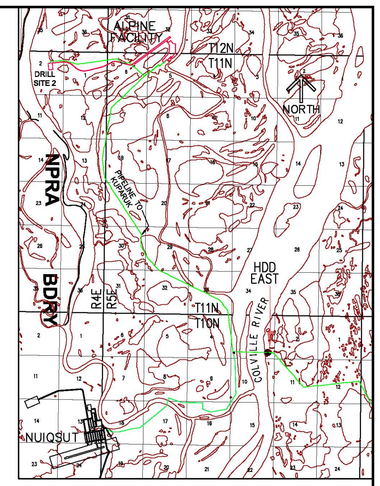
Appendix C HDD East Bank Erosion Survey

JOB NO: 02-205 | SUB JOB NO: | DRAWING NO: CE-CP00-134

NOTES:

1. DATES OF SURVEY: JULY & SEPTEMBER, 2001, 2002 AND 2003; JUNE & JULY 2004; JULY 10, 2005; AUGUST 21, 2006; AUGUST 30, 2007; AUGUST 6, 2008; AUGUST 3, 2009; JULY 19–20, 2010; AUGUST 4–5, 2011; JULY 14–15, 2012; JULY 20–21 2013.
2. REFERENCE FIELD BOOKS: LCMF2001–22, PGS. 2–6; LCMF2001–22, PG. 41; LCMF2001–23, PGS. 4–6; LCMF2001–23, PGS. 48–54; LCMF2001–25, PGS. 6–9; LCMF2002–21, PGS. 23, 27–29 & 35; LCMF2002–24, PGS. 35–41; LCMF2003–11, PGS. 1–5, LCMF2003–12 PGS. 67–69; LCMF2004–08, PGS 12–19,47,52; LCMF2005–19, PG46; LCMF2006–16, PG 44–46; LCMF2007–14, PGS. 70–72; LCMF 2008–13, PG. 75; LCMF2009–10, PGS 39–42; LCMF2010–06 PGS. 12–14. LCMF2011–09, PGS. 23–24; LCMF2012–06, PGS. 71–72; LCMF2013–15, PGS. 46–47;
3. ELEVATIONS ARE BASED ON HOUSTON CONSTRUCTION BENCHMARKS.
4. HORIZONTAL CONTROL IS BASED ON RECORD COORDINATES OF ALPINE PI's 13A AND 14A. COORDINATES ARE ALASKA STATE PLANE, ZONE 4, NAD 27, IN FEET.
5. OIL, SEAWATER, ANODE AND UTILITY CASINGS ARE SHOWN PER REFERENCE DRAWING CE–CP00–109. THEY WERE NOT SURVEYED AND ARE SHOWN FOR REFERENCE ONLY.
6. SEE REPORT RPT–EV–CP–0001 REV 5 FOR SURVEY DATA ON THE STREAM BANK EROSION. SEE REPORT RPT–EV–CP–0002 REV 4 FOR SURVEY DATA ON THE POLYGON TROUGH CROSS–SECTIONS.
7. PER MICHAEL BAKER Jr.: THE TOP OF BANK MIGRATION CONTROL POINT WAS ESTABLISHED BY PROJECTING THE DESIGN SCOUR CONTROL POINT FROM THE OIL CASING SECTION TO THE TOP OF BANK AT A SLOPE OF 1/2 TO 1. THE TOP OF BANK IN THE OIL CASING SECTION WAS THEN PROJECTED TO THE OIL LINE CASING PLAN. REF CE–CP00–108 AND CE–CP00–109.
8. POLYGON TROUGH SECTION STATIONING IS FROM NORTH TO SOUTH.
9. VERTICAL DATUM HAS BEEN ADJUSTED DOWN APPROXIMATELY 0.5 FEET TO REFLECT ACTUAL ELEVATIONS PER DIFFERENTIAL LEVELS FROM CD–1, AUGUST 2007.





VICINITY MAP
NO SCALE

LEGEND

- HEAT PIPE
- THERMISTOR STRING
- TRANSITION CASING ENTRY POINT
- 1' CONTOUR LINES
- PILE
- SURVEY CONTROL
- MICHAEL BAKER Jr. MIGRATION POINT
- TOP OF BANK 9/8/01
- TOP OF BANK 7/20/10
- TOP OF BANK 8/4/11
- TOP OF BANK 7/14/12
- TOP OF BANK 7/21/13

GRAPHIC SCALE
20 0 10 20 40
(IN FEET)
1 inch = 20 ft.

KUUKPIK LCMF LLC
615 E. 82nd Ave. · Anchorage, Alaska 99518 · (907) 273-1830 · (907) 670-4736
Alpine Survey Office

ConocoPhillips Alaska, Inc.

ALPINE | MODULE: CP00 | UNIT: CP

HDD BANK EROSION TOPO/MONITORING
HDD SITE – EAST
ALPINE FACILITY

REDRAWN FROM: | CONSTRUCTION SHEET OF

1 2 3 4 5 6
DO NOT SCALE | ABOVE SCALE FOR REFERENCE ONLY

DATE: 7/31/01	DRAWN: GD/CZ	DESIGN:	ECM NO: A01007ACS
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	APPROVAL: CD		CADD FILE NO. 01–12–05–1EAST
JOB NO: 02–205	SUB JOB NO:	DRAWING NO: CE–CP00–134	PART: 1 OF 2 / REV: 12

REFERENCE DWG NO/SHT NO:
CE–CP00–109
PD–CP00–130 SHEET 1

REV	DATE	REVISIONS	BY	CHK	JOB ENGR	PROJ ENGR	CUST APP
11	7/15/12	UPDATED PER 9101901ACS	AG	GD			
10	8/5/11	UPDATED PER 8292382ACS	AG	DB			
9	7/21/10	ISSUED PER 7224503ACS	AG	DB			
8	8/5/09	UPDATED PER 6370813ACS	AG	GD			
7	8/6/08	UPDATED PER 5538034ACS	CZ	GD			
6	8/30/07	UPDATED PER 4810351ACS	CZ	DB			
5	8/25/06	UPDATED PER 4116808ACS	AG	DB			
4	7/11/05	UPDATED PER 3391755ACS	CZ	GD			
3	6/27/04	ISSUED PER 2390460ACS	CZ	BD			
2	12/31/03	ISSUED PER 2094387ACS–ADDED SHEET 2 AND 2003 DATA	GD/CZ	JZ			C/K
1	11/1/02	ISSUED PER 1870227ACS	CZ	JZ			TM
12	7/21/13	UPDATED PER 9670829ACS	CZ	DB			

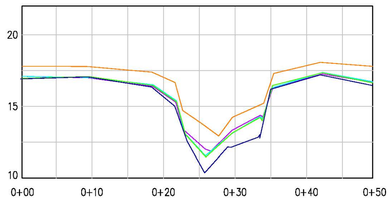
FORM: DSIZE

JOB NO:	SUB JOB NO:	DRAWING NO:
02-205		CE-CP00-134

CROSS SECTIONS, POLYGON TROUGH

HORIZONTAL SCALE = 1"=10' VERTICAL SCALE = 1"=5'

"A"



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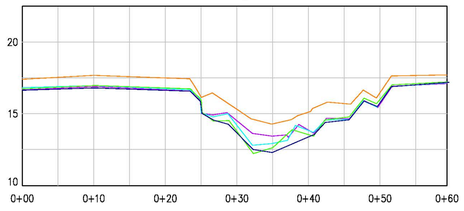

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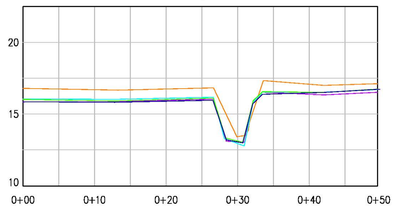

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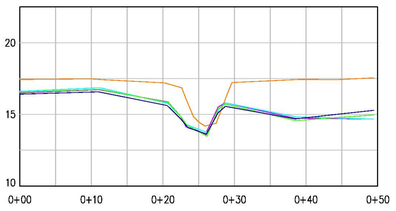

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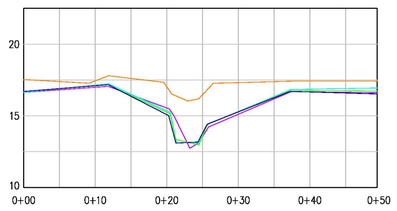

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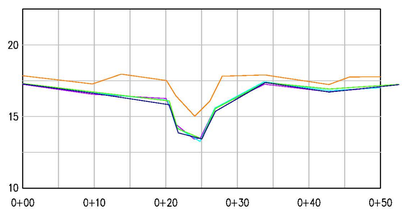

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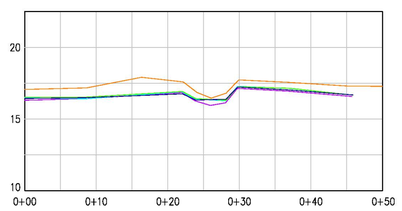

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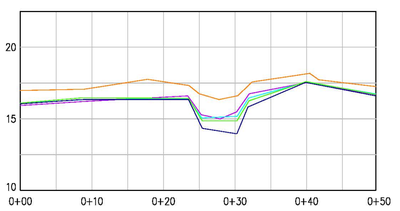
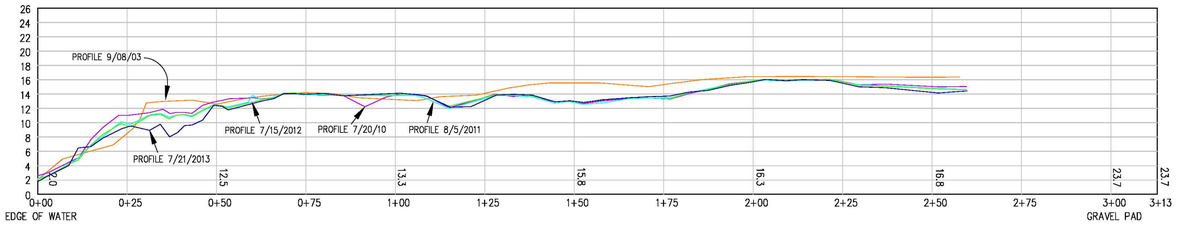


LEGEND

- CROSS SECTION 9/8/03
- CROSS SECTION 7/20/10
- CROSS SECTION 8/4/11
- CROSS SECTION 7/14/12
- CROSS SECTION 7/21/13

CENTERLINE PROFILE, POLYGON TROUGH

HORIZONTAL SCALE = 1"=20' VERTICAL SCALE = 1"=10'



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HDD BANK EROSION TOPO/MONITORING
HDD SITE – EAST
ALPINE FACILITY

REDRAWN FROM: | CONSTRUCTION SHEET OF

DO NOT SCALE — ABOVE SCALE FOR REFERENCE ONLY

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SCALE: 1"=20'	CHECKED: JZ		CC NO:
	APPROVAL: COLEGROVE/KANADY		CADD FILE NO. 01-12-05-1EAST
JOB NO: 02-205	SUB JOB NO:	DRAWING NO: CE-CP00-134	PART: 2 OF 2 / REV: 11

REFERENCE DWG NO/SHT NO:
CE-CP00-109
PD-CP00-130 SHEET 1

REV	DATE	REVISIONS	BY	CHK	JOB ENGR	PROJ ENGR	CUST APP
11	7/21/13	UPDATED PER 9670829ACS	CZ	DB			
10	7/16/12	UPDATED PER 9101901ACS	AG	GD			
9	8/5/11	UPDATED PER 8292382ACS	AG	DB			
8	7/21/10	ISSUED PER 7224503ACS	AG	DB			
7	8/6/09	UPDATED PER 6370813ACS	AG	GD			
6	8/6/08	UPDATED PER 5538034ACS	CZ	GD			
5	8/30/07	UPDATED PER 4810351ACS	CZ	DB			
4	8/25/06	UPDATED PER 4116808ACS	AG	DB			
3	7/28/05	UPDATED PER 3391755ACS	CZ	GD			
2	7/9/04	ISSUED PER 2390460ACS	AG	GD			
1	12/31/03	ISSUED PER 2094387ACS	GD	JZ			C/K

FORM: DSIZE

Alpine CP 00
HDD East Site
Streambank Monitor

Baseline Station	Streambank Monitor - Top of Bank Locations										Description
	See Drawing CE-CP00-134 Rev 12 for Survey Baseline Stations										
	6/19/2004	7/10/2005	8/21/2006	8/30/2007	8/6/2008	8/3/2009	7/20/2010	8/4/2011	7/14/2012	7/21/2013	Date
0+10	-25.3	-25.3	-25.3	-25.3	-25.3	-25.6	-25.6	-23.9	-24.0	-24.0	Baseline Offset (In Feet)
	0.0	0.0	0.0	0.0	0.0	0.3	0.0	-1.7	0.1	0.0	Incremental Change
	0.0	0.0	0.0	0.0	0.0	0.3	0.3	-1.4	-1.4	-1.4	Cumulative Change
0+20	-30.9	-30.9	-30.9	-30.9	-30.9	-31.0	-29.1	-29.2	-29.2	-29.2	Baseline Offset (In Feet)
	0.0	0.0	0.0	0.0	0.0	0.1	-1.9	0.1	0.0	0.0	Incremental Change
	-1.2	-1.2	-1.2	-1.2	-1.2	-1.1	-3.0	-2.9	-2.9	-2.9	Cumulative Change
0+25	-38.2	-37.0	-37.0	-37.0	-37.0	-34.1	-29.9	-29.2	-29.2	-29.2	Baseline Offset (In Feet)
	0.0	-1.2	0.0	0.0	0.0	-2.9	-4.2	-0.7	0.0	0.0	Incremental Change
	0.0	-1.2	-1.2	-1.2	-1.2	-4.1	-8.3	-9.0	-9.1	-9.1	Cumulative Change
0+30	-41.1	-36.9	-36.9	-36.9	-36.9	-34.3	-31.4	-29.3	-29.3	-29.3	Baseline Offset (In Feet)
	0.0	-4.2	0.0	0.0	0.0	-2.6	-2.9	-2.2	0.0	0.0	Incremental Change
	0.0	-4.2	-4.2	-4.2	-4.2	-6.8	-9.7	-11.8	-11.8	-11.8	Cumulative Change
0+40	-37.7	-36.5	-35.1	-35.1	-35.1	-34.8	-34.3	-29.4	-29.4	-29.4	Baseline Offset (In Feet)
	0.0	-1.2	-1.4	0.0	0.0	-0.3	-0.5	-4.9	0.0	0.0	Incremental Change
	0.0	-1.2	-2.6	-2.6	-2.6	-2.9	-3.4	-8.3	-8.2	-8.2	Cumulative Change
0+50	-30.3	-30.3	-30.3	-30.3	-30.3	-30.3	-30.3	-30.1	-30.1	-30.1	Baseline Offset (In Feet)
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	0.0	0.0	Incremental Change
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	-0.2	-0.2	Cumulative Change
0+60	-27.5	-27.5	-27.5	-27.5	-27.5	-27.5	-27.5	-25.3	-25.4	-25.4	Baseline Offset (In Feet)
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-2.2	0.0	0.0	Incremental Change
	-0.5	-0.5	-0.5	-0.5	-0.5	-0.4	-0.5	-2.7	-2.6	-2.6	Cumulative Change

Alpine CP 00
HDD East Site
Streambank Monitor

Baseline Station	Streambank Monitor - Top of Bank Locations See Drawing CE-CP00-134 Rev 12 for Survey Baseline Stations										Description
	6/19/2004	7/10/2005	8/21/2006	8/30/2007	8/6/2008	8/3/2009	7/20/2010	8/4/2011	7/14/2012	7/21/2013	Date
0+65	-23.9	-23.4	-23.4	-23.4	-23.4	-23.4	-23.4	-19.9	-19.9	-19.9	Baseline Offset (In Feet)
	0.0	-0.5	0.0	0.0	0.0	0.0	0.0	-3.5	0.0	0.0	Incremental Change
	-16.0	-16.4	-16.4	-16.4	-16.4	-16.4	-16.4	-19.9	-19.9	-19.9	Cumulative Change
0+70	-20.0	-16.2	-16.2	-16.2	-16.2	-16.2	-16.2	-16.2	-16.2	-16.2	Baseline Offset (In Feet)
	0.0	-3.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Incremental Change
	-12.4	-16.2	-16.2	-16.2	-16.2	-16.2	-16.2	-16.2	-16.2	-16.2	Cumulative Change
0+75	-21.0	-18.0	-18.0	-18.0	-18.0	-18.0	-18.0	-17.8	-17.8	-17.8	Baseline Offset (In Feet)
	-0.1	-3.0	0.1	0.0	0.0	0.0	0.0	-0.2	0.0	0.0	Incremental Change
	-6.1	-9.1	-9.1	-9.1	-9.1	-9.1	-9.1	-9.3	-9.3	-9.3	Cumulative Change
0+80	-22.4	-22.4	-22.4	-22.4	-22.4	-22.4	-22.1	-21.7	-21.6	-21.6	Baseline Offset (In Feet)
	0.0	0.0	0.0	0.0	0.0	0.0	-0.3	-0.4	-0.1	0.0	Incremental Change
	-4.0	-4.0	-4.0	-4.0	-4.0	-4.0	-4.3	-4.8	-4.8	-4.8	Cumulative Change
0+90	-27.8	-27.8	-27.2	-27.2	-27.2	-27.2	-26.5	-23.1	-23.1	-23.1	Baseline Offset (In Feet)
	-1.5	0.0	-0.6	0.0	0.0	0.0	-0.7	-3.4	0.0	0.0	Incremental Change
	-1.5	-1.5	-2.0	-2.0	-2.0	-2.0	-2.7	-6.1	-6.1	-6.1	Cumulative Change
1+00	-26.7	-26.7	-26.7	-26.7	-26.7	-26.7	-25.5	-20.0	-20.0	-20.0	Baseline Offset (In Feet)
	0.0	0.0	0.0	0.0	0.0	0.0	-1.2	-5.5	0.0	0.0	Incremental Change
	0.0	0.0	0.0	0.0	0.0	0.0	-1.2	-6.7	-6.7	-6.7	Cumulative Change
1+10	-23.9	-23.9	-23.9	-23.9	-23.9	-23.9	-23.7	-23.0	-23.0	-23.0	Baseline Offset (In Feet)
	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	-0.7	0.0	0.0	Incremental Change
	-1.7	-1.7	-1.7	-1.7	-1.7	-1.7	-1.9	-2.6	-2.6	-2.6	Cumulative Change

Alpine CP 00
HDD East Site
Streambank Monitor

Baseline Station	Streambank Monitor - Top of Bank Locations See Drawing CE-CP00-134 Rev 12 for Survey Baseline Stations										Description
	6/19/2004	7/10/2005	8/21/2006	8/30/2007	8/6/2008	8/3/2009	7/20/2010	8/4/2011	7/14/2012	7/21/2013	Date
1+15	-20.8	-20.2	-20.2	-20.2	-20.2	-20.2	-20.2	-20.3	-20.3	-20.3	Baseline Offset (In Feet)
	0.0	-0.7	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	Incremental Change
	-6.8	-7.4	-7.4	-7.4	-7.4	-7.4	-7.4	-7.3	-7.3	-7.3	Cumulative Change
1+20	-21.4	-18.2	-18.2	-18.2	-18.2	-18.8	-18.5	-18.6	-18.6	-18.6	Baseline Offset (In Feet)
	0.0	-3.2	0.0	0.0	0.0	0.6	-0.3	0.1	0.0	0.0	Incremental Change
	-14.1	-17.3	-17.3	-17.3	-17.3	-16.7	-17.0	-16.9	-16.9	-16.9	Cumulative Change
1+25	-18.1	-16.4	-16.4	-16.4	-16.4	-16.4	-16.4	-16.1	-16.2	-16.2	Baseline Offset (In Feet)
	0.0	-1.7	0.0	0.0	0.0	0.0	0.0	-0.3	0.0	0.0	Incremental Change
	-20.6	-22.3	-22.3	-22.3	-22.3	-22.3	-22.3	-22.6	-22.6	-22.6	Cumulative Change
1+30	-17.3	-17.0	-17.0	-17.0	-17.0	-17.0	-17.0	-16.3	-16.3	-16.3	Baseline Offset (In Feet)
	0.0	-0.3	0.0	0.0	0.0	0.0	0.0	-0.7	0.0	0.0	Incremental Change
	-20.5	-20.8	-20.8	-20.8	-20.8	-20.8	-20.8	-21.5	-21.5	-21.5	Cumulative Change
1+40	-17.1	-15.8	-15.8	-15.8	-15.8	-16.0	-16.0	-15.4	-15.4	-15.4	Baseline Offset (In Feet)
	0.0	-1.3	0.0	0.0	0.0	0.2	0.0	-0.6	0.0	0.0	Incremental Change
	-16.7	-18.1	-18.0	-18.0	-18.0	-17.8	-17.8	-18.5	-18.5	-18.5	Cumulative Change
1+45	-16.1	-14.3	-14.3	-14.3	-14.3	-14.3	-14.3	-14.1	-14.1	-14.1	Baseline Offset (In Feet)
	0.0	-1.8	0.0	0.0	0.0	0.0	0.0	-0.3	0.0	0.0	Incremental Change
	-12.1	-13.9	-13.9	-13.9	-13.9	-13.9	-13.9	-14.1	-14.1	-14.1	Cumulative Change
1+50	-13.8	-13.4	-13.4	-13.4	-13.4	-13.4	-13.4	-11.7	-11.7	-11.7	Baseline Offset (In Feet)
	0.0	-0.4	0.0	0.0	0.0	0.0	0.0	-1.7	0.0	0.0	Incremental Change
	-9.9	-10.3	-10.3	-10.3	-10.3	-10.3	-10.3	-12.0	-12.0	-12.0	Cumulative Change

Alpine CP 00
HDD East Site
Streambank Monitor

Baseline Station	Streambank Monitor - Top of Bank Locations										Description
	See Drawing CE-CP00-134 Rev 12 for Survey Baseline Stations										
	6/19/2004	7/10/2005	8/21/2006	8/30/2007	8/6/2008	8/3/2009	7/20/2010	8/4/2011	7/14/2012	7/21/2013	Date
1+55	-11.5	-7.1	-7.1	-7.1	-7.1	-7.5	-7.5	-7.0	-7.0	-7.0	Baseline Offset (In Feet)
	0.0	-4.4	0.0	0.0	0.0	0.4	0.0	-0.5	0.0	0.0	Incremental Change
	-10.7	-15.1	-15.1	-15.1	-15.1	-14.7	-14.7	-15.2	-15.2	-15.2	Cumulative Change
1+60	-9.0	-4.2	-4.2	-4.2	-4.2	-4.2	-4.2	-4.4	-4.5	-4.5	Baseline Offset (In Feet)
	0.0	-4.8	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	Incremental Change
	-12.6	-17.4	-17.4	-17.4	-17.4	-17.4	-17.4	-17.2	-17.2	-17.2	Cumulative Change
1+65	-9.7	-6.9	-6.9	-6.9	-6.9	-6.9	-6.9	-7.0	-7.0	-7.0	Baseline Offset (In Feet)
	-1.7	-2.8	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.0	Incremental Change
	-16.6	-19.4	-19.3	-19.3	-19.3	-19.3	-19.3	-19.2	-19.3	-19.3	Cumulative Change
1+70	-13.0	-10.8	-10.8	-10.8	-10.8	-10.8	-10.8	-10.0	-10.0	-10.0	Baseline Offset (In Feet)
	-2.7	-2.2	0.0	0.0	0.0	0.0	0.0	-0.8	0.0	0.0	Incremental Change
	-17.1	-19.3	-19.3	-19.3	-19.3	-19.3	-19.3	-20.0	-20.0	-20.0	Cumulative Change
1+75	-14.4	-12.0	-12.0	-12.0	-12.0	-12.0	-12.0	-10.2	-10.2	-10.2	Baseline Offset (In Feet)
	-1.7	-2.5	0.0	0.0	0.0	0.0	0.0	-1.8	0.0	0.0	Incremental Change
	-16.3	-18.7	-18.7	-18.7	-18.7	-18.7	-18.7	-20.5	-20.5	-20.5	Cumulative Change
1+80	-13.9	-12.8	-12.8	-12.8	-12.8	-12.8	-12.8	-10.5	-10.5	-10.5	Baseline Offset (In Feet)
	0.0	-1.1	0.0	0.0	0.0	0.0	0.0	-2.3	0.0	0.0	Incremental Change
	-16.4	-17.4	-17.4	-17.4	-17.4	-17.4	-17.4	-19.7	-19.8	-19.8	Cumulative Change
1+85	-12.7	-12.3	-12.3	-12.3	-12.3	-12.3	-12.3	-11.4	-11.4	-11.4	Baseline Offset (In Feet)
	0.0	-0.4	0.0	0.0	0.0	0.0	0.0	-0.9	0.0	0.0	Incremental Change
	-11.8	-12.2	-12.2	-12.2	-12.2	-12.2	-12.2	-13.1	-13.1	-13.1	Cumulative Change

Alpine CP 00
HDD East Site
Streambank Monitor

Baseline Station	Streambank Monitor - Top of Bank Locations See Drawing CE-CP00-134 Rev 12 for Survey Baseline Stations										Description
	6/19/2004	7/10/2005	8/21/2006	8/30/2007	8/6/2008	8/3/2009	7/20/2010	8/4/2011	7/14/2012	7/21/2013	Date
1+90	-16.9	-16.9	-16.9	-16.9	-16.9	-16.9	-16.6	-16.7	-16.8	-16.8	Baseline Offset (In Feet)
	0.0	0.0	0.0	0.0	0.0	0.0	-0.3	0.1	0.1	0.0	Incremental Change
	4.1	4.1	4.1	4.1	4.1	4.1	3.8	3.9	4.0	4.0	Cumulative Change
1+95	-27.7	-27.7	-26.3	-26.3	-26.3	-26.3	-18.7	-18.7	-18.7	-18.7	Baseline Offset (In Feet)
	0.0	0.0	-1.4	0.0	0.0	0.0	-7.6	0.0	0.0	0.0	Incremental Change
	0.1	0.1	-1.3	-1.3	-1.3	-1.3	-8.9	-9.0	-9.0	-9.0	Cumulative Change
2+00	-27.8	-27.8	-26.4	-26.4	-26.4	-26.4	-20.4	-20.4	-20.4	-20.4	Baseline Offset (In Feet)
	0.0	0.0	-1.4	0.0	0.0	0.0	-6.0	0.0	0.0	0.0	Incremental Change
	-5.9	-5.9	-7.3	-7.3	-7.3	-7.3	-13.3	-13.3	-13.3	-13.3	Cumulative Change
2+05	-27.3	-27.3	-26.8	-26.8	-26.8	-26.8	-23.1	-22.5	-22.4	-22.4	Baseline Offset (In Feet)
	0.0	0.0	-0.5	0.0	0.0	0.0	-3.7	-0.6	0.0	0.0	Incremental Change
	-5.6	-5.6	-6.1	-6.1	-6.1	-6.1	-9.8	-10.5	-10.5	-10.5	Cumulative Change
2+10	-26.0	-26.0	-26.0	-26.0	-26.0	-26.5	-26.0	-24.6	-24.6	-24.6	Baseline Offset (In Feet)
	0.0	0.0	0.0	0.0	0.0	0.5	-0.5	-1.4	0.0	0.0	Incremental Change
	-7.7	-7.7	-7.7	-7.7	-7.7	-7.2	-7.7	-9.2	-9.2	-9.2	Cumulative Change
2+15	-23.2	-23.2	-23.2	-23.2	-23.7	-23.7	-23.7	-23.8	-23.8	-23.8	Baseline Offset (In Feet)
	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.1	0.0	0.0	Incremental Change
	-11.7	-11.7	-11.7	-11.7	-11.2	-11.2	-11.2	-11.1	-11.1	-11.1	Cumulative Change
2+20	-20.4	-17.4	-17.3	-17.3	-17.3	-18.2	-18.2	-17.5	-17.4	-17.4	Baseline Offset (In Feet)
	-0.6	-3.0	0.0	0.0	0.0	0.9	0.0	-0.7	0.0	0.0	Incremental Change
	-14.0	-17.0	-17.1	-17.1	-17.1	-16.2	-16.2	-16.9	-17.0	-17.0	Cumulative Change

Alpine CP 00
HDD East Site
Streambank Monitor

Baseline Station	Streambank Monitor - Top of Bank Locations										Description
	See Drawing CE-CP00-134 Rev 12 for Survey Baseline Stations										
	6/19/2004	7/10/2005	8/21/2006	8/30/2007	8/6/2008	8/3/2009	7/20/2010	8/4/2011	7/14/2012	7/21/2013	Date
2+25	-5.2	-5.2	-5.2	-1.0	-1.0	-1.0	-1.0	-1.1	-1.1	-1.1	Baseline Offset (In Feet)
	-2.9	0.0	0.0	-4.2	0.0	0.0	0.0	0.1	0.0	0.0	Incremental Change
	-26.8	-26.8	-26.8	-31.0	-31.0	-31.0	-31.0	-31.0	-30.9	-30.9	Cumulative Change
2+30	-2.4	-2.4	-2.4	-2.4	-2.4	-2.8	-2.8	-3.0	-3.0	-2.6	Baseline Offset (In Feet)
	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.2	0.0	-0.4	Incremental Change
	-21.0	-21.0	-21.0	-21.0	-21.0	-20.6	-20.6	-20.5	-20.4	-20.8	Cumulative Change
2+35	-7.1	-7.1	-7.1	-7.1	-7.1	-7.9	-7.9	-8.1	-8.1	-4.0	Baseline Offset (In Feet)
	0.1	0.0	0.0	0.0	0.0	0.8	0.0	0.2	0.0	-4.2	Incremental Change
	-13.5	-13.5	-13.5	-13.5	-13.5	-12.7	-12.7	-12.5	-12.5	-16.7	Cumulative Change
2+40	-8.3	-8.3	-8.3	-8.3	-8.2	-8.2	-8.2	-8.5	-8.5	-5.3	Baseline Offset (In Feet)
	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.3	0.0	-3.3	Incremental Change
	-10.8	-10.8	-10.9	-10.9	-11.0	-11.0	-11.0	-10.6	-10.6	-13.9	Cumulative Change
2+50	-14.6	-14.6	-13.6	-13.3	-13.3	-13.3	-13.3	-10.6	-10.6	-9.0	Baseline Offset (In Feet)
	0.0	0.0	-1.0	-0.3	0.0	0.0	0.0	-2.7	0.0	-1.6	Incremental Change
	-7.2	-7.2	-8.2	-8.5	-8.5	-8.5	-8.5	-11.2	-11.2	-12.8	Cumulative Change
2+60	-20.5	-19.8	-17.7	-17.7	-17.7	-17.4	-16.3	-14.2	-14.2	-14.2	Baseline Offset (In Feet)
	-0.1	-0.7	-2.1	0.0	0.0	-0.3	-1.1	-2.1	0.0	0.0	Incremental Change
	-6.0	-6.7	-8.8	-8.8	-8.8	-9.1	-10.2	-12.3	-12.3	-12.3	Cumulative Change
2+70	-20.8	-20.8	-20.6	-20.0	-20.0	-20.0	-17.4	-17.7	-17.6	-17.6	Baseline Offset (In Feet)
	0.0	0.0	-0.2	-0.6	0.0	0.0	-2.6	0.3	0.0	0.0	Incremental Change
	-9.6	-9.6	-9.8	-10.4	-10.4	-10.4	-13.0	-12.8	-12.8	-12.8	Cumulative Change

Alpine CP 00
HDD East Site
Streambank Monitor

Baseline Station	Streambank Monitor - Top of Bank Locations										Description
	See Drawing CE-CP00-134 Rev 12 for Survey Baseline Stations										
	6/19/2004	7/10/2005	8/21/2006	8/30/2007	8/6/2008	8/3/2009	7/20/2010	8/4/2011	7/14/2012	7/21/2013	Date
2+75	-20.9	-20.8	-19.7	-19.7	-19.7	-19.4	-17.6	-17.5	-17.5	-17.5	Baseline Offset (In Feet)
	0.0	-0.1	-1.1	0.0	0.0	-0.3	-1.8	-0.1	0.0	0.0	Incremental Change
	-10.5	-10.6	-11.7	-11.7	-11.7	-12.0	-13.8	-13.9	-13.9	-13.9	Cumulative Change
2+85	-22.8	-20.4	-17.9	-17.9	-17.9	-17.9	-17.9	-17.2	-17.2	-17.2	Baseline Offset (In Feet)
	0.0	-2.4	-2.5	0.0	0.0	0.0	0.0	-0.7	0.0	0.0	Incremental Change
	-4.1	-6.5	-9.1	-9.0	-9.0	-9.0	-9.0	-9.7	-9.7	-9.7	Cumulative Change
2+90	-21.3	-21.3	-17.3	-16.5	-15.1	-15.1	-12.0	-8.7	-8.8	-0.6	Baseline Offset (In Feet)
	-0.1	0.0	-4.1	-0.8	-1.4	0.0	-3.1	-3.3	0.0	-8.2	Incremental Change
	-3.2	-3.2	-7.2	-8.0	-9.4	-9.4	-12.5	-15.8	-15.7	-23.9	Cumulative Change
3+00	-6.0	0.3	0.3	0.3	0.3	0.3	0.3	0.1	0.1	2.1	Baseline Offset (In Feet)
	0.0	-6.3	0.0	0.0	0.0	0.0	0.0	0.2	0.0	-2.0	Incremental Change
	-3.1	-9.4	-9.4	-9.4	-9.4	-9.4	-9.4	-9.2	-9.2	-11.2	Cumulative Change
3+10	-11.4	-6.9	-5.2	-5.2	-5.2	-5.0	-5.0	-5.3	-5.2	-3.2	Baseline Offset (In Feet)
	0.0	-4.4	-1.7	0.0	0.0	-0.2	0.0	0.3	-0.1	-2.0	Incremental Change
	-0.1	-4.5	-6.2	-6.2	-6.2	-6.4	-6.4	-6.2	-6.2	-8.3	Cumulative Change
3+15	-15.9	-10.5	-9.6	-9.6	-9.6	-9.6	-9.6	-9.5	-9.6	-4.2	Baseline Offset (In Feet)
	0.0	-5.4	-0.9	0.0	0.0	0.0	0.0	-0.1	0.0	-5.3	Incremental Change
	-0.3	-5.7	-6.6	-6.6	-6.6	-6.6	-6.6	-6.7	-6.6	-11.9	Cumulative Change
3+20	-11.8	-11.8	-8.9	-8.9	-8.9	-8.9	-8.9	-8.9	-8.9	-4.0	Baseline Offset (In Feet)
	0.0	0.0	-2.9	0.0	0.0	0.0	0.0	0.0	0.0	-4.9	Incremental Change
	-4.1	-4.1	-7.0	-7.0	-7.0	-7.0	-7.0	-7.1	-7.1	-12.0	Cumulative Change

Alpine CP 00
HDD East Site
Streambank Monitor

Baseline Station	Streambank Monitor - Top of Bank Locations										Description
	See Drawing CE-CP00-134 Rev 12 for Survey Baseline Stations										
	6/19/2004	7/10/2005	8/21/2006	8/30/2007	8/6/2008	8/3/2009	7/20/2010	8/4/2011	7/14/2012	7/21/2013	Date
3+25	-11.1	-10.3	-9.5	-9.5	-9.5	-9.5	-9.5	-9.6	-9.6	-4.0	Baseline Offset (In Feet)
	0.0	-0.8	-0.8	0.0	0.0	0.0	0.0	0.1	0.0	-5.6	Incremental Change
	-6.0	-6.8	-7.6	-7.6	-7.6	-7.6	-7.6	-7.5	-7.5	-13.2	Cumulative Change
3+30	-11.5	-11.2	-11.2	-11.2	-11.2	-11.2	-11.0	-11.0	-11.0	-5.9	Baseline Offset (In Feet)
	0.0	-0.3	0.0	0.0	0.0	0.0	-0.2	0.0	0.0	-5.1	Incremental Change
	-23.9	-24.2	-24.2	-24.2	-24.2	-24.2	-24.4	-24.4	-24.4	-29.5	Cumulative Change
3+35	-23.5	-23.5	-23.5	-23.5	-23.5	-24.6	-24.6	-12.7	-12.7	-12.7	Baseline Offset (In Feet)
	0.0	0.0	0.0	0.0	0.0	1.1	0.0	-11.9	0.0	0.0	Incremental Change
	-12.2	-12.2	-12.2	-12.2	-12.2	-11.1	-11.1	-23.0	-23.0	-23.0	Cumulative Change
3+40	-25.4	-25.4	-25.4	-25.4	-25.4	-25.4	-25.4	-18.9	-18.9	-18.9	Baseline Offset (In Feet)
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-6.5	0.0	0.0	Incremental Change
	-8.8	-8.8	-8.8	-8.8	-8.8	-8.8	-8.8	-15.3	-15.3	-15.3	Cumulative Change
3+45	-26.4	-24.1	-24.1	-24.1	-24.1	-24.6	-24.6	-17.0	-17.0	-17.0	Baseline Offset (In Feet)
	-1.0	-2.3	0.0	0.0	0.0	0.5	0.0	-7.6	0.0	0.0	Incremental Change
	-6.0	-8.3	-8.3	-8.3	-8.3	-7.8	-7.8	-15.4	-15.4	-15.4	Cumulative Change
3+52	-8.4	-8.4	2.4	2.4	2.4	3.1	3.1	3.1	3.1	3.1	Baseline Offset (In Feet)
	0.0	0.0	-10.8	0.0	0.0	-0.7	0.0	0.0	0.0	0.0	Incremental Change
	-1.7	-1.7	-12.5	-12.5	-12.5	-13.2	-13.2	-13.2	-13.2	-13.2	Cumulative Change
3+60	-10.8	-10.8	3.0	3.0	3.0	3.0	3.0	3.1	3.1	3.1	Baseline Offset (In Feet)
	-0.4	0.0	-13.8	0.0	0.0	0.0	0.0	0.1	0.0	0.0	Incremental Change
	-1.1	-1.1	-14.9	-14.9	-14.9	-14.9	-14.9	-15.0	-15.0	-15.0	Cumulative Change

Alpine CP 00
HDD East Site
Streambank Monitor

Baseline Station	Streambank Monitor - Top of Bank Locations										Description
	See Drawing CE-CP00-134 Rev 12 for Survey Baseline Stations										
	6/19/2004	7/10/2005	8/21/2006	8/30/2007	8/6/2008	8/3/2009	7/20/2010	8/4/2011	7/14/2012	7/21/2013	Date
3+65	-18.4	-18.4	-3.3	-13.8	-13.8	-13.8	-13.8	-13.9	-13.9	-13.9	Baseline Offset (In Feet)
	-0.3	0.0	-15.1	10.5	0.0	0.0	0.0	0.0	0.0	0.0	Incremental Change
	-0.4	-0.4	-15.5	-5.0	-5.0	-5.0	-5.0	-5.0	-5.0	-5.0	Cumulative Change
3+70	-24.1	-21.2	-9.6	-11.9	-11.9	-11.9	-11.9	-12.0	-12.0	-12.0	Baseline Offset (In Feet)
	0.1	-2.9	-11.6	2.3	0.0	0.0	0.0	0.1	0.0	0.0	Incremental Change
	0.2	-2.8	-14.3	-12.0	-12.0	-12.0	-12.0	-12.0	-12.0	-12.0	Cumulative Change
3+75	-20.2	-19.3	-11.3	-10.1	-10.1	-10.1	-10.1	-10.1	-10.1	-10.1	Baseline Offset (In Feet)
	0.0	-0.9	-8.0	-1.2	0.0	0.0	0.0	0.0	0.0	0.0	Incremental Change
	-3.0	-3.9	-11.9	-13.1	-13.1	-13.1	-13.1	-13.1	-13.1	-13.1	Cumulative Change
3+80	-11.6	-11.6	-9.0	-9.0	-9.0	-9.0	-9.0	-8.9	-8.9	-8.9	Baseline Offset (In Feet)
	-1.3	0.0	-2.6	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	Incremental Change
	-8.0	-8.0	-10.6	-10.6	-10.6	-10.6	-10.6	-10.7	-10.7	-10.7	Cumulative Change
3+85	-12.0	-12.0	-11.1	-11.1	-11.1	-11.1	-11.1	-10.6	-10.6	-10.6	Baseline Offset (In Feet)
	-0.3	0.0	-0.9	0.0	0.0	0.0	0.0	-0.5	0.0	0.0	Incremental Change
	-7.9	-7.9	-8.9	-8.8	-8.8	-8.8	-8.8	-9.4	-9.3	-9.3	Cumulative Change
3+95	-21.9	-21.9	-16.1	-16.1	-16.1	-16.1	-16.1	-14.1	-14.1	-14.1	Baseline Offset (In Feet)
	-0.5	0.0	-5.8	0.0	0.0	0.0	0.0	-2.0	0.0	0.0	Incremental Change
	-4.2	-4.2	-10.1	-10.0	-10.0	-10.0	-10.0	-12.0	-12.0	-12.0	Cumulative Change
4+00	-21.9	-21.9	-18.6	-18.6	-18.6	-18.6	-18.6	-15.9	-15.9	-15.9	Baseline Offset (In Feet)
	0.7	0.0	-3.3	0.0	0.0	0.0	0.0	-2.7	0.0	0.0	Incremental Change
	-8.0	-8.0	-11.3	-11.3	-11.3	-11.3	-11.3	-14.0	-14.0	-14.0	Cumulative Change

Alpine CP 00
HDD East Site
Streambank Monitor

Baseline Station	Streambank Monitor - Top of Bank Locations										Description
	See Drawing CE-CP00-134 Rev 12 for Survey Baseline Stations										
	6/19/2004	7/10/2005	8/21/2006	8/30/2007	8/6/2008	8/3/2009	7/20/2010	8/4/2011	7/14/2012	7/21/2013	Date
4+05	-19.5	-19.5	-21.7	-21.7	-21.7	-21.3	-21.3	-20.4	-20.5	-20.5	Baseline Offset (In Feet)
	0.0	0.0	2.2	0.0	0.0	-0.4	0.0	-0.9	0.0	0.0	Incremental Change
	-10.3	-10.3	-8.1	-8.1	-8.1	-8.5	-8.5	-9.4	-9.4	-9.4	Cumulative Change
4+15	2.6	2.6	2.7	2.7	2.5	2.5	2.5	2.5	2.5	2.5	Baseline Offset (In Feet)
	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	Incremental Change
	-33.3	-33.3	-33.4	-33.4	-33.2	-33.2	-33.2	-33.2	-33.2	-33.2	Cumulative Change
4+25	5.1	5.1	5.1	5.1	5.1	4.7	4.7	4.7	4.6	4.6	Baseline Offset (In Feet)
	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	Incremental Change
	-13.7	-13.7	-13.7	-13.7	-13.7	-13.3	-13.3	-13.3	-13.2	-13.2	Cumulative Change
4+35	4.5	4.5	4.5	4.5	4.5	4.9	4.9	5.0	4.9	4.9	Baseline Offset (In Feet)
	0.0	0.0	0.0	0.0	0.0	-0.4	0.0	0.1	0.0	0.0	Incremental Change
	-10.0	-10.0	-10.1	-10.1	-10.1	-10.5	-10.5	-10.5	-10.5	-10.5	Cumulative Change
4+45	1.9	1.9	1.9	1.9	1.9	1.6	1.6	1.6	1.6	1.6	Baseline Offset (In Feet)
	-0.7	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	Incremental Change
	-7.0	-7.0	-7.0	-7.0	-7.0	-6.7	-6.7	-6.7	-6.7	-6.7	Cumulative Change
4+50	4.1	4.1	4.1	4.1	4.1	4.1	4.1	5.0	5.0	5.0	Baseline Offset (In Feet)
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9	0.1	0.0	Incremental Change
	-10.4	-10.4	-10.4	-10.4	-10.4	-10.4	-10.4	-11.3	-11.3	-11.3	Cumulative Change

*****Note:** Field Survey dated 8/7/01 was used for baseline data to compute Incremental/Cumulative Change. Negative numbers indicate erosion.

Alpine CP 00
HDD East Site
Subsidence Monitor - Seawater Line

Baseline Station	Point Description	Subsidence Monitor - Cross-Section A								Description
		See Drawing CE-CP00-134 for Survey Cross-Section Locations								
		7/14/2012	7/20/2013	Future	Future	Future	Future	Future	Future	Date
0+00	**Tundra**	17.0	16.9							Elevation (In Feet)
		-0.1	0.0							Incremental Change
		-0.9	-1.0							Cumulative Change
0+09	**Tundra**	17.1	17.1							Elevation (In Feet)
		0.1	0.0							Incremental Change
		-0.8	-0.8							Cumulative Change
0+18	**Tundra**	16.5	16.3							Elevation (In Feet)
		-0.1	-0.1							Incremental Change
		-1.2	-1.3							Cumulative Change
0+21	**Top Bank**	15.3	15.0							Elevation (In Feet)
		-0.1	-0.3							Incremental Change
		-1.5	-1.8							Cumulative Change
0+22.5	**Gradebreak**	13.0	12.5							Elevation (In Feet)
		-0.1	-0.5							Incremental Change
		-2.4	-2.9							Cumulative Change
0+25	**Toe Bank**	11.5	10.4							Elevation (In Feet)
		-0.1	-1.1							Incremental Change
		-2.1	-3.2							Cumulative Change
0+27	**CL Swale**	11.1	9.8							Elevation (In Feet)
		-0.1	-1.4							Incremental Change
		-2.2	-3.5							Cumulative Change
0+29	**Toe Bank**	13.1	12.1							Elevation (In Feet)
		0.1	-1.0							Incremental Change
		-0.2	-1.2							Cumulative Change

Alpine CP 00
HDD East Site
Subsidence Monitor - Seawater Line

Baseline Station	Point Description	Subsidence Monitor - Cross-Section A								Description
		See Drawing CE-CP00-134 for Survey Cross-Section Locations								
		7/14/2012	7/20/2013	Future	Future	Future	Future	Future	Future	Date
0+34	**Gradebreak**	14.0	12.8							Elevation (In Feet)
		-0.2	-1.1							Incremental Change
		-1.6	-2.8							Cumulative Change
0+35	**Top Bank**	16.5	16.2							Elevation (In Feet)
		0.2	-0.3							Incremental Change
		-1.2	-1.4							Cumulative Change
0+42	**Tundra**	17.3	17.2							Elevation (In Feet)
		0.0	-0.1							Incremental Change
		-1.0	-1.1							Cumulative Change
0+50	**Tundra**	16.6	16.5							Elevation (In Feet)
		-0.1	-0.2							Incremental Change
		-1.4	-1.6							Cumulative Change
*****Note: Baseline Stationing Runs from North to South along Cross-Sections.**										
*****Note: Vertical Datum Adjusted Down Approximately 0.5 feet to reflet Actual Elevation per Differential Levels from CD-1, ran August 2007**										

Alpine CP 00
HDD East Site
Subsidence Monitor - Seawater Line

Baseline Station	Point Description	Subsidence Monitor - Cross-Section B								Description
		See Drawing CE-CP00-134 for Survey Cross-Section Locations								
		7/14/2012	7/20/2013	Future	Future	Future	Future	Future	Future	Date
0+00	**Tundra**	16.7	16.6							Elevation (In Feet)
		-0.1	-0.1							Incremental Change
		-0.8	-0.9							Cumulative Change
0+10	**Tundra**	17.0	16.8							Elevation (In Feet)
		0.0	-0.2							Incremental Change
		-0.9	-1.1							Cumulative Change
0+23	**Tundra**	16.7	16.6							Elevation (In Feet)
		0.1	-0.2							Incremental Change
		-0.8	-0.9							Cumulative Change
0+25	**Top of Bank**	15.1	15.0							Elevation (In Feet)
		0.0	-0.1							Incremental Change
		-2.1	-2.2							Cumulative Change
0+27	**Gradebreak**	14.5	14.5							Elevation (In Feet)
		-0.3	0.1							Incremental Change
		-2.2	-2.2							Cumulative Change
0+32	**Toe Bank**	12.2	12.5							Elevation (In Feet)
		-0.6	0.3							Incremental Change
		-2.0	-1.7							Cumulative Change
0+35	**CL Swale**	12.6	12.3							Elevation (In Feet)
		-1.2	-0.3							Incremental Change
		-1.8	-2.1							Cumulative Change
0+37	**Toe Bank**	N/A	13.5							Elevation (In Feet)
		N/A	#VALUE!							Incremental Change
		#VALUE!	-0.4							Cumulative Change

Alpine CP 00
HDD East Site
Subsidence Monitor - Seawater Line

Baseline Station	Point Description	Subsidence Monitor - Cross-Section B								Description
		See Drawing CE-CP00-134 for Survey Cross-Section Locations								
		7/14/2012	7/20/2013	Future	Future	Future	Future	Future	Future	Date
0+38	**Gradebreak**	13.9	13.5							Elevation (In Feet)
		-0.3	-0.3							Incremental Change
		-1.3	-1.7							Cumulative Change
0+40	**Gradebreak**	13.4	13.4							Elevation (In Feet)
		-0.3	0.0							Incremental Change
		-1.1	-1.1							Cumulative Change
0+42	**Gradebreak**	14.6	14.4							Elevation (In Feet)
		0.0	-0.2							Incremental Change
		-1.3	-1.4							Cumulative Change
0+49	**Gradebreak**	15.7	15.5							Elevation (In Feet)
		0.2	-0.2							Incremental Change
		-0.5	-0.7							Cumulative Change
0+52	**Top Bank**	17.0	16.9							Elevation (In Feet)
		0.1	-0.1							Incremental Change
		-0.3	-0.4							Cumulative Change
0+60	**Tundra**	17.2	17.2							Elevation (In Feet)
		0.1	0.0							Incremental Change
		-0.6	-0.6							Cumulative Change

*****Note: Baseline Stationing Runs from North to South along Cross-Sections.**

*****Note: Vertical Datum Adjusted Down Approximately 0.5 feet to reflet Actual Elevation per Differential Levels from CD-1, ran August 2007**

Alpine CP 00
HDD East Site
Subsidence Monitor - Seawater Line

Baseline Station	Point Description	Subsidence Monitor - Cross-Section C								Description
		See Drawing CE-CP00-134 for Survey Cross-Section Locations								
		7/14/2012	7/20/2013	Future	Future	Future	Future	Future	Future	Date
0+00	**Tundra**	16.0	15.9							Elevation (In Feet)
		0.0	-0.2							Incremental Change
		-0.9	-1.1							Cumulative Change
0+13	**Tundra**	15.9	15.8							Elevation (In Feet)
		-0.1	-0.1							Incremental Change
		-0.9	-1.0							Cumulative Change
0+27	**Top Bank**	16.1	16.0							Elevation (In Feet)
		-0.1	-0.2							Incremental Change
		-0.9	-1.1							Cumulative Change
0+29	**Toe Bank**	13.3	13.2							Elevation (In Feet)
		0.0	-0.1							Incremental Change
		0.5	0.4							Cumulative Change
0+31	**Toe Bank**	13.0	13.0							Elevation (In Feet)
		0.3	0.0							Incremental Change
		-0.9	-0.9							Cumulative Change
0+32	**Gradebreak**	15.9	15.7							Elevation (In Feet)
		0.1	-0.2							Incremental Change
		-0.8	-1.0							Cumulative Change
0+33	**Top Bank**	16.6	16.4							Elevation (In Feet)
		0.0	-0.2							Incremental Change
		-0.7	-0.9							Cumulative Change
0+42	**Tundra**	16.5	16.5							Elevation (In Feet)
		0.0	0.0							Incremental Change
		-0.5	-0.5							Cumulative Change

Alpine CP 00
HDD East Site
Subsidence Monitor - Seawater Line

Baseline	Point	Subsidence Monitor - Cross-Section C								Description
Station	Description	See Drawing CE-CP00-134 for Survey Cross-Section Locations								
		7/14/2012	7/20/2013	Future	Future	Future	Future	Future	Future	Date
0+50	Tundra	16.8	16.7							Elevation (In Feet)
		0.0	0.0							Incremental Change
		-0.4	-0.5							Cumulative Change
***Note: Baseline Stationing Runs from North to South along Cross-Sections.										
***Note: Vertical Datum Adjusted Down Approximately 0.5 feet to reflet Actual Elevation per Differential Levels from CD-1, ran August 2007										

Alpine CP 00
HDD East Site
Subsidence Monitor - Seawater Line

Baseline Station	Point Description	Subsidence Monitor - Cross-Section D								Description
		See Drawing CE-CP00-134 for Survey Cross-Section Locations								
		7/15/2012	7/20/2013	Future	Future	Future	Future	Future	Future	Date
0+00	**Tundra**	16.5	16.4							Elevation (In Feet)
		-0.1	-0.1							Incremental Change
		-1.1	-1.2							Cumulative Change
0+10	**Tundra**	16.7	16.6							Elevation (In Feet)
		-0.1	-0.2							Incremental Change
		-1.0	-1.1							Cumulative Change
0+20	**Gradebreak**	15.8	15.6							Elevation (In Feet)
		0.1	-0.2							Incremental Change
		-1.6	-1.8							Cumulative Change
0+22	**Top Bank**	14.8	14.7							Elevation (In Feet)
		0.0	-0.2							Incremental Change
		-2.0	-2.1							Cumulative Change
0+24	**Toe Bank**	14.3	14.1							Elevation (In Feet)
		0.0	-0.2							Incremental Change
		-0.4	-0.6							Cumulative Change
0+25	**CL Swale**	13.5	13.6							Elevation (In Feet)
		0.1	0.2							Incremental Change
		-0.6	-0.5							Cumulative Change
0+27	**Toe Bank**	15.4	15.1							Elevation (In Feet)
		0.0	-0.3							Incremental Change
		1.0	0.7							Cumulative Change
0+29	**Top Bank**	15.7	15.6							Elevation (In Feet)
		-0.1	-0.1							Incremental Change
		-1.6	-1.8							Cumulative Change

Alpine CP 00
HDD East Site
Subsidence Monitor - Seawater Line

Baseline	Point	Subsidence Monitor - Cross-Section D								Description
Station	Description	See Drawing CE-CP00-134 for Survey Cross-Section Locations								
		7/15/2012	7/20/2013	Future	Future	Future	Future	Future	Future	Date
0+38	**Tundra**	14.6	14.7							Elevation (In Feet)
		-0.3	0.1							Incremental Change
		-3.0	-2.9							Cumulative Change
0+50	**Tundra**	15.0	15.3							Elevation (In Feet)
		0.3	0.3							Incremental Change
		-2.8	-2.4							Cumulative Change
*****Note: Baseline Stationing Runs from North to South along Cross-Sections.**										
*****Note: Vertical Datum Adjusted Down Approximately 0.5 feet to reflet Actual Elevation per Differential Levels from CD-1, ran August 2007**										

Alpine CP 00
HDD East Site
Subsidence Monitor - Seawater Line

Baseline Station	Point Description	Subsidence Monitor - Cross-Section E										Description
		See Drawing CE-CP00-134 for Survey Cross-Section Locations										
		7/20/2013	Future	Future	Future	Future	Future	Future	Future	Future	Future	Date
0+00	**Tundra**	16.7										Elevation (In Feet)
		0.0										Incremental Change
		-0.8										Cumulative Change
0+9	**Tundra**	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Elevation (In Feet)
												Incremental Change
												Cumulative Change
0+12	**Gradebreak**	17.2										Elevation (In Feet)
		0.0										Incremental Change
		-0.6										Cumulative Change
0+20	**Top Bank**	15.0										Elevation (In Feet)
		-0.1										Incremental Change
		-2.3										Cumulative Change
0+21	**Toe Bank**	13.1										Elevation (In Feet)
		-0.3										Incremental Change
		-3.4										Cumulative Change
0+23	**CL Swale**	13.1										Elevation (In Feet)
		0.2										Incremental Change
		-2.9										Cumulative Change
0+24	**Toe Bank**	13.2										Elevation (In Feet)
		0.2										Incremental Change
		-3.0										Cumulative Change
0+27	**Top Bank**	14.7										Elevation (In Feet)
		0.3										Incremental Change
		-2.6										Cumulative Change

Alpine CP 00
HDD East Site
Subsidence Monitor - Seawater Line

Baseline	Point	Subsidence Monitor - Cross-Section E										Description
Station	Description	See Drawing CE-CP00-134 for Survey Cross-Section Locations										
		7/20/2013	Future	Future	Future	Future	Future	Future	Future	Future	Future	Date
0+38	**Tundra**	16.7										Elevation (In Feet)
		-0.1										Incremental Change
		-0.7										Cumulative Change
0+49	**Tundra**	16.5										Elevation (In Feet)
		-0.2										Incremental Change
		-0.9										Cumulative Change
*****Note: Baseline Stationing Runs from North to South along Cross-Sections.**												
*****Note: Vertical Datum Adjusted Down Approximately 0.5 feet to reflet Actual Elevation per Differential Levels from CD-1, ran August 2007**												

Alpine CP 00
HDD East Site
Subsidence Monitor - Seawater Line

Baseline Station	Point Description	Subsidence Monitor - Cross-Section F										Description
		See Drawing CE-CP00-134 for Survey Cross-Section Locations										
		9/20/2013	Future	Future	Future	Future	Future	Future	Future	Future	Future	Date
0+00	Tundra	17.3										Elevation (In Feet)
		0.0										Incremental Change
		-0.6										Cumulative Change
0+10	Tundra	16.6										Elevation (In Feet)
		-0.1										Incremental Change
		-0.7										Cumulative Change
0+14	Gradebreak	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Elevation (In Feet)
												Incremental Change
												Cumulative Change
0+20	Top Bank	15.8										Elevation (In Feet)
		-0.3										Incremental Change
		-1.7										Cumulative Change
0+21	Toe Bank	13.9										Elevation (In Feet)
		-0.3										Incremental Change
		-2.6										Cumulative Change
0+24	CL Swale	13.6										Elevation (In Feet)
		-0.1										Incremental Change
		-1.4										Cumulative Change
0+26	Toe Bank	14.4										Elevation (In Feet)
		1.0										Incremental Change
		-1.7										Cumulative Change
0+28	Top Bank	15.7										Elevation (In Feet)
		0.1										Incremental Change
		-2.1										Cumulative Change

Alpine CP 00

HDD East Site

Subsidence Monitor - Seawater Line

Baseline	Point	Subsidence Monitor - Cross-Section F										Description
Station	Description	See Drawing CE-CP00-134 for Survey Cross-Section Locations										
		9/20/2013	Future	Future	Future	Future	Future	Future	Future	Future	Future	Date
0+34	Gradebreak	17.4										Elevation (In Feet)
		0.0										Incremental Change
		-0.5										Cumulative Change
0+43	Gradebreak	16.7										Elevation (In Feet)
		-0.2										Incremental Change
		-0.5										Cumulative Change
0+46	Gradebreak	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Elevation (In Feet)
												Incremental Change
												Cumulative Change
0+52	Tundra	17.2										Elevation (In Feet)
		0.0										Incremental Change
		-0.6										Cumulative Change
***Note: Baseline Stationing Runs from North to South along Cross-Sections.												
***Note: Vertical Datum Adjusted Down Approximately 0.5 feet to reflet Actual Elevation per Differential Levels from CD-1, ran August 2007												

Alpine CP 00
HDD East Site
Subsidence Monitor - Seawater Line

Baseline Station	Point Description	Subsidence Monitor - Cross-Section G									
		See Drawing CE-CP00-134 for Survey Cross-Section Locations									
		9/20/2013	Future	Future	Future	Future	Future	Future	Future	Future	Future
0+00	Tundra	16.4									
		-0.1									
		-0.7									
0+09	Tundra	16.5									
		0.0									
		-0.7									
0+16	Gradebreak	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
0+22	Top Bank	16.8									
		-0.2									
		-0.8									
0+24	Toe Bank	16.3									
		-0.1									
		-0.6									
0+26	CL Swale	16.4									
		0.4									
		-0.1									
0+28	Toe Bank	16.4									
		0.1									
		-0.4									
0+30	Top Bank	17.2									
		0.0									
		-0.5									

Alpine CP 00
HDD East Site
Subsidence Monitor - Seawater Line

Baseline Station	Point Description	Subsidence Monitor - Cross-Section G									
		See Drawing CE-CP00-134 for Survey Cross-Section Locations									
		9/20/2013	Future	Future	Future	Future	Future	Future	Future	Future	Future
0+37	Tundra	17.0									
		-0.1									
		-0.6									
0+46	Tundra	16.7									
		0.0									
		-0.6									
***Note: Baseline Stationing Runs from North to South along Cross-Sections.											
***Note: Vertical Datum Adjusted Down Approximately 0.5 feet to reflet Actual Elevation per Differential Levels from CD-1, ran August 2007											

Alpine CP 00

HDD East Site

Subsidence Monitor - Seawater Line

Description
Date
Elevation (In Feet)
Incremental Change
Cumulative Change
Elevation (In Feet)
Incremental Change
Cumulative Change
Elevation (In Feet)
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Elevation (In Feet)
Incremental Change
Cumulative Change

Alpine CP 00

HDD East Site

Subsidence Monitor - Seawater Line

Description
Date
Elevation (In Feet)
Incremental Change
Cumulative Change
Elevation (In Feet)
Incremental Change
Cumulative Change

Alpine CP 00
HDD East Site
Subsidence Monitor - Seawater Line

Baseline Station	Point Description	Subsidence Monitor - Cross-Section H										Description
		See Drawing CE-CP00-134 for Survey Cross-Section Locations										
		9/20/2013	Future	Future	Future	Future	Future	Future	Future	Future	Future	Date
0+00	**Tundra**	16.0										Elevation (In Feet)
		-0.1										Incremental Change
		-1.0										Cumulative Change
0+09	**Tundra**	16.3										Elevation (In Feet)
		-0.1										Incremental Change
		-0.8										Cumulative Change
0+18	**Gradebreak**	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Elevation (In Feet)
												Incremental Change
												Cumulative Change
0+24	**Top Bank**	16.4										Elevation (In Feet)
		-0.1										Incremental Change
		-0.9										Cumulative Change
0+25	**Toe Bank**	14.3										Elevation (In Feet)
		-0.5										Incremental Change
		-2.5										Cumulative Change
0+28	**CL Swale**	14.1										Elevation (In Feet)
		-0.6										Incremental Change
		-2.2										Cumulative Change
0+30	**Toe Bank**	14.0										Elevation (In Feet)
		-0.9										Incremental Change
		-2.7										Cumulative Change
0+32	**Top Bank**	15.8										Elevation (In Feet)
		-0.4										Incremental Change
		-1.8										Cumulative Change

Alpine CP 00
HDD East Site
Subsidence Monitor - Seawater Line

Baseline Station	Point Description	Subsidence Monitor - Cross-Section H										Description
		See Drawing CE-CP00-134 for Survey Cross-Section Locations										
		9/20/2013	Future	Future	Future	Future	Future	Future	Future	Future	Future	Date
0+40	**Gradebreak**	17.5										Elevation (In Feet)
		-0.1										Incremental Change
		-0.7										Cumulative Change
0+42	**Gradebreak**	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Elevation (In Feet)
												Incremental Change
												Cumulative Change
0+50	**Tundra**	16.6										Elevation (In Feet)
		-0.1										Incremental Change
		-0.6										Cumulative Change
*****Note: Baseline Stationing Runs from North to South along Cross-Sections.**												
*****Note: Vertical Datum Adjusted Down Approximately 0.5 feet to reflet Actual Elevation per Differential Levels from CD-1, ran August 2007**												