Alpine Pipeline River Crossings

2008 Monitoring Report

Submitted to

ConocoPhillips

Submitted by

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1.0 Introduction/Objectives

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

Monitoring is conducted to document the condition of the pipelines and channel morphology at each of the river crossings and allow for a comparison between observed conditions and design criteria, as required by Right-of-Way Lease/Grant Stipulations and the Alpine Surveillance and Monitoring Program. The primary concern is the state of the pipeline itself at each crossing, as well as the pipeline's impact on the channel.

Monitoring of the HDD crossing was first conducted in the spring of 2001 (Baker 2002). Since 2003 monitoring of the HDD, Kachemach River, and the Miluveach River crossings has been conducted; however in 2007, monitoring was performed only at the HDD crossing (Baker 2003, 2004, 2005, 2006, and 2007). In 2008, all three crossings were monitored (Figure 1).

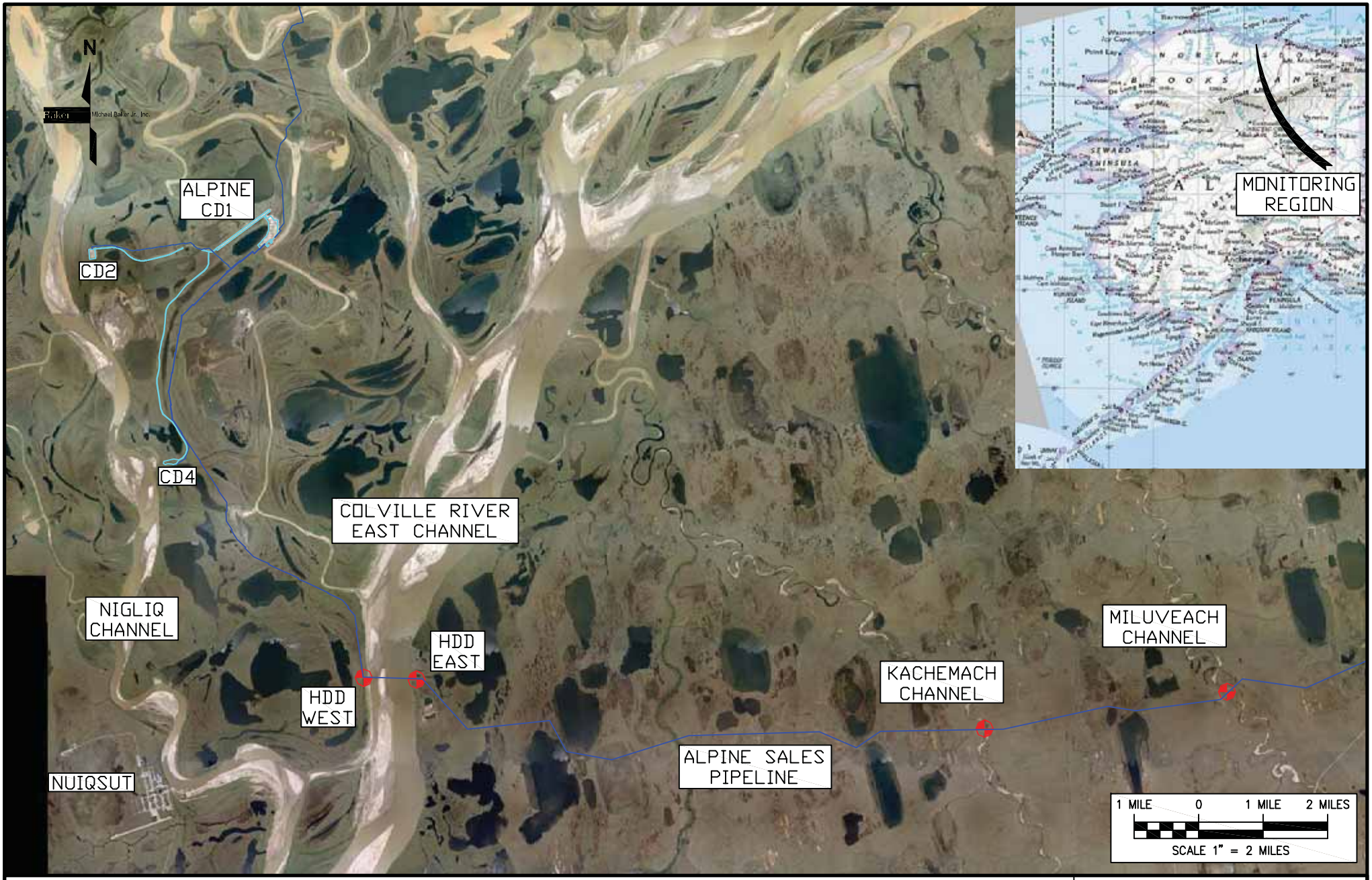
The data collected in 2008 included the following:

- Photographs at each crossing location
- Condition of Vertical Support Member(s) (VSM): tilting, settling, or jacking:
    - Miluveach River – VSM Nos. 2047 A/B and 2048 A/B
    - Kachemach River – VSM Nos. 1714, 1715 A/B, and 1716
- Evaluation of bank erosion, 50 feet upstream and downstream from the NPS 14 crude oil pipeline at the HDD crossing.
- Measurements of depth and width of scour around VSM in river channels
- Measurements of localized scour near river crossings
- Top and bottom elevations of river banks for evaluation of bank erosion at the HDD crossing

- Topographic survey from the Colville River to the HDD East Pad to document bank and ground stability

The following physical conditions were specifically evaluated during the site inspections:

- The presence or absence of erosion at HDD facility gravel pads
- Settlement and jacking of the HDD building foundations
- Obstructions, ice dams, or changes in flow in the channels
- Signs of flooding that threatened a facility or pipeline
- Water that could not be diverted and was concentrated longitudinally on or along the pipeline centerline, or gullying that threatened the below grade pipeline
- Soil pressure ridges parallel to the pipe axis and exceeded one foot in height and 60 feet in length
- Ponding that extended over the pipe axis deeper than one foot and more than 100 feet long
- Cracks within ten feet of the pipeline centerlines at least ten feet long with vertical displacement exceeding six inches, or wider than two inches parallel to the pipe axis and longer than 60 feet
- Depressions occurring longitudinally over pipe axis deeper than one foot and more than 100 feet long
- Pipeline leaks



ConocoPhillips Alaska, Inc.

DATE:	8/21/08	PROJECT:	114133 ALPINE PIPELINE
DRAWN:	MDM	FILE:	FIGURE 1
CHECKED:	OOO	SCALE:	1" = 2 MILES

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2008 POST BREAKUP PIPELINE MONITORING SITES

FIGURE 1

2.0 Methods

Throughout the 2008 spring breakup event, observations and photographs of the three river crossings were collected. On July 15, 2008, Baker personnel inspected and took measurements at each of the river crossings. Channels were clear of ice and snow allowing full access to the channels and pipelines. Inspections at the HDD crossing extended from the points of pipeline casing entry to the riverbanks while at the Kachemach and Miluveach Rivers, inspections extended within the banks of the channel. The inspections extended upstream and downstream several hundred feet on both the east and west banks. In addition to visual observations, both aerial and ground photographs were taken and are provided in **Appendix A**. The observations and measurements were then compared to established design criteria.

2.1 Bank Erosion

Kuukpik/LCMF, LLC (LCMF) surveyed the local topography at each of the crossings in August 2008. LCMF incorporated the data into figures and a tabulation of historical migration since 2001 for each bank, available in **Appendices B through E**. The baseline stationing was based on arbitrary scour control points, each beginning at 100 feet along each bank, and was established as 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 1997). Setbacks at the Kachemach River and Miluveach River allow for 25 feet and 35 feet, respectively, of bank migration on either bank of the rivers (Baker 1999). Setbacks were based on a 30-year design life.

2.2 VSM Tilt, Settlement, and Jacking

LCMF surveyed the top of steel (TOS) elevation for various pipeline supports and developed tabulations of historical TOS elevations for each support, available in **Appendices B, D and E**. Tilt of various VSM adjacent to the river crossings were measured using a plumb bob (5-foot line) and tape measure. Tilt was measured perpendicular to the oil pipeline (north/south) and parallel to the pipeline (east/west). Tilt of each VSM was documented by measuring the horizontal distance from plumb in feet per vertical foot (feet/foot). The VSM axis was considered plumb if the tilt was measured

to be less than or equal to 0.00125 feet/foot (1/64 inch/foot). If tilt was measurable, the direction of tilt was also recorded (N, S, E, or W). Conversions between feet/foot measurements presented in this report and inch/foot units are provided in Table 2-1.

Table 2-1 VSM Tilt Unit Conversion

Feet/Foot	Inch/Foot
< 0.00125	< 1/64
0.00250	1/32
0.00500	1/16
0.00750	3/32
0.01000	1/8
0.01250	5/32

The 1999 Alpine VSM installation specification states that "the plumb of each VSM shall vary no more than +/- 0.5% (1/16 inch per 12 inches) in any direction" (ARCO 1999). The 2004 CPAI North Slope VSM specification states that "the slope of any support beam in the direction parallel to the pipeline centerline shall not exceed 1/2 inch (0.042 feet) in ten feet (0.004 feet/foot or 1/16 inch per foot)" (CPAI 2004). Based on these VSM specifications and for comparison purposes, the plumb (tilt) tolerance was accepted to be 0.005 feet/foot (1/16 inch/foot).

2.3 VSM Scour

Streambed scour at each in-stream VSM at the Miluveach and Kachemach Rivers was surveyed by LCMF to compare to the design scour limits. Based on the Mechanical Analysis of Aboveground Pipeline & Aboveground River Crossings (Baker 1999), the VSM within the floodplain of the Kachemach and Miluveach River crossings were designed to withstand local (pier) scour and general main channel scour during a 200-year flood as summarized in Table 2-2.

Table 2-2 VSM Design Scour Limits

River	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 HDD building foundation piles (bottom of pile cap) and developed tabulations of historic elevations for each pile, available in **Appendix B**. Vertical datum was adjusted at HDD West (-0.35 feet) to reflect actual elevations based on differential levels carried from CD1 (Alpine) in August of 2007.

2.5 Polygon Trough Subsidence (HDD East)

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**. Vertical datum was adjusted at HDD East (-0.50 feet) to reflect actual elevations based on differential levels carried from CD1 (Alpine) in August of 2007.

3.0 Results

3.1 HDD West Bank

The west bank of the Colville River HDD crossing was evaluated by visual inspection, review of ground and aerial photography **(Photo A-1 through Photo A-6, Appendix A)**, and field surveys. The 2008 Colville River breakup floodwaters did not overtop the west bank of the channel. No significant erosion was evident along the west bank (**Photo A-1**). Deposition of sand along the toe of the bank did occur.

3.1.1 Bank Erosion (HDD West)

The greatest bank erosion observed between the 2007 and 2008 monitoring events was 1.5 feet, occurring approximately 75 feet downstream (north) of the oil pipeline centerline.

A maximum erosion of 18.7 feet, between April 2002 and August 2008, was measured along the top of bank at a single location 120 feet north of the oil pipeline centerline. This value yields a maximum average rate of 3.1 feet/year at this location over the monitoring period. The average rate of erosion along the 440-foot top of bank was measured to be 0.5 feet/year. This is less than the observed historic average rate of 0.8 feet/year, and less than the estimated maximum erosion rate used for design of 2.3 feet/year (Baker 1997). A summary of the LCMF surveying results for the HDD West Bank crossing is presented in **Appendix B**.

Approximately 9.0 feet of bank erosion at the oil pipeline centerline has occurred since 1997 (0.9 feet/year) based on a comparison of 2008 survey data and the 1997 scour control point **(Appendix B)**. This equals approximately 9% of the design setback as of 2008. The west bank erosion has not yet reached the 50% design setback; however, if either bank “migrates 50% of the design setback, erosion rates or possible mitigation measures will be evaluated” (Baker 1999).

3.1.2 VSM Tilt (HDD West)

The VSM directly adjacent to the HDD West pad and crossing were found to be generally plumb and adequately supporting the pipeline based on observations and

measurements. Of the six VSM measured for tilt, the maximum tilt was measured to be 0.005 feet/foot (VSM 748A, 748B, and 789A), within the project tolerances of less than or equal to 0.005 feet/foot (1/16 inch/foot). A summary of the HDD West Bank VSM tilt survey results is presented in Table 3-1 (2008). Table 3-2 presents the difference in tilt measurements collected during the 2008 and 2007 monitoring events.

Table 3-1 HDD West VSM Tilt Measurement Results (2008)

VSM Number	Tilt Measurement Orientation (ft/ft)	
	North/South	East/West
783	0.00200 N	<0.00125
784A	0.00300 N	0.00500 W
784B	0.00500 N	0.00200 W
788	< 0.00125	< 0.00125
789A	0.00500 N	0.00400 E
789B	0.00500 N	0.00200 W

Table 3-2 HDD West VSM Change in Tilt from 2008 to 2007

VSM Number	Tilt Measurement Orientation (ft/ft)	
	North/South	East/West
783	-0.00050 N	no change
784A	-0.00075 N	0.00375 W
784B	0.00375 N	0.00025 W
788	0.00250 N	no change
789A	0.00125 N	0.00375 E
789B	0.00125 N	0.00075 W

3.1.3 Foundation Pile Cap Survey (HDD West)

LCMF has conducted a pile cap elevation survey annually since 2004. Based on their survey, the pile caps have experienced less than 0.1 feet of movement vertically. A summary of the LCMF surveying results for the HDD West Bank crossing is presented in **Appendix B**.

3.1.4 Summary

The HDD West Bank crossing has eroded at an average rate that is less than both the long-term historic and design erosion rates over the 6-year study period. The observed

erosion of the west bank at the NPS14 oil centerline represents approximately 9% of the 105-foot design setback, while the pipeline crossing has operated for approximately 30% of the original design life. Based on the visual inspections, measurements, and survey results, there appeared to be no tilting, settling, or jacking of the VSM or HDD building foundations. The HDD West Bank gravel pad is free from erosion and 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.

3.2 HDD East Bank

The east bank of the Colville River HDD crossing was evaluated by visual inspection, review of ground and aerial photography **(Photo A-7 through Photo A-10, Appendix A)**, and field surveys**.** The 2008 Colville River breakup floodwaters were not observed above the river bank and there were no signs of major erosion along the east bank of the HDD crossing**.**

3.2.1 Bank Erosion (HDD East)

The greatest bank erosion observed between the 2007 and 2008 monitoring events was 1.4 feet near the oil pipeline centerline.

A maximum erosion of 33.1 feet, between October 2001 and August 2008, was measured along the top of bank at a single location approximately 160 feet downstream (north) of the oil pipeline centerline. This value yields a maximum average rate of 4.7 feet/year over the monitoring period at this location. The average rate of erosion along the 335-foot top of bank was measured to be 1.6 feet/year. This is greater than the observed long-term historical average rate of 1.5 feet/year, but less than the estimated maximum erosion rate used for design of 2.5 feet/year (Baker 1997). A summary of the LCMF surveying results for the HDD East Bank crossing is presented in **Appendix C**.

Approximately 8.8 feet of bank erosion at the oil pipeline centerline has occurred since 1997 (0.8 feet/year) based on a comparison of 2008 survey data and the 1997 scour control point **(Appendix C)**. As of 2008, the observed bank erosion equals approximately 8% of the design setback. The east bank erosion has not yet reached the 50% design

setback; however, if the bank "migrates 50% of the design setback, erosion rates or possible mitigation measures will be evaluated" (Baker 1999).

3.2.2 Polygon Trough Subsidence (HDD East)

In addition to bank erosion surveys, subsidence monitoring has been conducted at eight cross sections of the polygon trough since 2001. The cumulative subsidence at each of the cross sections is generally less than one foot **(Appendix C)**. Cross Section E has a cumulative subsidence of 2.8 feet at the polygon trough centerline, dropping 0.6 feet since 2006.

3.2.3 VSM Tilt

The VSM directly adjacent to the HDD East pad and crossing were found to be generally plumb and adequately supporting the pipelines based on observations and measurements. Of the five VSM measured for tilt, the maximum tilt was measured to be 0.005 feet/foot, within the project tolerances of less than or equal to 0.005 feet/foot (1/16 inch/foot).A summary of the HDD West Bank VSM tilt survey results is presented in Table 3-3 (2008). Table 3-4 presents the difference in tilt measurements collected during the 2008 and 2007 monitoring events.

Table 3-3 HDD East VSM Tilt Measurement Results (2008)

VSM Number	Tilt Measurement Orientation (ft/ft)	
	North/South	East/West
883	< 0.00125	0.00200 W
884	0.00200 S	< 0.00125
885	0.00500 S	0.00300 W
889	0.00200 N	0.00200 E
890	0.00500 S	0.00300 E

Table 3-4 HDD East VSM Change in Tilt from 2008 to 2007

VSM Number	Tilt Measurement Orientation (ft/ft)	
	North/South	East/West
883	no change	0.00075 W
884	0.00075 S	no change
885	0.00250 S	0.00050 W
889	0.00075 N	-0.00075 E
890	0.00375 S	-0.00075 W

3.2.4 Summary

Though the seven year average erosion rate is greater than the long-term historic average, it is less than the design erosion rate. The observed erosion of the east bank at the NPS14 oil centerline represents approximately 8% of the 115-foot design setback, while the pipeline crossing has operated for approximately 30% of the original design life. Based on visual inspections, measurements, and survey results, there appeared to be no notable tilting, settling, or jacking of VSM or foundation piles. The HDD East Bank gravel pad is free from erosion and 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. The polygon trough does pass over the seawater casing axis; however, features of the trough do not meet the physical conditions listed in Section 1.0, relative to the pipeline axis.

3.3 Kachemach River

The Kachemach River crossing was evaluated by visual inspection, review of ground and aerial photography **(Photo A-11 through Photo A-15, Appendix A),** and field surveys**.** At the time of the inspection, flow was observed within the gravel channel bottom at a depth of generally less than three feet. Based on visual observation, flow from the 2008 breakup was confined to the main channel and did not appear to have reached the overbank regions adjacent to the river crossing.

3.3.1 Bank Erosion

Based on summer monitoring observations and LCMF stream bank surveys **(Appendix D)**, no significant bank erosion was evident at the crossing or upstream and downstream of the pipelines.

3.3.2 VSM Tilt

The VSM located within the channel of the Kachemach River were found to be generally plumb and adequately supporting the pipelines based on observations and measurements. Of the six VSM measured for tilt, the maximum tilt was measured to be 0.007 feet/foot for the operational VSM (1716) and 0.01600 feet/foot for the abandoned VSM (1715C). The tilt of each operational VSM was within the project tolerances of less than or equal to

0.005 feet/foot (1/16 inch/foot) with the exception of VSM 1714 and VSM 1716. The tilt of VSM 1714 and VSM 1716 exceeded the project tolerance by no more than 0.00200 feet/foot which is equal to the accuracy of the methods of the survey. Since the last monitoring event in 2006, the tilt of VSM 1714 has increased in the north/south and east/west orientations by 0.001 feet/foot and 0.00175 feet/foot, respectively. The tilt of VSM 1716 has also increased in the east/west direction by 0.0035 and decreased in the north/south direction by -0.0005 feet/foot. A summary of the 2008 Kachemach River VSM tilt survey results are presented in Table 3-5 (2008). Table 3-6 presents the difference in tilt measurements collected during the 2008 and 2006 monitoring events.

Table 3-5 Kachemach River VSM Tilt Measurement Results (2008)

VSM Number	Tilt Measurement Orientation (ft/ft)	
	North/South	East/West
1713	Not within Channel	
1714	0.00600 N	0.00300 W
Abandoned (1714A)	0.00700 S	0.01300 E
1715A	< 0.00125	0.00300 W
1715B	0.00200 N	0.00300 W
Abandoned (1715C)	< 0.00125	0.01600 E
1716	0.00700 S	0.00600 E
1717	Not within Channel	

Table 3-6 Kachemach River VSM Change in Tilt from 2008 to 2006

VSM Number	Tilt Measurement Orientation (ft/ft)	
	North/South	East/West
1713	Not within Channel	
1714	0.00100 N	0.00175 W
Abandoned (1714A)	0.00350 S	0.00300 W
1715A	no change	0.00175 W
1715B	0.00075 N	0.00050 W
Abandoned (1715C)	no change	0.00350 E
1716	-0.00050 S	0.00350 E
1717	Not within Channel	

3.3.3 VSM Settling and Jacking

LCMF has conducted a pile cap elevation survey annually since 2004. Based on their survey, the pile caps have generally experienced less than 0.1 feet of movement vertically. A summary of the LCMF surveying results for the Kachemach River crossing can be found in **Appendix D**.

3.3.4 VSM Scour

Based on summer monitoring observations and LCMF surveys, there were no signs of significant scour at the base of the VSM located within the channel or floodplain of the Kachemach River. The design scour limits for the main channel of the Kachemach River is 6.9 feet BPMSL. The greatest scour observed was located to the southwest of VSM 1715A at an elevation of approximately 24 feet BPMSL. A summary of the LCMF surveying results can be found in **Appendix D**.

3.3.5 Summary

The tilt of VSM 1714 and VSM 1716 exceeded the project tolerance of 0.005 feet/foot. The project tolerance exceedance was within the accuracy of the methods of the survey 0.002 feet/foot. From 2006 to 2008, the tilt of VSM 1714 increased in the north/south and east/west orientations while VSM 1716 decreased in the north/south direction and increased in the east/west direction. Based on visual observations, the VSM located in the Kachemach River channel are having no significant impact on bank erosion or channel scour, and the pipelines appear to be in good condition with no leaks.

3.4 Miluveach River

The Miluveach River crossing was evaluated by visual inspection, review of ground and aerial photography **(Photo A-16 through Photo A-19, Appendix A),** and field surveys. At the time of the inspection, flow was observed within the gravel channel bottom at a depth of generally less than one foot. Based on visual observation, flow from the 2008 spring breakup was confined to the main channel and did not appear to have reached the overbank regions adjacent to the river crossing.

3.4.1 Bank Erosion

Based on summer monitoring observations and LCMF stream bank surveys **(Appendix E)**, no significant bank erosion was evident at the crossing or upstream and downstream of the pipelines.

3.4.2 VSM Tilt

The VSM located within the channel of the Miluveach River were found to be generally plumb and adequately supporting the pipelines observations and measurements. Of the four VSM measured for tilt, the maximum tilt was measured to be 0.014 feet/foot at VSM 2048B. The only VSM that was less than or equal to project tolerances of 0.005 feet/foot (1/16 inch/foot) was VSM 2048A. The tilt of VSM 2047A and VSM 2047B exceeded the project tolerance by no more than 0.002 feet/foot which is equal to the accuracy of the methods of the survey. Since the last monitoring event in 2006, the tilt of VSM 2047A and 2047B have increased in the north/south direction by 0.00600 feet/foot and 0.00700 feet/foot, respectively, while the tilt of VSM 2048A has increased in the east/west direction by 0.00375 feet/foot. In both orientations, the tilt of VSM 2048B has also increased by 0.00575 feet/foot (north/south) and 0.0065 feet/foot (east/west). A summary of the Kachemach River VSM tilt survey results is presented in Table 3-7 (2008). Table 3-8 presents the difference in tilt measurements collected during the 2008 and 2006 monitoring events.

Table 3-7 Miluveach River VSM Tilt Measurement Results

VSM Number	Tilt Measurement Orientation (ft/ft)	
	North/South	East/West
2046	Not within Channel	
2047A	0.00600 N	< 0.00125
2047B	0.00700 S	< 0.00125
2048A	< 0.00125	0.00500 W
2048B	0.00600 S	0.01400 E
2049	Not within Channel	

Table 3-8 Miluveach River VSM Tilt Change in Tilt from 2008 to 2006

VSM Number	Tilt Measurement Orientation (ft/ft)	
	North/South	East/West
2046	Not within Channel	
2047A	0.00350 N	no change
2047B	0.00450 S	no change
2048A	no change	0.00375 W
2048B	0.00575 S	0.00650 E
2049	Not within Channel	

3.4.3 VSM Settling and Jacking

LCMF has conducted a pile cap elevation survey annually since 2004; based on their survey, the pile caps have generally experienced less than 0.2 feet of movement vertically. A summary of the LCMF surveying results for the Miluveach River crossing can be found in **Appendix E**.

3.4.4 VSM Scour

Based on summer monitoring observations and LCMF surveys, there were no signs of significant scour at the base of the VSM located within the channel or floodplain of the Miluveach River. The design scour limits for the main channel of the Miluveach River is 35.1 feet BPMSL. The greatest scour observed was located to the south of VSM 2048B at an elevation of approximately 44.25 feet BPMSL. A summary of the LCMF surveying results can be found in **Appendix E**.

3.4.5 Summary

The tilt of VSM 2047A and VSM 2047B exceeded the project tolerance of 0.005 feet/foot but did not exceed it beyond accuracy of the methods of the survey, 0.002 feet/foot. However, the tilt of VSM 2048B was measured to be more than twice the project tolerance (0.01400 feet/foot). From 2006 to 2008, the tilt of VSM 2048B increased the north/south and east/west orientations while the tilt of VSM 2047A and 2047B increased in the north/south direction and VSM 2048A increased in the east/west direction. Based on visual observations, the VSM located in the Miluveach River channel are having no significant impact on bank erosion or channel scour, and the pipelines appear to be in good condition with no leaks.

4.0 Conclusions

No significant erosion or scour occurred at the Alpine Pipeline System river crossing sites during the 2008 spring breakup. Floodwaters did not overtop any banks during the 2008 spring breakup. The condition of the VSM and pipelines was determined to be stable despite VSM tilt measurements being outside of the project tolerance at the Kachemach River and Miluveach River crossings. At the east and west bank HDD crossing sites, continuing natural erosion along the banks was noted to be within design estimates and is not negatively impacting the safe operation of the pipeline. No signs of pressure ridges, depressions, ponding, or cracking were evident over a length greater than 60 feet of the pipeline.

5.0 References

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Appendix A Photos

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Photo A-16 Miluveach River, June 3, 2008. Pipeline crossing post-breakup, looking north. A-9
Photo A-17 Miluveach River, July 15, 2008. VSM located in the river channel and left bank (foreground), looking east. A-10
Photo A-18 Miluveach River, July 15, 2008. VSM located in the river channel and left bank, looking north. A-10
Photo A-19 Miluveach River, July 15, 2008. VSM located in the river channel and right bank, looking west. A-11
Photo A-20 Miluveach River, August 27, 2008. Pipeline crossing, looking north. A-11

Photo A-1 HDD West, June 3, 2008. HDD West three days after peak stage, looking west.

Photo A-2 HDD West, July 15, 2008. Thermosyphons, facilities, and pad at HDD West, looking west.

Photo A-3 HDD West, July 15, 2008. Thermosyphons, facilities, and pad at HDD West, looking southwest.

Photo A-4 HDD West, July 15, 2008. Bluff and thermosyphon at HDD West, looking west from Colville River.

Photo A-5 HDD West, July 15, 2008. Bluff, thermosyphons, facilities, and pad at HDD West, looking west.

Photo A-6 HDD East, June 3, 2008. HDD East three days after peak stage, looking east.

Photo A-7 HDD East, July 15, 2008. Bluff, thermosyphons, and pad at HDD East, looking southeast.

Photo A-8 HDD East, July 15, 2008. Thermosyphons, pad, and pipeline at HDD East, looking east.

Photo A-9 HDD East, July 15, 2008. Thermosyphons and polygon trough at HDD East, looking west.

Photo A-10 HDD East, July 15, 2008. Bluff and northern thermosyphons at HDD East, looking north.

Photo A-11 Kachemach River, June 3, 2008. Pipeline crossing post-breakup, looking north.

Photo A-12 Kachemach River, July 15, 2008. VSM located in the river channel, looking west.

Photo A-13 Kachemach River, July 15, 2008. Left Bank, looking west.

Photo A-14 Kachemach River, July 15, 2008. Downstream reach, looking north.

Photo A-15 Kachemach River, August 27, 2008. Pipeline crossing, looking north.

Photo A-16 Miluveach River, June 3, 2008. Pipeline crossing post-breakup, looking north.

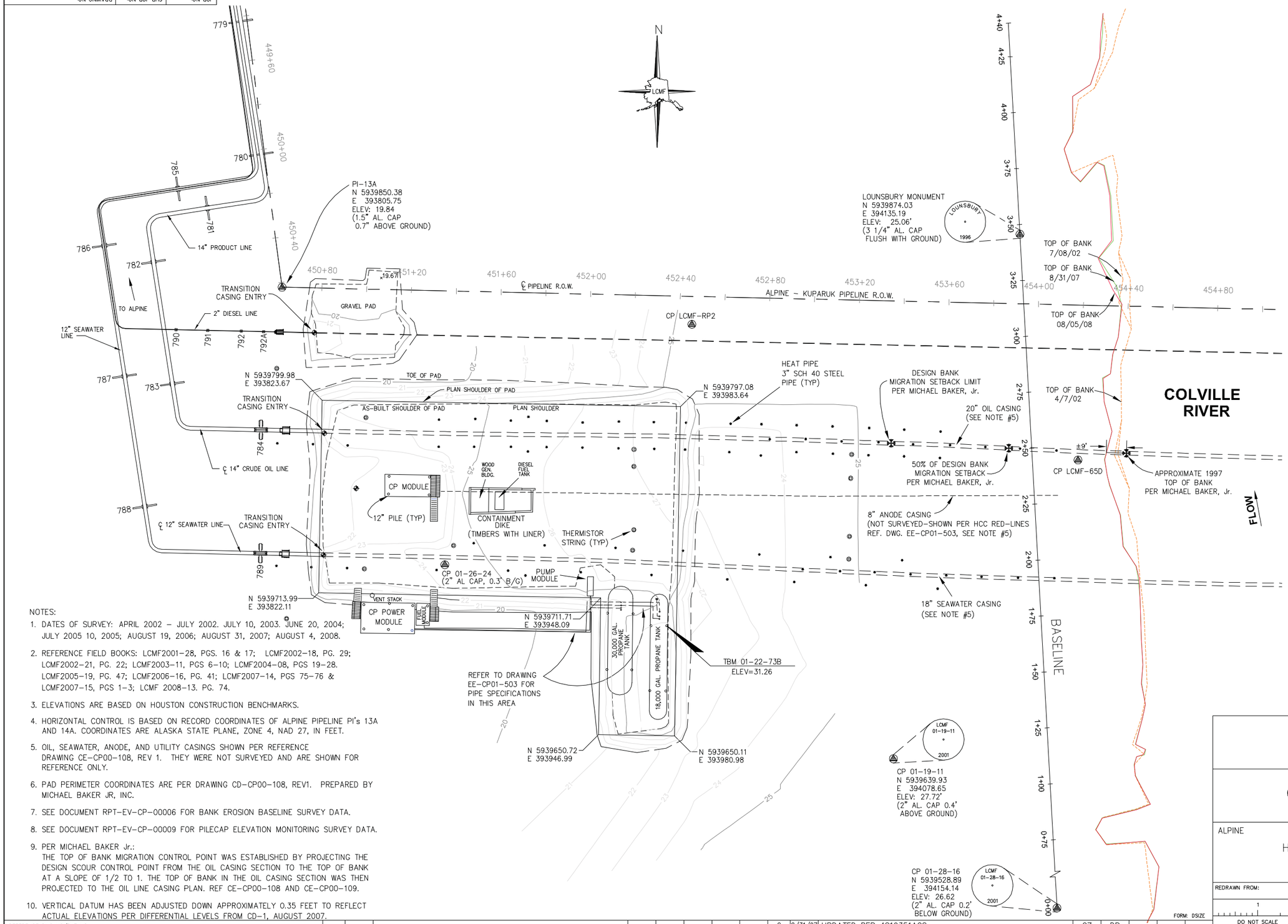
Photo A-17 Miluveach River, July 15, 2008. VSM located in the river channel and left bank (foreground), looking east.

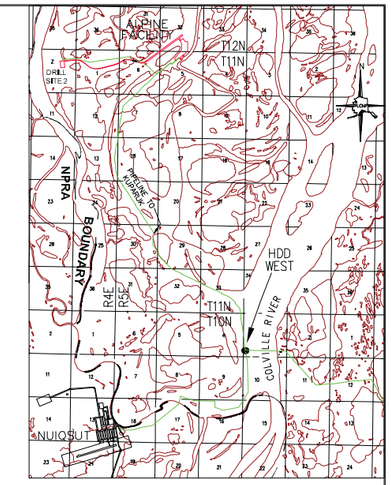
Photo A-18 Miluveach River, July 15, 2008. VSM located in the river channel and left bank, looking north.

Photo A-19 Miluveach River, July 15, 2008. VSM located in the river channel and right bank, looking west.

Photo A-20 Miluveach River, August 27, 2008. Pipeline crossing, looking north.

Appendix B HDD West Survey Data





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 8/31/07
- TOP OF BANK 8/05/08

NOTES:

1. DATES OF SURVEY: APRIL 2002 – JULY 2002. JULY 10, 2003. JUNE 20, 2004; JULY 2005 10, 2005; AUGUST 19, 2006; AUGUST 31, 2007; AUGUST 4, 2008.
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.
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.

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ALPINE | MODULE: CP00 | UNIT: CP

HDD BANK EROSION MONITORING
HDD SITE – WEST
ALPINE FACILITY

REDRAWN FROM:
CONSTRUCTION SHEET OF

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:
	APPROVAL: ML		CADD FILE NO. 01-12-05-1WEST
JOB NO: 02-205	SUB JOB NO:	DRAWING NO: CE-CP00-143	PART: 1 OF 1 / REV: 7

FORM: DSIZE

REFERENCE DWG NO/SHT NO:

REV	DATE	REVISIONS	BY	CHK	JOB ENGR	PROJ ENGR	CUST APP
7	8/7/08	UPDATED PER 5538034ACS	CZ	GD			

REV	DATE	REVISIONS	BY	CHK	JOB ENGR	PROJ ENGR	CUST APP
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			

Alpine CP 00
HDD West Site
Streambank Monitor

Pile Cap Designation	Pile Cap Monitor - Bottom of Pile Cap Locations See Drawing CE-CP00-143 Rev 7 for Survey Baseline Location					Description
	6/20/2004	8/4/2005	8/19/2006	8/31/2007	8/7/2008	8/30/2007
W-01 NE Cor	26.389	26.389	26.391	26.040	26.039	Bottom of Pile Cap (In Feet)
W-02 NE Cor	26.391	26.390	26.390	26.042	26.039	Bottom of Pile Cap (In Feet)
W-03 NE Cor	26.391	26.391	26.394	26.042	26.040	Bottom of Pile Cap (In Feet)
W-04 NE Cor	26.389	26.388	26.390	26.036	26.036	Bottom of Pile Cap (In Feet)
W-05 NE Cor	26.383	26.378	26.386	26.032	26.031	Bottom of Pile Cap (In Feet)
W-06 NE Cor	26.395	26.391	26.394	26.042	26.039	Bottom of Pile Cap (In Feet)
W-07 NE Cor	26.397	26.393	26.402	26.048	26.046	Bottom of Pile Cap (In Feet)
W-08 NE Cor	26.403	26.401	26.404	26.050	26.048	Bottom of Pile Cap (In Feet)
W-09 NE Cor	31.291	31.294	31.292	30.932	30.934	Bottom of Pile Cap (In Feet)
W-10 NE Cor	31.266	31.261	31.261	30.906	30.905	Bottom of Pile Cap (In Feet)
W-11 NE Cor	31.299	31.300	31.288	30.936	30.941	Bottom of Pile Cap (In Feet)
W-12 NE Cor	31.301	31.301	31.298	30.936	30.939	Bottom of Pile Cap (In Feet)
W-13 NE Cor	27.377	27.373	27.383	27.035	27.031	Bottom of Pile Cap (In Feet)
W-14 NE Cor	27.428	27.423	27.433	27.081	27.084	Bottom of Pile Cap (In Feet)
W-15 NE Cor	27.413	27.407	27.407	27.067	27.070	Bottom of Pile Cap (In Feet)
W-16 NE Cor	27.389	27.385	27.392	27.058	27.042	Bottom of Pile Cap (In Feet)
W-17 NE Cor	28.940	28.947	28.944	28.582	28.587	Bottom of Pile Cap (In Feet)
W-18 NE Cor	28.965	28.972	28.968	28.607	28.612	Bottom of Pile Cap (In Feet)
W-19 NE Cor	28.959	28.962	28.960	28.598	28.600	Bottom of Pile Cap (In Feet)
W-20 NE Cor	28.964	28.965	28.965	28.607	28.608	Bottom of Pile Cap (In Feet)

Note: Vertical Datum has been Adjusted Down approximately 0.35 feet to reflect actual elevations per Differential Levels from CD-1, ran August 2007.

Alpine CP 00
HDD West Site
Streambank Monitor

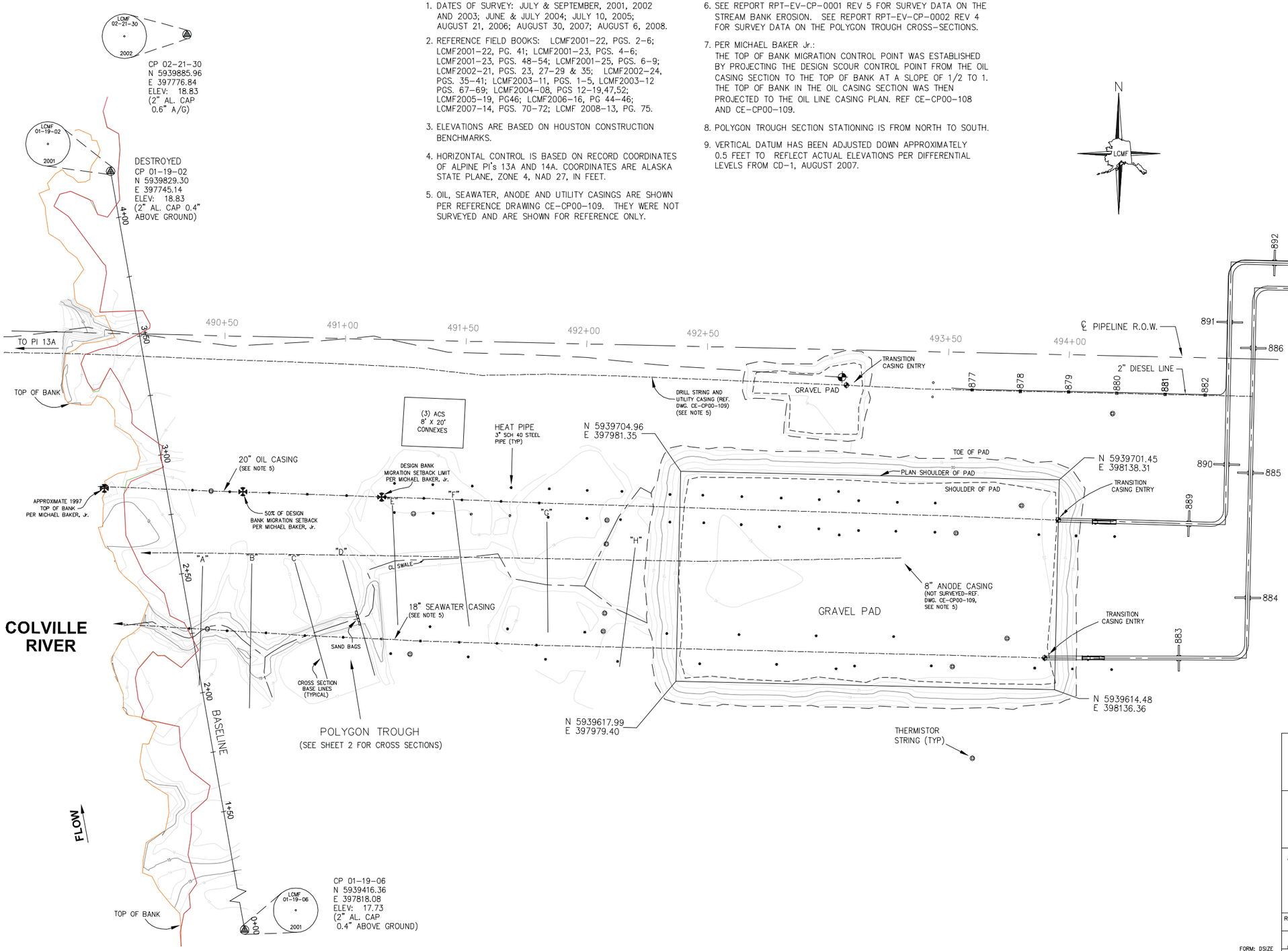
Baseline Station	Streambank Monitor - Top of Bank Locations							Description
	See Drawing CE-CP00-143 Rev 7 for Survey Baseline Location							
	7/8/2002	7/10/2003	6/20/2004	7/10/2005	8/19/2006	8/31/2007	8/5/2008	
0+00	39.5	39.5	39.5	39.3	39.3	39.3	39.3	Baseline Offset (In Feet)
0+05	39.3	39.3	39.3	37.6	37.6	37.6	37.6	Baseline Offset (In Feet)
0+10	39.4	39.4	39.4	38.5	38.5	38.5	38.5	Baseline Offset (In Feet)
0+20	45.8	45.8	45.8	41.9	41.9	41.9	41.9	Baseline Offset (In Feet)
0+25	41.5	41.5	41.5	39.1	39.1	39.1	39.1	Baseline Offset (In Feet)
0+30	37.9	37.9	37.9	37.9	37.9	37.9	37.9	Baseline Offset (In Feet)
0+40	41.9	41.9	41.9	41.9	41.9	41.9	41.9	Baseline Offset (In Feet)
0+50	42.0	42.0	42.0	42.0	42.0	44.5	44.5	Baseline Offset (In Feet)
0+60	41.4	41.4	41.4	41.4	41.4	46.4	46.4	Baseline Offset (In Feet)
0+70	40.7	40.7	40.7	40.7	40.7	41.9	41.9	Baseline Offset (In Feet)
0+75	21.4	21.4	21.4	21.4	21.4	21.4	21.4	Baseline Offset (In Feet)
0+80	20.1	20.1	20.1	20.1	20.1	20.1	20.1	Baseline Offset (In Feet)
0+85	29.0	29.0	29.0	29.0	29.0	29.7	29.7	Baseline Offset (In Feet)
0+90	42.8	42.8	42.8	42.8	42.8	42.8	42.8	Baseline Offset (In Feet)
1+00	38.7	38.7	38.7	38.7	38.7	38.7	38.7	Baseline Offset (In Feet)
1+05	37.9	37.9	37.9	37.9	37.9	37.9	37.9	Baseline Offset (In Feet)
1+10	41.4	41.4	41.4	39.2	39.2	39.2	39.2	Baseline Offset (In Feet)
1+15	38.2	38.2	38.2	38.2	38.2	39.9	39.9	Baseline Offset (In Feet)
1+20	39.4	39.4	39.4	39.4	39.4	40.4	40.4	Baseline Offset (In Feet)
1+25	41.4	41.4	41.4	41.4	41.4	41.4	41.4	Baseline Offset (In Feet)
1+30	43.0	43.0	43.0	43.0	43.0	43.0	43.0	Baseline Offset (In Feet)
1+35	44.2	44.2	44.2	43.8	43.8	43.8	43.8	Baseline Offset (In Feet)
1+40	45.3	45.3	45.3	43.4	43.4	43.4	43.4	Baseline Offset (In Feet)
1+45	45.7	45.7	45.7	43.4	43.4	43.4	43.4	Baseline Offset (In Feet)
1+50	45.7	45.7	45.7	43.9	43.9	43.9	43.9	Baseline Offset (In Feet)
1+60	45.8	45.8	44.9	44.2	44.3	44.3	44.3	Baseline Offset (In Feet)
1+65	45.9	45.9	45.0	44.3	44.4	44.4	44.4	Baseline Offset (In Feet)
1+75	45.9	45.9	45.9	44.4	44.4	44.4	44.4	Baseline Offset (In Feet)
1+90	45.0	44.1	44.1	44.1	44.1	44.1	44.1	Baseline Offset (In Feet)
2+00	44.7	41.8	41.8	41.1	40.4	40.4	40.4	Baseline Offset (In Feet)
2+05	44.6	40.4	40.4	39.7	38.4	38.4	38.4	Baseline Offset (In Feet)
2+10	43.7	40.4	40.2	40.2	38.3	38.3	38.3	Baseline Offset (In Feet)
2+20	41.5	41.5	40.6	40.6	37.5	37.5	37.5	Baseline Offset (In Feet)
2+25	42.0	42.0	40.7	40.7	35.9	35.9	35.9	Baseline Offset (In Feet)
2+30	42.3	42.2	40.9	40.9	34.2	34.2	34.2	Baseline Offset (In Feet)
2+35	40.4	40.4	40.4	40.4	33.1	33.1	33.1	Baseline Offset (In Feet)
2+45	36.8	36.8	36.8	36.8	32.7	32.7	32.7	Baseline Offset (In Feet)
2+50	38.1	37.8	37.5	37.1	34.3	34.3	34.3	Baseline Offset (In Feet)
2+55	39.3	38.2	38.2	37.4	35.9	35.9	35.9	Baseline Offset (In Feet)
2+60	40.7	40.7	40.7	38.3	35.1	35.1	35.1	Baseline Offset (In Feet)
2+65	40.9	40.9	40.6	39.2	34.1	34.1	34.1	Baseline Offset (In Feet)
2+70	41.1	41.1	40.3	40.3	33.3	33.3	33.3	Baseline Offset (In Feet)
2+75	41.3	41.3	39.9	39.9	33.3	33.3	33.3	Baseline Offset (In Feet)
2+80	41.5	41.5	39.4	39.4	34.6	34.6	34.6	Baseline Offset (In Feet)
2+85	41.7	41.7	39.6	39.6	37.8	37.8	37.8	Baseline Offset (In Feet)
2+90	43.5	41.5	40.8	40.8	38.5	38.5	38.5	Baseline Offset (In Feet)
3+00	47.0	46.1	46.1	44.8	41.6	41.6	41.6	Baseline Offset (In Feet)
3+10	43.6	43.6	43.6	43.6	43.2	43.2	43.2	Baseline Offset (In Feet)
3+15	42.9	42.9	42.9	42.3	42.9	42.9	42.0	Baseline Offset (In Feet)
3+25	44.6	44.6	44.4	42.3	38.9	38.9	37.4	Baseline Offset (In Feet)
3+30	44.0	44.0	43.2	42.7	36.2	36.2	35.4	Baseline Offset (In Feet)
3+35	43.4	43.4	43.4	42.0	36.4	36.4	35.8	Baseline Offset (In Feet)
3+40	44.8	44.0	44.0	41.3	41.1	41.1	40.1	Baseline Offset (In Feet)
3+45	45.2	44.2	44.2	42.8	41.5	41.5	40.7	Baseline Offset (In Feet)
3+50	44.9	44.2	44.2	42.3	41.4	41.4	40.8	Baseline Offset (In Feet)
3+60	44.1	44.1	44.1	43.4	41.4	41.4	41.4	Baseline Offset (In Feet)
3+70	44.7	42.8	41.8	41.0	26.0	26.0	26.0	Baseline Offset (In Feet)
3+75	23.6	23.6	23.6	23.6	23.6	23.6	23.6	Baseline Offset (In Feet)
3+85	23.1	23.1	23.1	23.1	23.0	23.0	23.0	Baseline Offset (In Feet)
4+00	28.4	28.4	28.4	26.5	26.5	26.5	26.5	Baseline Offset (In Feet)
4+10	37.1	37.1	37.1	33.0	33.0	33.0	33.0	Baseline Offset (In Feet)
4+25	42.2	42.2	42.2	40.4	40.3	40.2	40.0	Baseline Offset (In Feet)
4+30	43.2	43.2	42.1	41.2	41.1	41.1	40.5	Baseline Offset (In Feet)
4+35	43.1	43.1	41.9	41.9	41.8	41.8	41.1	Baseline Offset (In Feet)
4+40	42.5	42.5	42.1	42.1	42.1	42.1	42.1	Baseline Offset (In Feet)

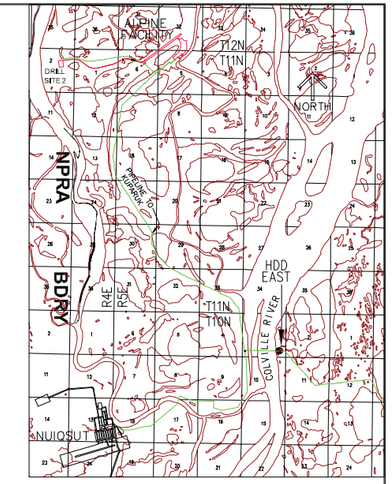
Appendix C HDD East Survey Data

JOB NO:	SUB JOB NO:	DRAWING NO:
02-205		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.
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.
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 8/30/07
- TOP OF BANK 8/6/08

GRAPHIC SCALE

20 0 10 20 40

(IN FEET)
1 inch = 20 ft.

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Anchorage, Alaska (907) 273-1830
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

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SCALE: 1"=20'	CHECKED: JZ		CC NO:
	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: 7

FORM: DSIZE

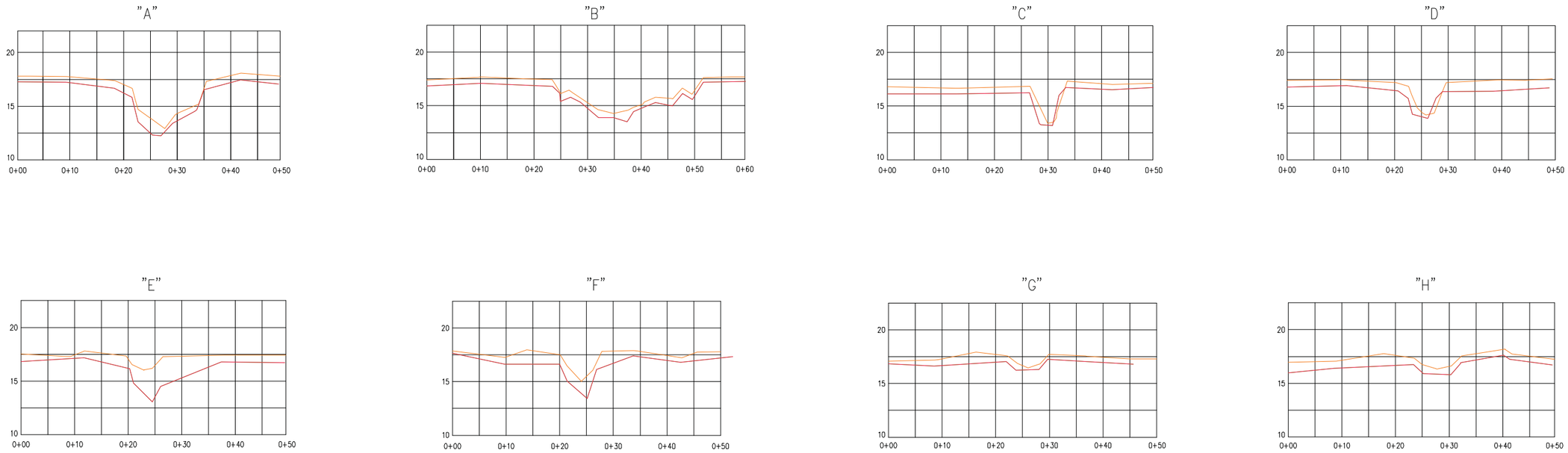
REFERENCE DWG NO/SHT NO:
CE-CP00-109
PD-CP00-130 SHEET 1

REV	DATE	REVISIONS	BY	CHK	JOB ENGR	PROJ ENGR	CUST APP
7	8/6/08	UPDATED PER 5538034ACS	CZ	GD			
6	8/30/07	UPDATED PER 4810351ACS	CZ	DB			
5	8/25/06	UPDATED PER 411680BACS	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
0	7/31/01	ISSUED PER A01007ACS	RLW	JZ			CD

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

CROSS SECTIONS, POLYGON TROUGH

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

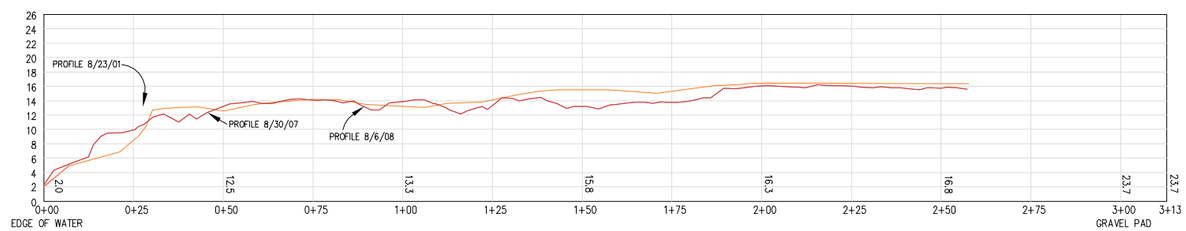


LEGEND

- CROSS SECTION 9/8/03
- CROSS SECTION 8/30/07
- CROSS SECTION 8/06/08

CENTERLINE PROFILE, POLYGON TROUGH

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



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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

FORM: DSIZE

DO NOT SCALE — ABOVE SCALE FOR REFERENCE ONLY

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

REV	DATE	REVISIONS	BY	CHK	JOB ENGR	PROJ ENGR	CUST APP
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

DATE: 12/31/03	DRAWN: GD/CZ	DESIGN:	ECM NO: 2094387ACS
	CHECKED: JZ		CC NO:
SCALE: 1"=20'	APPROVAL: COLEGROVE/KANADY 01-12-05-1EAST		CADD FILE NO.
JOB NO: 02-205 / SUB JOB NO:	DRAWING NO: CE-CP00-134	PART: 2 OF 2	REV: 6

Alpine CP 00

HDD East Site

Streambank Monitor

Baseline Station	Streambank Monitor - Top of Bank Locations								Description
	See Drawing CE-CP00-134 Rev 7 for Survey Baseline Stations								
	9/8/2001	9/12/2002	9/8/2003	6/19/2004	7/10/2005	8/21/2006	8/30/2007	8/6/2008	
0+10	N/A	-25.3	-25.3	-25.3	-25.3	-25.3	-25.3	-25.3	Baseline Offset (In Feet)
0+20	N/A	-32.1	-30.9	-30.9	-30.9	-30.9	-30.9	-30.9	Baseline Offset (In Feet)
0+25	N/A	-38.2	-38.2	-38.2	-37.0	-37.0	-37.0	-37.0	Baseline Offset (In Feet)
0+30	N/A	-41.1	-41.1	-41.1	-36.9	-36.9	-36.9	-36.9	Baseline Offset (In Feet)
0+40	N/A	-37.7	-37.7	-37.7	-36.5	-35.1	-35.1	-35.1	Baseline Offset (In Feet)
0+50	N/A	-30.3	-30.3	-30.3	-30.3	-30.3	-30.3	-30.3	Baseline Offset (In Feet)
0+60	N/A	-28.0	-27.5	-27.5	-27.5	-27.5	-27.5	-27.5	Baseline Offset (In Feet)
0+65	N/A	-39.8	-23.9	-23.9	-23.4	-23.4	-23.4	-23.4	Baseline Offset (In Feet)
0+70	-31.2	-27.7	-20.0	-20.0	-16.2	-16.2	-16.2	-16.2	Baseline Offset (In Feet)
0+75	-27.1	-27.2	-21.1	-21.0	-18.0	-18.0	-18.0	-18.0	Baseline Offset (In Feet)
0+80	-26.5	-27.5	-22.4	-22.4	-22.4	-22.4	-22.4	-22.4	Baseline Offset (In Feet)
0+90	-29.2	-29.2	-29.2	-27.8	-27.8	-27.2	-27.2	-27.2	Baseline Offset (In Feet)
1+00	-26.8	-26.7	-26.7	-26.7	-26.7	-26.7	-26.7	-26.7	Baseline Offset (In Feet)
1+10	-25.4	-25.6	-23.9	-23.9	-23.9	-23.9	-23.9	-23.9	Baseline Offset (In Feet)
1+15	-27.6	-24.5	-20.8	-20.8	-20.2	-20.2	-20.2	-20.2	Baseline Offset (In Feet)
1+20	-30.5	-22.6	-21.4	-21.4	-18.2	-18.2	-18.2	-18.2	Baseline Offset (In Feet)
1+25	-32.8	-23.0	-18.1	-18.1	-16.4	-16.4	-16.4	-16.4	Baseline Offset (In Feet)
1+30	-36.1	-28.0	-17.3	-17.3	-17.0	-17.0	-17.0	-17.0	Baseline Offset (In Feet)
1+40	-34.9	-20.6	-17.1	-17.1	-15.8	-15.8	-15.8	-15.8	Baseline Offset (In Feet)
1+45	-28.8	-16.5	-16.1	-16.1	-14.3	-14.3	-14.3	-14.3	Baseline Offset (In Feet)
1+50	-23.8	-15.6	-13.8	-13.8	-13.4	-13.4	-13.4	-13.4	Baseline Offset (In Feet)
1+55	-22.2	-14.5	-11.5	-11.5	-7.1	-7.1	-7.1	-7.1	Baseline Offset (In Feet)
1+60	-21.6	-15.1	-9.0	-9.0	-4.2	-4.2	-4.2	-4.2	Baseline Offset (In Feet)
1+65	-26.5	-24.9	-11.4	-9.7	-6.9	-6.9	-6.9	-6.9	Baseline Offset (In Feet)
1+70	-30.1	-29.7	-15.7	-13.0	-10.8	-10.8	-10.8	-10.8	Baseline Offset (In Feet)
1+75	-30.5	-29.6	-16.1	-14.4	-12.0	-12.0	-12.0	-12.0	Baseline Offset (In Feet)
1+80	-29.4	-24.6	-13.9	-13.9	-12.8	-12.8	-12.8	-12.8	Baseline Offset (In Feet)
1+85	-24.5	-20.5	-12.7	-12.7	-12.3	-12.3	-12.3	-12.3	Baseline Offset (In Feet)
1+90	-21.5	-21.9	-16.9	-16.9	-16.9	-16.9	-16.9	-16.9	Baseline Offset (In Feet)
1+95	-28.5	-27.7	-27.7	-27.7	-27.7	-26.3	-26.3	-26.3	Baseline Offset (In Feet)
2+00	-33.4	-27.8	-27.8	-27.8	-27.8	-26.4	-26.4	-26.4	Baseline Offset (In Feet)
2+05	-32.6	-27.3	-27.3	-27.3	-27.3	-26.8	-26.8	-26.8	Baseline Offset (In Feet)
2+10	-33.5	-26.0	-26.0	-26.0	-26.0	-26.0	-26.0	-26.0	Baseline Offset (In Feet)
2+15	-34.5	-23.2	-23.2	-23.2	-23.2	-23.2	-23.2	-23.7	Baseline Offset (In Feet)
2+20	-34.9	-21.0	-21.0	-20.4	-17.4	-17.3	-17.3	-17.3	Baseline Offset (In Feet)
2+25	-31.2	-18.4	-8.0	-5.2	-5.2	-5.2	-1.0	-1.0	Baseline Offset (In Feet)
2+30	-23.2	-13.7	-2.4	-2.4	-2.4	-2.4	-2.4	-2.4	Baseline Offset (In Feet)
2+35	-18.8	-8.9	-7.0	-7.1	-7.1	-7.1	-7.1	-7.1	Baseline Offset (In Feet)
2+40	-15.9	-8.3	-8.3	-8.3	-8.3	-8.3	-8.3	-8.2	Baseline Offset (In Feet)
2+50	-21.0	-14.7	-14.6	-14.6	-14.6	-13.6	-13.3	-13.3	Baseline Offset (In Feet)
2+60	-26.0	-20.5	-20.6	-20.5	-19.8	-17.7	-17.7	-17.7	Baseline Offset (In Feet)
2+70	-30.0	-25.5	-20.8	-20.8	-20.8	-20.6	-20.0	-20.0	Baseline Offset (In Feet)
2+75	-30.7	-26.1	-20.9	-20.9	-20.8	-19.7	-19.7	-19.7	Baseline Offset (In Feet)
2+85	-26.8	-22.8	-22.8	-22.8	-20.4	-17.9	-17.9	-17.9	Baseline Offset (In Feet)
2+90	-24.5	-21.4	-21.4	-21.3	-21.3	-17.3	-16.5	-15.1	Baseline Offset (In Feet)
3+00	-8.7	-9.0	-6.0	-6.0	0.3	0.3	0.3	0.3	Baseline Offset (In Feet)
3+10	-11.0	-11.4	-11.4	-11.4	-6.9	-5.2	-5.2	-5.2	Baseline Offset (In Feet)
3+15	-16.2	-16.0	-15.9	-15.9	-10.5	-9.6	-9.6	-9.6	Baseline Offset (In Feet)
3+20	-15.8	-11.9	-11.9	-11.8	-11.8	-8.9	-8.9	-8.9	Baseline Offset (In Feet)
3+25	-17.3	-11.4	-11.1	-11.1	-10.3	-9.5	-9.5	-9.5	Baseline Offset (In Feet)
3+30	-35.0	-23.4	-11.5	-11.5	-11.2	-11.2	-11.2	-11.2	Baseline Offset (In Feet)
3+35	-35.0	-23.8	-23.5	-23.5	-23.5	-23.5	-23.5	-23.5	Baseline Offset (In Feet)
3+40	-33.9	-25.4	-25.4	-25.4	-25.4	-25.4	-25.4	-25.4	Baseline Offset (In Feet)
3+45	-32.4	-27.3	-27.4	-26.4	-24.1	-24.1	-24.1	-24.1	Baseline Offset (In Feet)
3+52	-10.4	-9.9	-8.4	-8.4	-8.4	2.4	2.4	2.4	Baseline Offset (In Feet)
3+60	-12.4	-11.3	-11.2	-10.8	-10.8	3.0	3.0	3.0	Baseline Offset (In Feet)
3+65	-18.9	-18.7	-18.7	-18.4	-18.4	-3.3	-13.8	-13.8	Baseline Offset (In Feet)
3+70	-23.8	-24.0	-24.0	-24.1	-21.2	-9.6	-11.9	-11.9	Baseline Offset (In Feet)
3+75	-23.3	-20.2	-20.2	-20.2	-19.3	-11.3	-10.1	-10.1	Baseline Offset (In Feet)
3+80	-19.3	-12.9	-12.9	-11.6	-11.6	-9.0	-9.0	-9.0	Baseline Offset (In Feet)
3+85	-19.5	-13.2	-12.3	-12.0	-12.0	-11.1	-11.1	-11.1	Baseline Offset (In Feet)
3+95	-25.9	-22.4	-22.4	-21.9	-21.9	-16.1	-16.1	-16.1	Baseline Offset (In Feet)
4+00	-29.7	-21.2	-21.2	-21.9	-21.9	-18.6	-18.6	-19.6	Baseline Offset (In Feet)
4+05	-29.4	-19.5	-19.5	-19.5	-19.5	-21.7	-21.7	-21.7	Baseline Offset (In Feet)
4+15	-30.6	2.7	2.6	2.6	2.6	2.7	2.7	2.5	Baseline Offset (In Feet)
4+25	-5.4	5.1	5.1	5.1	5.1	5.1	5.1	5.1	Baseline Offset (In Feet)
4+35	-5.4	4.4	4.5	4.5	4.5	4.5	4.5	4.5	Baseline Offset (In Feet)
4+45	N/A	1.3	1.2	1.9	1.9	1.9	1.9	1.9	Baseline Offset (In Feet)
4+50	N/A	1.9	4.1	4.1	4.1	4.1	4.1	4.1	Baseline Offset (In Feet)

Alpine CP 00

HDD East Site

Subsidence Monitor - Seawater Line

Baseline Station	Point Description	Subsidence Monitor - Cross-Section A See Drawing CE-CP00-134 Rev 6 for Survey Cross-Section Locations								Description
		9/8/2001	9/14/2002	9/8/2003	7/9/2004	7/28/2005	8/21/2006	8/30/2007	8/7/2008	
0+00	Tundra	18.0	17.8	17.8	17.7	17.9	18.0	17.3	17.3	Elevation (In Feet)
0+09	Tundra	18.0	17.8	17.8	17.7	17.8	17.9	17.2	17.3	Elevation (In Feet)
0+18	Tundra	17.5	17.5	17.4	17.2	17.4	17.4	16.7	16.7	Elevation (In Feet)
0+21	Top Bank	16.7	16.5	16.8	16.4	16.6	16.6	15.8	15.9	Elevation (In Feet)
0+22.5	Gradebreak	15.4	14.8	14.8	14.8	14.6	14.4	13.5	13.6	Elevation (In Feet)
0+25	Toe Bank	13.9	13.6	13.7	13.0	13.3	13.0	12.3	12.3	Elevation (In Feet)
0+27	CL Swale	13.5	12.5	13.1	11.7	12.2	12.8	12.3	12.0	Elevation (In Feet)
0+29	Toe Bank	13.5	14.2	14.5	13.9	14.1	14.0	13.4	13.5	Elevation (In Feet)
0+34	Gradebreak	15.6	15.2	15.5	14.8	15.3	15.3	14.6	14.6	Elevation (In Feet)
0+35	Top Bank	17.6	17.4	17.4	17.6	17.2	17.2	16.5	16.5	Elevation (In Feet)
0+42	Tundra	18.4	18.1	18.1	18.0	18.1	18.1	17.5	17.5	Elevation (In Feet)
0+50	Tundra	18.1	17.8	17.8	17.7	17.8	17.8	17.1	17.1	Elevation (In Feet)

Baseline Station	Point Description	Subsidence Monitor - Cross-Section B See Drawing CE-CP00-134 Rev 6 for Survey Cross-Section Locations								Description
		9/8/2001	9/14/2002	9/8/2003	7/9/2004	7/28/2005	8/21/2006	8/30/2007	8/7/2008	
0+00	Tundra	17.6	17.2	17.4	17.5	17.4	17.5	16.8	16.9	Elevation (In Feet)
0+10	Tundra	18.0	17.7	17.7	17.7	17.7	17.8	17.1	17.1	Elevation (In Feet)
0+23	Tundra	17.6	17.3	17.4	17.3	17.4	17.5	16.8	16.8	Elevation (In Feet)
0+25	Top of Bank	17.2	16.0	16.0	15.9	16.0	16.1	15.4	15.4	Elevation (In Feet)
0+27	Gradebreak	16.6	16.5	16.5	16.4	16.4	16.5	15.8	15.7	Elevation (In Feet)
0+32	Toe Bank	14.4	14.1	14.5	14.5	14.7	14.6	13.9	13.9	Elevation (In Feet)
0+35	CL Swale	14.3	13.7	14.2	14.2	14.6	14.6	13.9	13.9	Elevation (In Feet)
0+37	Toe Bank	14.2	13.5	14.4	13.7	14.4	14.5	13.5	13.8	Elevation (In Feet)
0+38	Gradebreak		14.9	14.9	14.9	15.0	15.1	14.4	14.5	Elevation (In Feet)
0+40	Gradebreak		14.0	15.4	15.4	15.5	15.5	14.9	14.9	Elevation (In Feet)
0+42	Gradebreak	16.1	15.6	15.8	15.8	15.9	15.9	15.3	15.2	Elevation (In Feet)
0+49	Gradebreak	16.2	16.0	16.0	16.0	16.2	16.2	15.6	15.6	Elevation (In Feet)
0+52	Top Bank	17.6	17.6	17.7	17.6	17.7	17.8	17.2	17.2	Elevation (In Feet)
0+60	Tundra	17.8	17.7	17.7	17.6	17.8	17.9	17.2	16.9	Elevation (In Feet)

Baseline Station	Point Description	Subsidence Monitor - Cross-Section C See Drawing CE-CP00-134 Rev 6 for Survey Cross-Section Locations								Description
		9/8/2001	9/14/2002	9/8/2003	7/9/2004	7/28/2005	8/21/2006	8/30/2007	8/7/2008	
0+00	Tundra	16.9	16.8	16.8	16.7	16.7	16.8	16.1	16.1	Elevation (In Feet)
0+13	Tundra	16.7	16.6	16.7	16.6	16.7	16.8	16.1	16.2	Elevation (In Feet)
0+27	Top Bank	16.8	16.8	16.8	16.8	16.8	16.9	16.2	16.2	Elevation (In Feet)
0+29	Toe Bank	12.9	12.4	13.2	13.5	13.7	13.8	13.2	13.5	Elevation (In Feet)
0+31	Toe Bank	13.9	13.4	13.6	13.5	13.6	13.9	13.2	13.3	Elevation (In Feet)
0+32	Gradebreak	16.7	N/A	16.7	16.6	16.7	16.7	16.0	16.0	Elevation (In Feet)
0+33	Top Bank	17.5	17.2	17.2	17.1	17.1	17.5	16.7	16.7	Elevation (In Feet)
0+42	Tundra	17.1	16.9	16.9	17.0	17.0	17.1	16.5	16.7	Elevation (In Feet)
0+50	Tundra	17.2	17.0	17.2	17.1	17.2	17.3	16.7	16.8	Elevation (In Feet)

Baseline Station	Point Description	Subsidence Monitor - Cross-Section D See Drawing CE-CP00-134 Rev 6 for Survey Cross-Section Locations								Description
		9/8/2001	9/14/2002	9/8/2003	7/9/2004	7/28/2005	8/21/2006	8/30/2007	8/7/2008	
0+00	Tundra	17.6	17.3	17.5	17.5	17.4	17.5	16.8	16.9	Elevation (In Feet)
0+10	Tundra	17.9	17.6	17.6	17.6	17.6	17.6	16.9	16.9	Elevation (In Feet)
0+20	Gradebreak	17.6	16.6	NA	NA	17.2	17.2	16.4	16.5	Elevation (In Feet)
0+22	Top Bank	16.7	16.6	16.8	16.8	16.5	16.5	15.7	15.7	Elevation (In Feet)
0+24	Toe Bank	14.7	14.3	14.8	14.8	13.9	14.9	14.2	14.5	Elevation (In Feet)
0+25	CL Swale	14.2	13.7	14.1	14.1	13.7	14.0	13.4	13.9	Elevation (In Feet)
0+27	Toe Bank	14.6	14.0	14.2	14.2	16.2	16.5	15.8	15.8	Elevation (In Feet)
0+29	Top Bank	17.4	16.9	17.1	17.0	17.0	17.0	16.4	16.5	Elevation (In Feet)
0+38	Tundra	17.7	17.3	17.3	17.2	17.2	17.1	16.4	16.4	Elevation (In Feet)
0+50	Tundra	17.6	17.3	16.8	17.4	17.4	17.4	16.7	16.8	Elevation (In Feet)

Note: Vertical datum has been adjusted down (-) approximately 0.50 feet to reflect actual elevations 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 See Drawing CE-CP00-134 Rev 6 for Survey Cross-Section Locations								Description
		9/8/2003	7/9/2004	7/28/2005	8/21/2006	8/30/2007	8/7/2008	Future	Future	
0+00	Tundra	17.5	17.5	17.4	17.5	16.8	16.8			Elevation (In Feet)
0+9	Tundra	17.3	17.3	17.3	17.8	17.1	N/A			Elevation (In Feet)
0+12	Gradebreak	17.8	17.8	17.4	17.9	17.2	17.3			Elevation (In Feet)
0+20	Top Bank	17.3	17.3	17.3	17.3	16.2	15.8			Elevation (In Feet)
0+21	Toe Bank	16.5	16.5	16.5	16.2	14.8	14.3			Elevation (In Feet)
0+23	CL Swale	16.0	16.0	16.0	14.7	13.8	13.2			Elevation (In Feet)
0+24	Toe Bank	16.2	16.4	16.3	14.8	13.1	13.8			Elevation (In Feet)
0+27	Top Bank	17.3	17.4	17.4	16.3	14.5	14.5			Elevation (In Feet)
0+38	Tundra	17.4	17.4	17.5	17.5	16.8	16.8			Elevation (In Feet)
0+49	Tundra	17.4	17.4	17.4	17.4	16.7	16.8			Elevation (In Feet)

Baseline Station	Point Description	Subsidence Monitor - Cross-Section F See Drawing CE-CP00-134 Rev 6 for Survey Cross-Section Locations								Description
		9/8/2003	7/9/2004	7/28/2005	8/21/2006	8/30/2007	8/7/2008	Future	Future	
0+00	Tundra	17.9	17.9	18.2	18.3	17.7	17.7			Elevation (In Feet)
0+10	Tundra	17.3	17.2	17.2	17.3	16.6	16.6			Elevation (In Feet)
0+14	Gradebreak	18.0	18.0	18.0	18.0	16.6	N/A			Elevation (In Feet)
0+20	Top Bank	17.5	17.5	17.6	17.6	16.6	16.6			Elevation (In Feet)
0+21	Toe Bank	16.5	16.3	16.3	16.0	15.1	15.0			Elevation (In Feet)
0+24	CL Swale	15.0	12.5	15.0	13.8	13.4	13.7			Elevation (In Feet)
0+26	Toe Bank	16.1	12.5	13.1	13.6	15.2	13.6			Elevation (In Feet)
0+28	Top Bank	17.8	17.9	17.9	17.3	16.4	16.1			Elevation (In Feet)
0+34	Gradebreak	17.9	17.9	18.0	18.0	17.4	17.5			Elevation (In Feet)
0+43	Gradebreak	17.2	17.3	17.2	17.4	16.8	16.8			Elevation (In Feet)
0+46	Gradebreak	17.8	17.8	17.8	17.6	17.0	N/A			Elevation (In Feet)
0+52	Tundra	17.8	17.9	17.9	18.0	17.3	17.4			Elevation (In Feet)

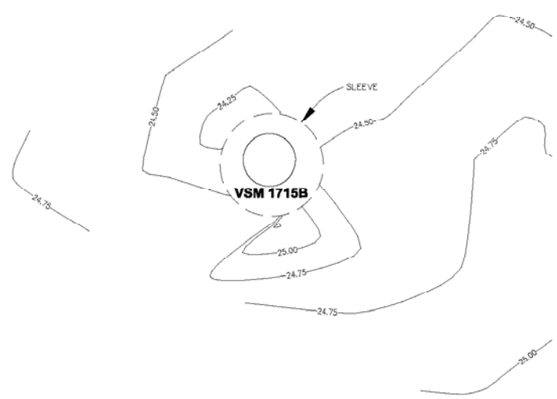
Baseline Station	Point Description	Subsidence Monitor - Cross-Section G See Drawing CE-CP00-134 Rev 6 for Survey Cross-Section Locations								Description
		9/8/2003	7/9/2004	7/28/2005	8/21/2006	8/30/2007	8/7/2008	Future	Future	
0+00	Tundra	17.1	17.3	17.4	17.5	16.8	16.9			Elevation (In Feet)
0+09	Tundra	17.2	17.1	17.2	17.3	16.6	16.9			Elevation (In Feet)
0+16	Gradebreak	17.9	17.9	17.9	17.5	16.8	N/A			Elevation (In Feet)
0+22	Top Bank	17.6	17.7	17.7	17.8	17.0	17.1			Elevation (In Feet)
0+24	Toe Bank	16.9	17.0	17.0	17.0	16.2	16.3			Elevation (In Feet)
0+26	CL Swale	16.5	16.5	16.5	16.5	16.3	16.1			Elevation (In Feet)
0+28	Toe Bank	16.8	16.7	16.9	16.9	16.3	16.3			Elevation (In Feet)
0+30	Top Bank	17.7	17.8	17.8	17.9	17.3	17.3			Elevation (In Feet)
0+37	Tundra	17.6	17.6	17.6	17.7	17.0	17.3			Elevation (In Feet)
0+46	Tundra	17.3	17.3	17.3	17.4	16.8	N/A			Elevation (In Feet)

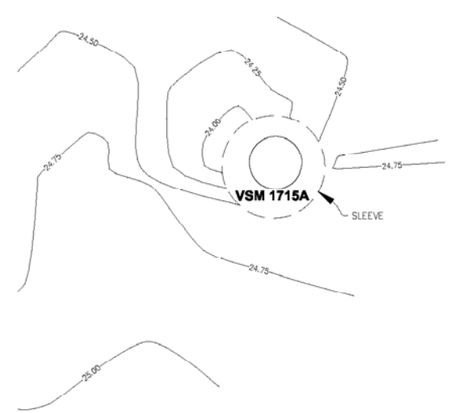
Baseline Station	Point Description	Subsidence Monitor - Cross-Section H See Drawing CE-CP00-134 Rev 6 for Survey Cross-Section Locations								Description
		9/8/2003	7/9/2004	7/28/2005	8/21/2006	8/30/2007	8/7/2008	Future	Future	
0+00	Tundra	17.0	16.8	16.6	16.7	16.0	16.0			Elevation (In Feet)
0+09	Tundra	17.1	16.9	16.9	17.0	16.4	16.5			Elevation (In Feet)
0+18	Gradebreak	17.8	17.8	17.8	17.3	16.6	N/A			Elevation (In Feet)
0+24	Top Bank	17.3	17.4	17.4	17.5	16.8	16.8			Elevation (In Feet)
0+25	Toe Bank	16.8	16.4	16.6	16.6	15.9	15.9			Elevation (In Feet)
0+28	CL Swale	16.3	16.3	16.3	16.3	15.8	15.6			Elevation (In Feet)
0+30	Toe Bank	16.6	16.6	16.4	16.5	15.8	15.9			Elevation (In Feet)
0+32	Top Bank	17.6	17.7	17.6	17.6	16.9	17.0			Elevation (In Feet)
0+40	Gradebreak	18.2	18.2	18.2	18.3	17.6	17.7			Elevation (In Feet)
0+42	Gradebreak	17.7	17.7	17.8	17.9	17.2	N/A			Elevation (In Feet)
0+50	Tundra	17.2	17.2	17.3	17.4	16.7	16.7			Elevation (In Feet)

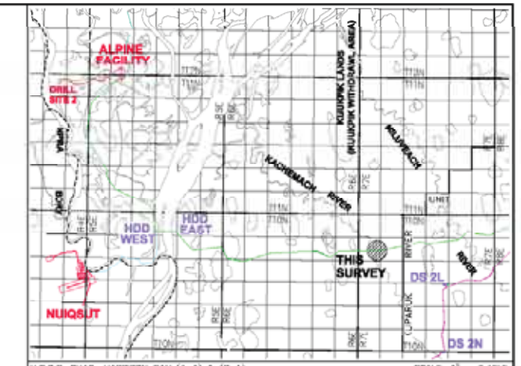
Note: Vertical datum has been adjusted down (-) approximately 0.50 feet to reflect actual elevations per differential levels from CD-1, ran August 2007.

Appendix D Kachemach River Survey Data

JOB NO:	SUB JOB NO:	DRAWING NO:
02-205		CE-CP00-145







U.S.G.S. QUAD: HARRISON BAY (A-1) & (B-1)
T. 10 N., R. 7 E.
UMIAT MERIDIAN, ALASKA

VICINITY MAP

SCALE: 1" = 3 MILE

NOTES:

1. DATES OF SURVEY: JULY 17, & AUGUST 30, 2004, AUGUST 4, 2005, AUGUST 14, 2006; AUGUST 29 & 31, 2007, SEPTEMBER 2. 2007; AUGUST 26, 2008.
2. REFERENCE FIELD BOOKS: LCMF 2004-08, PGS 56-60, LCMF 2004-11 PGS 20,21; LCMF2005-21, PGS 13 & 22; LCMF2006-12, PG. 58; LCMF2007-14, PG. 67 & LCMF2007-15, PG. 4 & 12; LCMF2008-15, PGS. 32-35.
3. VERTICAL CONTROL IS BASED ON AS-BUILT TOP OF STEEL ELEVATIONS AT VSM 1712. 1713 AND 1724 PER DRAWING PD-CP00-109. SHEETS 31 AND 32.
4. HORIZONTAL CONTROL IS BASED ON RECORD COORDINATES OF ALPINE PIPELINE PI 13A AND ALPINE MONUMENT No. 19. COORDINATES ARE ALASKA STATE PLANE, ZONE 4, NAD 27, IN FEET.

Kuukpik/LCMF
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Alpine Survey Office

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ALPINE | MODULE: CP00 | UNIT: CP

ALPINE PIPELINE KACHEMACH CROSSING
PILE SCOURING MONITOR
ALPINE, ALASKA

REDRAWN FROM:

CONSTRUCTION SHEET OF

FORM: DSIZE

DO NOT SCALE — ABOVE SCALE FOR REFERENCE ONLY

DATE: 8/17/04	DRAWN: AG	DESIGN:	ECM NO: 2390461ACS
SCALE: 1" = 2'	CHECKED: GD		CC NO: 2390461
	APPROVAL:		CADD FILE NO. 04-06-14-3
JOB NO: 02-205 / SUB JOB NO:	DRAWING NO: CE-CP00-145		PART: 1 OF 2 / REV: 5

REFERENCE DWG NO/SHT NO:

REV	DATE	REVISIONS	BY	CHK	JOB ENGR	PROJ ENGR	CUST APP
5	8/26/08	UPDATED PER 5351457ACS	CZ	DB			
4	8/31/07	UPDATED PER 4810412ACS	CZ	DB			
3	8/14/06	UPDATED PER 4083251ACS	AG	GD			
2	8/4/05	UPDATED PER 3423995ACS	CZ	DB			
1	8/17/04	ISSUED PER 2390461ACS	AG	GD			

Alpine CP00

Alpine Pipeline Kachemach Crossing

West Streambank Erosion Monitor

Baseline Station	Streambank Monitor - Top of West Bank Locations See Drawing CE-CP00-145 Rev 7 for Survey Baseline Location						Description
	8/5/2002	7/11/2003	7/17/2004	8/3/2005	8/14/2006	8/28/2008	Date
0+40	199.0	199.0	187.1	187.1	187.1	187.1	Baseline Offset (In Feet)
0+50	196.3	196.3	186.5	186.5	186.5	186.5	Baseline Offset (In Feet)
0+60	191.8	191.8	185.5	185.5	185.5	185.5	Baseline Offset (In Feet)
0+70	189.0	189.0	185.3	185.3	185.3	185.3	Baseline Offset (In Feet)
0+80	189.4	189.4	185.7	185.7	185.7	185.7	Baseline Offset (In Feet)
0+90	194.4	194.4	185.8	185.8	185.8	185.8	Baseline Offset (In Feet)
1+00	200.1	200.1	185.9	185.9	185.9	185.9	Baseline Offset (In Feet)
1+10	201.7	201.7	186.1	186.1	186.1	186.1	Baseline Offset (In Feet)
1+20	199.2	199.2	186.4	186.4	186.4	186.4	Baseline Offset (In Feet)
1+30	196.4	196.4	186.7	186.7	186.7	186.7	Baseline Offset (In Feet)
1+40	190.4	190.4	188.6	188.6	188.6	188.6	Baseline Offset (In Feet)
1+50	186.8	186.8	183.7	183.7	183.7	183.7	Baseline Offset (In Feet)
1+60	185.1	185.1	178.6	178.6	178.6	178.6	Baseline Offset (In Feet)
1+70	182.4	182.4	171.7	171.7	171.7	171.7	Baseline Offset (In Feet)
1+80	179.1	179.1	167.7	167.7	167.7	167.7	Baseline Offset (In Feet)
1+90	182.8	182.8	171.2	171.2	171.2	171.2	Baseline Offset (In Feet)
2+00	174.2	174.2	170.8	170.8	170.8	170.8	Baseline Offset (In Feet)
2+10	175.3	175.3	170.9	170.9	170.9	170.9	Baseline Offset (In Feet)
2+20	175.1	175.1	173.1	173.1	171.5	171.5	Baseline Offset (In Feet)
2+30	171.2	171.2	171.2	171.2	171.2	171.2	Baseline Offset (In Feet)
2+40	169.5	169.5	169.5	169.5	169.5	169.5	Baseline Offset (In Feet)
2+50	171.0	171.0	171.0	171.0	171.0	171.0	Baseline Offset (In Feet)
2+60	170.9	170.9	170.9	170.9	170.9	170.9	Baseline Offset (In Feet)
2+71	169.4	169.4	169.4	169.4	169.4	169.4	Baseline Offset (In Feet)
2+80	168.2	168.2	168.2	168.2	168.2	168.2	Baseline Offset (In Feet)
2+90	166.8	166.8	166.8	166.8	166.8	166.8	Baseline Offset (In Feet)
3+00	165.4	165.4	165.4	165.4	165.4	165.4	Baseline Offset (In Feet)
3+10	163.7	163.7	163.7	163.7	163.7	163.7	Baseline Offset (In Feet)
3+20	161.9	161.9	161.9	161.9	161.9	161.9	Baseline Offset (In Feet)
3+30	160.9	160.9	160.9	160.9	160.9	160.9	Baseline Offset (In Feet)
3+40	160.3	160.3	160.3	160.3	160.3	160.3	Baseline Offset (In Feet)
3+50	159.4	159.4	159.4	159.4	159.4	159.4	Baseline Offset (In Feet)
3+60	158.1	158.1	158.1	158.1	158.1	158.1	Baseline Offset (In Feet)
3+70	156.8	156.8	156.8	156.8	156.8	156.8	Baseline Offset (In Feet)
3+80	154.8	154.8	154.8	154.8	154.8	154.8	Baseline Offset (In Feet)
3+90	152.5	152.5	152.5	152.5	152.5	152.5	Baseline Offset (In Feet)
4+00	150.1	150.1	150.1	150.1	150.1	150.1	Baseline Offset (In Feet)
4+10	146.5	146.5	146.5	146.5	146.5	146.5	Baseline Offset (In Feet)
4+20	143.8	143.8	143.8	143.8	143.8	143.8	Baseline Offset (In Feet)
4+30	144.0	144.0	144.0	144.0	144.0	144.0	Baseline Offset (In Feet)
4+40	141.8	141.8	141.8	141.8	141.8	141.8	Baseline Offset (In Feet)
4+50	138.7	138.7	138.7	138.7	138.7	138.7	Baseline Offset (In Feet)
4+60	135.5	135.5	135.5	135.5	135.5	135.5	Baseline Offset (In Feet)
4+70	131.8	131.8	131.8	131.8	131.8	131.8	Baseline Offset (In Feet)
4+80	128.1	128.1	128.1	128.1	128.1	128.1	Baseline Offset (In Feet)
VSM 1714	160.5	160.5	160.5	160.5	160.5	160.5	Baseline Offset (In Feet)

Alpine CP00

Alpine Pipeline Kachemach Crossing

East Streambank Erosion Monitor

Baseline Station	Streambank Monitor - Top of East Bank Locations See Drawing CE-CP00-145 Rev 7 for Survey Baseline Location						Description
	8/5/2002	7/11/2003	7/17/2004	8/3/2005	8/14/2006	8/28/2008	Date
1+80	363.8	363.8	358.2	358.2	358.2	356.1	Baseline Offset (In Feet)
1+90	367.8	367.8	357.7	356.8	356.8	356.0	Baseline Offset (In Feet)
2+00	369.4	369.4	360.4	351.9	351.9	351.9	Baseline Offset (In Feet)
2+10	370.7	370.7	363.9	356.0	356.0	356.0	Baseline Offset (In Feet)
2+20	371.9	371.9	367.7	366.7	366.7	366.7	Baseline Offset (In Feet)
2+30	373.0	373.0	371.6	372.1	372.1	371.9	Baseline Offset (In Feet)
2+40	374.8	374.8	374.8	374.8	374.8	374.8	Baseline Offset (In Feet)
2+50	378.3	378.3	376.3	376.3	376.3	376.3	Baseline Offset (In Feet)
2+60	381.8	381.8	377.9	377.9	377.9	377.9	Baseline Offset (In Feet)
2+70	385.3	385.3	379.7	379.7	379.7	379.7	Baseline Offset (In Feet)
2+80	388.9	388.9	381.4	381.4	381.4	381.4	Baseline Offset (In Feet)
2+90	392.6	392.6	390.4	390.4	389.0	389.0	Baseline Offset (In Feet)
3+00	394.0	394.0	394.0	394.0	393.1	393.1	Baseline Offset (In Feet)
3+10	394.8	394.8	394.8	394.8	394.4	394.4	Baseline Offset (In Feet)
3+20	395.5	395.5	395.5	395.5	395.5	395.5	Baseline Offset (In Feet)
3+30	395.1	395.1	395.1	395.1	395.1	395.1	Baseline Offset (In Feet)
3+40	394.8	394.8	394.8	394.8	394.8	394.8	Baseline Offset (In Feet)
3+50	394.0	394.0	394.0	394.0	394.0	394.0	Baseline Offset (In Feet)
3+60	392.6	392.6	392.6	392.6	392.6	392.6	Baseline Offset (In Feet)
3+70	391.1	391.1	391.1	391.1	391.1	391.1	Baseline Offset (In Feet)
3+80	389.4	389.4	389.4	389.4	389.4	389.4	Baseline Offset (In Feet)
3+90	387.6	387.6	387.6	387.6	387.6	387.6	Baseline Offset (In Feet)
4+00	381.6	381.6	381.6	381.6	381.6	381.6	Baseline Offset (In Feet)
4+10	375.0	375.0	375.0	375.0	375.0	375.0	Baseline Offset (In Feet)
4+20	371.3	371.3	371.3	371.3	371.3	371.3	Baseline Offset (In Feet)
4+30	368.0	368.0	368.0	368.0	368.0	368.0	Baseline Offset (In Feet)
4+40	365.4	365.4	365.4	365.4	365.4	365.4	Baseline Offset (In Feet)
4+50	362.7	362.7	362.7	362.7	362.7	362.7	Baseline Offset (In Feet)
4+60	358.5	358.5	358.5	358.5	359.5	359.5	Baseline Offset (In Feet)
4+70	356.0	356.0	356.0	356.0	356.0	356.0	Baseline Offset (In Feet)
4+80	352.4	352.4	352.4	352.4	352.4	352.4	Baseline Offset (In Feet)
4+90	348.6	348.6	348.6	348.6	348.6	348.6	Baseline Offset (In Feet)
5+00	344.8	344.8	344.8	344.8	344.8	344.8	Baseline Offset (In Feet)
5+10	342.3	342.3	342.3	342.3	342.3	342.3	Baseline Offset (In Feet)
5+20	341.0	341.0	341.0	341.0	341.0	341.0	Baseline Offset (In Feet)
5+30	339.8	339.8	339.8	339.8	339.8	339.8	Baseline Offset (In Feet)
5+40	335.5	335.5	335.5	335.5	335.5	335.5	Baseline Offset (In Feet)
5+50	330.7	330.7	330.7	330.7	330.7	330.7	Baseline Offset (In Feet)
5+60	325.6	325.6	325.6	325.6	324.3	324.3	Baseline Offset (In Feet)
5+70	320.1	320.1	320.1	320.1	315.7	315.7	Baseline Offset (In Feet)
5+80	314.6	314.6	314.6	314.6	309.1	309.1	Baseline Offset (In Feet)
5+90	313.0	313.0	313.0	313.0	310.0	310.0	Baseline Offset (In Feet)
6+00	312.1	312.1	312.1	312.1	310.9	310.9	Baseline Offset (In Feet)
VSM 1716	349.7	349.7	349.7	349.7	349.7	349.7	Baseline Offset (In Feet)

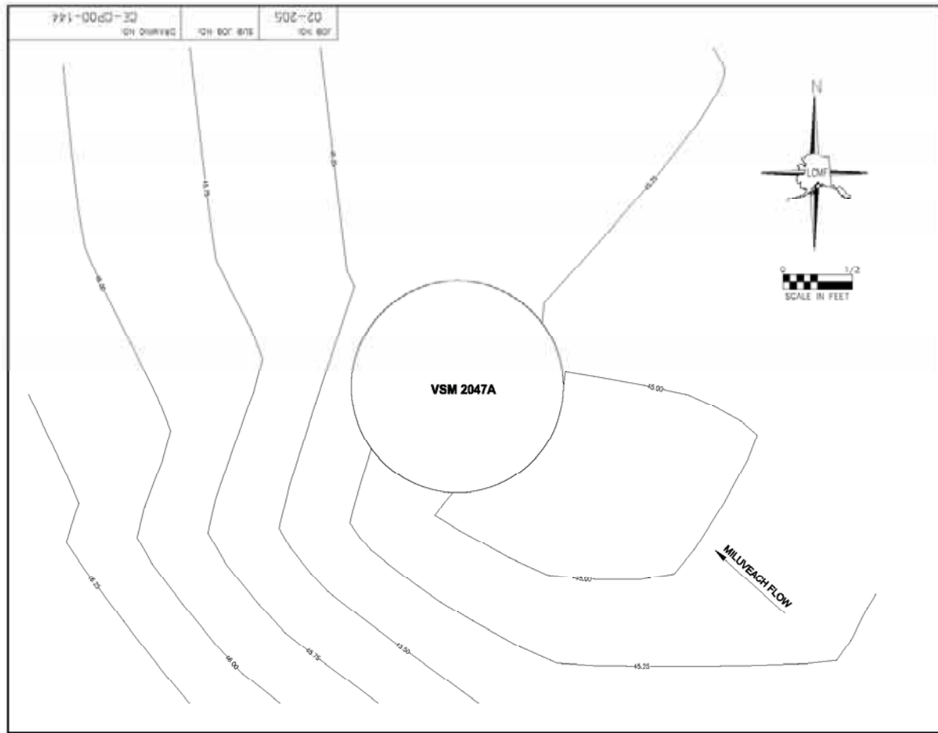
Alpine CP00

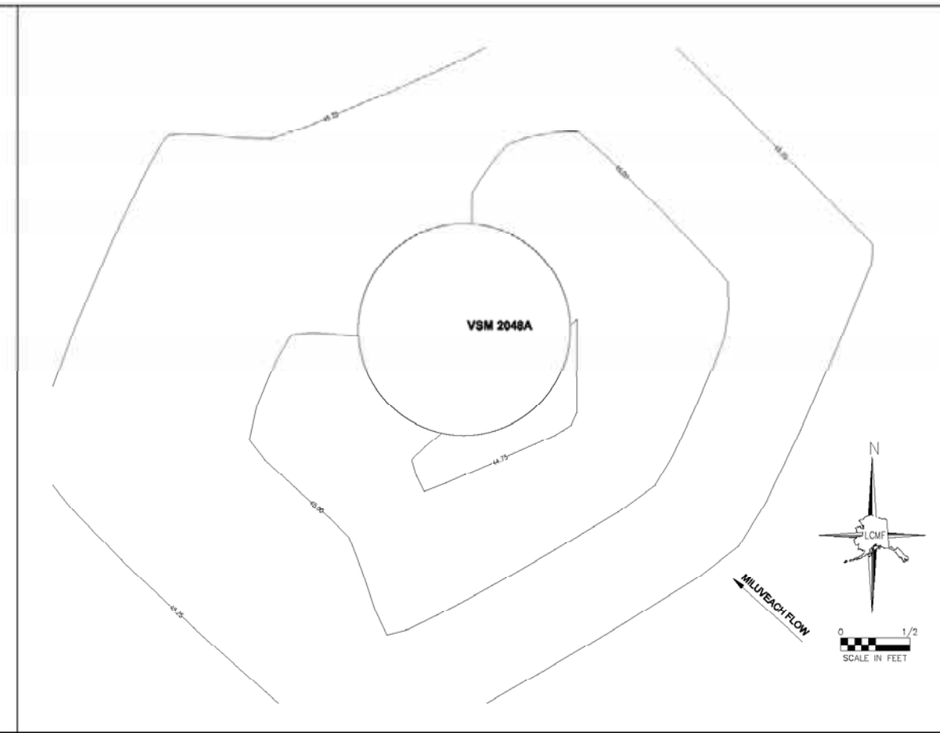
Alpine Pipeline Kachemach Crossing

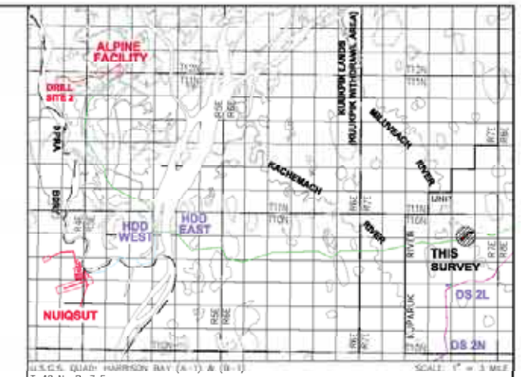
Pilecap Monitor

Location	7/16/2004	8/3/2005	8/3/2006	8/29/2007	8/26/2008	Description
VSM 1713	N/A	43.812	43.840	43.830	43.835	Monitor Point Elev. at Bottom NE Cor Pile Cap
VSM 1714	N/A	42.812	42.815	42.810	42.808	8/28/2008
VSM 1714A	N/A	N/A	42.720	42.790	42.768	Monitor Point Elev. at Bottom NE Cor Pile Cap
VSM 1715A	42.272	42.268	42.285	42.320	42.323	Monitor Point Elev. at Bottom NE Cor Pile Cap
VSM 1715B	42.263	42.272	42.285	42.300	42.294	Monitor Point Elev. at Bottom NE Cor Pile Cap
VSM 1715C	N/A	42.612	42.520	42.520	42.516	Monitor Point Elev. at Bottom NE Cor Pile Cap

Appendix E Miluveach River Survey Data

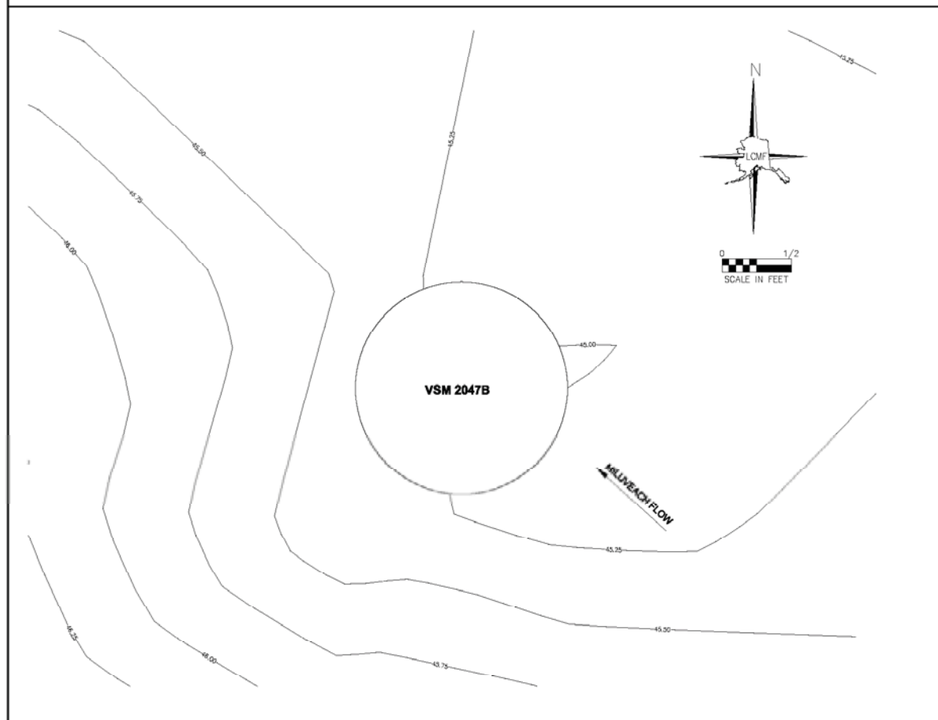


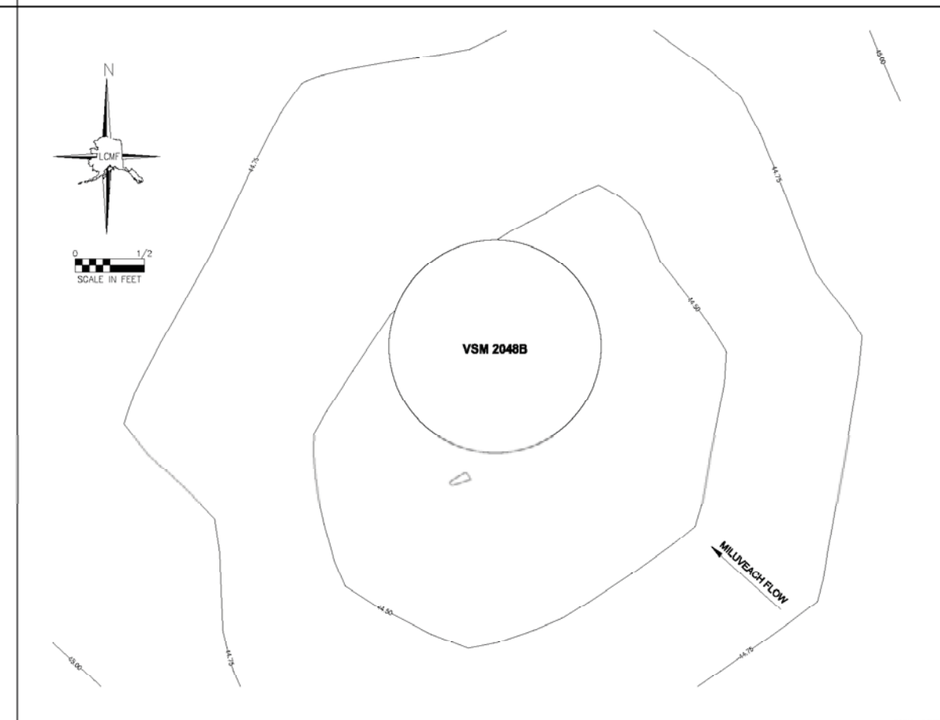




T. 10 N., R. 7 E.
UMIAT MERIDIAN, ALASKA

VICINITY MAP





NOTES:

1. DATE OF SURVEY: JUNE 18, 2004; AUGUST 4, 2005, AUGUST 17, 2006; AUGUST 28, 2007; AUGUST 25, 2008.
2. REFERENCE FIELD BOOK: LCMF2004-8, PGS 1-11; LCMF2005-21, PGS. 17-21; LCMF2006-12, PG. 72; LMCF2007-14 PGS. 61-64. LCMF 2008-15, PGS. 30-31.
3. VERTICAL CONTROL BASED ON AS-BUILT TOP OF STEEL ELEVATIONS AT VSM 2049 AND 2059 PER DRAWING PD-CP00-109, SHEETS 38 AND 39.
4. HORIZONTAL CONTROL IS BASED ON RECORD COORDINATES OF ALPINE PIPELINE PI 13A AND ALPINE MONUMENT No, 19. COORDINATES ARE ALASKA STATE PLANE, ZONE 4, NAD 27, IN FEET.

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ALPINE | MODULE: CP00 | UNIT: CP

ALPINE PIPELINE MILUVEACH CROSSING
PILE SCOURING MONITOR
ALPINE, ALASKA

REDRAWN FROM:
CONSTRUCTION SHEET OF

DO NOT SCALE — ABOVE SCALE FOR REFERENCE ONLY

DATE: 6/22/04	DRAWN: CZ	DESIGN:	ECM NO: 2390462ACS
SCALE: 1" = 1/2'	CHECKED: BD		CC NO:
	APPROVAL:		CADD FILE NO. 04-06-16-4
JOB NO: 02-205 / SUB JOB NO:	DRAWING NO: CE-CP00-144		PART: 2 OF 2 / REV: 5

REFERENCE DWG NO/SHT NO:

REV	DATE	REVISIONS	BY	CHK	JOB ENGR	PROJ ENGR	CUST APP
5	8/26/08	UPDATED PER 5351457ACS	CZ	DB			
4	8/28/07	UPDATED PER 4810413ACS	AG	DB			
3	8/19/06	UPDATED PER 4083252ACS	AG	GD			
2	8/5/05	UPDATED PER 3423996ACS	CZ	DB			
1	6/21/04	ISSUED PER 2390462ACS	CZ	BD			

FORM: DSIZE

Alpine CP 00

Alpine Pipeline Miluveach Crossing

West Streambank Erosion Monitor

Baseline Station	Streambank Monitor - Top of West Bank Locations See Drawing CE-CP00-144 Rev 6 for Survey Baseline Location						Description
	8/4/2002	7/12/2003	6/18/2004	8/4/2005	8/17/2006	8/28/2008	Date
0+50	859.5	859.5	858.0	858.0	858.0	858.0	Baseline Offset (In Feet)
0+60	859.7	859.7	856.9	856.9	856.9	856.9	Baseline Offset (In Feet)
0+70	859.0	859.0	856.2	856.2	856.2	856.2	Baseline Offset (In Feet)
0+80	859.2	859.2	855.6	855.6	855.6	855.6	Baseline Offset (In Feet)
0+90	858.7	858.7	855.9	855.9	855.9	855.9	Baseline Offset (In Feet)
1+00	858.1	858.1	856.1	856.1	856.1	856.1	Baseline Offset (In Feet)
1+10	857.4	857.4	855.8	855.8	855.8	855.8	Baseline Offset (In Feet)
1+20	856.5	856.5	854.8	854.8	854.8	854.8	Baseline Offset (In Feet)
1+30	854.6	854.6	852.5	852.5	852.5	852.5	Baseline Offset (In Feet)
1+40	854.4	854.4	851.1	851.1	851.1	851.1	Baseline Offset (In Feet)
1+50	854.0	854.0	849.7	849.7	849.7	849.7	Baseline Offset (In Feet)
1+60	851.8	851.8	847.9	847.9	847.9	847.9	Baseline Offset (In Feet)
1+70	850.3	850.3	845.9	845.9	845.9	845.9	Baseline Offset (In Feet)
1+80	848.8	848.8	843.8	843.8	843.8	843.8	Baseline Offset (In Feet)
1+90	846.4	846.4	841.7	841.7	841.7	841.7	Baseline Offset (In Feet)
2+00	842.2	842.2	839.4	839.4	839.4	839.4	Baseline Offset (In Feet)
2+10	838.1	838.1	837.2	837.2	837.2	837.2	Baseline Offset (In Feet)
2+20	837.1	837.1	835.7	835.7	835.7	835.7	Baseline Offset (In Feet)
2+30	836.1	836.1	834.1	834.1	834.1	834.1	Baseline Offset (In Feet)
2+40	834.7	834.7	832.4	832.4	832.4	832.4	Baseline Offset (In Feet)
2+50	830.5	830.5	829.3	829.3	829.3	829.3	Baseline Offset (In Feet)
2+60	827.7	827.7	827.1	827.1	827.1	827.1	Baseline Offset (In Feet)
2+70	826.0	826.0	825.5	825.5	825.5	825.5	Baseline Offset (In Feet)
2+80	824.6	824.6	823.8	823.8	823.8	823.8	Baseline Offset (In Feet)
2+90	823.5	823.5	822.1	822.1	822.1	822.1	Baseline Offset (In Feet)
3+00	822.3	822.3	820.4	820.4	820.4	820.4	Baseline Offset (In Feet)
3+10	821.1	821.1	818.8	818.8	818.8	818.8	Baseline Offset (In Feet)
3+20	818.9	818.9	816.8	816.8	816.8	816.8	Baseline Offset (In Feet)
3+30	816.4	816.4	814.8	814.8	814.8	814.8	Baseline Offset (In Feet)
3+40	814.9	814.9	812.7	812.7	812.7	812.7	Baseline Offset (In Feet)
3+50	812.0	812.0	810.7	810.7	810.7	810.7	Baseline Offset (In Feet)
VSM 2046	793.8	793.8	793.8	793.8	793.8	793.8	Baseline Offset (In Feet)
3+60	810.3	810.3	809.1	809.1	809.1	809.1	Baseline Offset (In Feet)
3+70	807.8	807.8	805.9	805.9	805.9	805.9	Baseline Offset (In Feet)
3+80	805.2	805.2	804.3	804.3	804.3	804.3	Baseline Offset (In Feet)
3+90	802.7	802.7	801.4	801.4	801.4	801.4	Baseline Offset (In Feet)
4+00	801.7	801.7	800.4	800.4	800.4	800.4	Baseline Offset (In Feet)
4+10	799.2	799.2	798.4	798.4	798.4	798.4	Baseline Offset (In Feet)
4+20	797.0	797.0	796.3	796.3	796.3	796.3	Baseline Offset (In Feet)
4+30	794.9	794.9	793.8	793.8	793.8	793.8	Baseline Offset (In Feet)
4+40	792.2	792.2	791.3	791.3	791.3	791.3	Baseline Offset (In Feet)
4+50	789.9	789.9	789.1	789.1	789.1	789.1	Baseline Offset (In Feet)
4+60	788.7	788.7	787.3	787.3	787.3	787.3	Baseline Offset (In Feet)
4+70	786.3	786.3	784.8	784.8	784.8	784.8	Baseline Offset (In Feet)
4+80	783.1	783.1	781.7	781.7	781.7	781.7	Baseline Offset (In Feet)
4+90	780.0	780.0	778.6	778.6	778.6	778.6	Baseline Offset (In Feet)
5+00	776.3	776.3	775.1	775.1	775.1	775.1	Baseline Offset (In Feet)
5+10	772.4	772.4	771.3	771.3	771.3	771.3	Baseline Offset (In Feet)
5+20	768.7	768.7	767.5	767.5	767.5	767.5	Baseline Offset (In Feet)
5+30	765.1	765.1	763.7	763.7	763.7	763.7	Baseline Offset (In Feet)
5+40	761.4	761.4	759.8	759.8	759.8	759.8	Baseline Offset (In Feet)
5+50	757.0	757.0	755.8	755.8	755.8	755.8	Baseline Offset (In Feet)
5+60	752.6	752.6	751.6	751.6	751.6	751.6	Baseline Offset (In Feet)
5+70	748.0	748.0	747.0	747.0	747.0	747.0	Baseline Offset (In Feet)
5+80	743.5	743.5	742.4	742.4	742.4	742.4	Baseline Offset (In Feet)
5+90	739.4	739.4	738.4	738.4	738.4	738.4	Baseline Offset (In Feet)
6+00	735.5	735.5	734.2	734.2	734.2	734.2	Baseline Offset (In Feet)
6+10	731.5	731.5	730.0	730.0	730.0	730.0	Baseline Offset (In Feet)
6+20	726.6	726.6	725.3	725.3	725.3	725.3	Baseline Offset (In Feet)
6+30	721.7	721.7	720.5	720.5	720.5	720.5	Baseline Offset (In Feet)
6+40	716.9	716.9	715.6	715.6	715.6	715.6	Baseline Offset (In Feet)
6+50	712.0	712.0	710.8	710.8	710.8	710.8	Baseline Offset (In Feet)
6+60	707.1	707.1	705.9	705.9	705.9	705.9	Baseline Offset (In Feet)

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Alpine Pipeline Miluveach Crossing

East Streambank Erosion Monitor

Baseline Station	Streambank Monitor - Top of East Bank Locations See Drawing CE-CP00-144 Rev 6 for Survey Baseline Location						Description
	8/4/2002	7/12/2003	6/18/2004	8/4/2005	8/17/2006	8/28/2008	Date
8+80	1196.2	1196.2	1196.2	1196.2	1196.2	1196.2	Baseline Offset (In Feet)
8+90	1190.3	1190.3	1190.3	1190.3	1190.3	1190.3	Baseline Offset (In Feet)
9+00	1184.3	1184.3	1184.3	1184.3	1184.3	1184.3	Baseline Offset (In Feet)
9+10	1178.3	1178.3	1178.3	1178.3	1178.3	1178.3	Baseline Offset (In Feet)
9+20	1172.4	1172.4	1172.4	1172.4	1172.4	1172.4	Baseline Offset (In Feet)
9+30	1166.4	1166.4	1166.4	1166.4	1166.4	1166.4	Baseline Offset (In Feet)
9+40	1160.3	1160.3	1160.3	1160.3	1160.3	1160.3	Baseline Offset (In Feet)
9+50	1154.3	1154.3	1154.3	1154.3	1154.3	1154.3	Baseline Offset (In Feet)
9+60	1148.2	1148.2	1148.2	1148.2	1148.2	1148.2	Baseline Offset (In Feet)
9+70	1142.0	1142.0	1142.0	1142.0	1142.0	1142.0	Baseline Offset (In Feet)
9+80	1135.5	1135.5	1135.5	1135.5	1135.5	1135.5	Baseline Offset (In Feet)
9+90	1129.0	1129.0	1129.0	1129.0	1129.0	1129.0	Baseline Offset (In Feet)
10+00	1122.5	1122.5	1122.5	1122.5	1122.5	1122.5	Baseline Offset (In Feet)
10+10	1116.0	1116.0	1116.0	1116.0	1116.0	1116.0	Baseline Offset (In Feet)
10+20	1110.7	1110.7	1110.7	1110.7	1110.7	1110.7	Baseline Offset (In Feet)
10+30	1105.7	1105.7	1105.7	1105.7	1105.7	1105.7	Baseline Offset (In Feet)
10+40	1100.6	1100.6	1100.6	1100.6	1100.6	1100.6	Baseline Offset (In Feet)
10+50	1095.5	1095.5	1095.5	1095.5	1095.5	1095.5	Baseline Offset (In Feet)
10+60	1090.5	1090.5	1090.5	1090.5	1090.5	1090.5	Baseline Offset (In Feet)
10+70	1086.2	1086.2	1086.2	1086.2	1086.2	1086.2	Baseline Offset (In Feet)
10+80	1082.3	1082.3	1082.3	1082.3	1082.3	1082.3	Baseline Offset (In Feet)
10+90	1078.4	1078.4	1078.4	1078.4	1078.4	1078.4	Baseline Offset (In Feet)
11+00	1074.4	1074.4	1074.4	1074.4	1074.4	1074.4	Baseline Offset (In Feet)
11+10	1070.5	1070.5	1070.5	1070.5	1070.5	1070.5	Baseline Offset (In Feet)
11+20	1065.1	1065.1	1065.1	1065.1	1065.1	1065.1	Baseline Offset (In Feet)
11+30	1058.3	1058.3	1058.3	1058.3	1058.3	1058.3	Baseline Offset (In Feet)
VSM 2049	1013.8	1013.8	1013.8	1013.8	1013.8	1013.8	Baseline Offset (In Feet)
11+40	1051.6	1051.6	1051.6	1051.6	1051.6	1051.6	Baseline Offset (In Feet)
11+55	1042.9	1042.9	1042.9	1042.9	1042.9	1042.9	Baseline Offset (In Feet)
11+70	1033.0	1033.0	1033.0	1033.0	1033.0	1033.0	Baseline Offset (In Feet)
11+80	1027.5	1027.5	1027.5	1027.5	1027.5	1027.5	Baseline Offset (In Feet)
11+90	1024.0	1024.0	1024.0	1024.0	1024.0	1024.0	Baseline Offset (In Feet)
12+00	1017.6	1017.6	1017.6	1017.6	1017.6	1017.6	Baseline Offset (In Feet)
12+10	1012.1	1012.1	1010.9	1010.9	1010.9	1010.9	Baseline Offset (In Feet)
12+20	1007.1	1007.1	1004.8	1007.1	1007.1	1007.1	Baseline Offset (In Feet)
12+30	1001.8	1001.8	999.4	1001.8	1001.8	1001.8	Baseline Offset (In Feet)
12+40	994.5	994.5	994.5	994.5	994.5	994.5	Baseline Offset (In Feet)
12+50	993.8	993.8	993.8	993.8	993.8	993.8	Baseline Offset (In Feet)
12+60	993.2	993.2	993.2	993.2	993.2	993.2	Baseline Offset (In Feet)
12+70	998.0	998.0	998.0	998.0	998.0	998.0	Baseline Offset (In Feet)
12+80	1001.9	1001.9	1001.9	1001.9	1001.9	1001.9	Baseline Offset (In Feet)
12+90	1001.1	1001.1	1001.1	1001.1	1001.1	1001.1	Baseline Offset (In Feet)
13+00	1000.3	1000.3	1000.3	1000.3	1000.3	1000.3	Baseline Offset (In Feet)
13+10	999.4	999.4	999.4	999.4	999.4	999.4	Baseline Offset (In Feet)
13+20	998.8	998.8	998.8	998.8	998.8	998.8	Baseline Offset (In Feet)
13+30	997.8	997.8	997.8	997.8	997.8	997.8	Baseline Offset (In Feet)
13+40	996.8	996.8	996.8	996.8	996.8	996.8	Baseline Offset (In Feet)
13+50	995.8	995.8	995.8	995.8	995.8	995.8	Baseline Offset (In Feet)
13+60	994.7	994.7	994.7	994.7	994.7	994.7	Baseline Offset (In Feet)
13+70	993.7	993.7	993.7	993.7	993.7	993.7	Baseline Offset (In Feet)
13+80	992.6	992.6	992.6	992.6	992.6	992.6	Baseline Offset (In Feet)

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Alpine Pipeline Miluveach Crossing

East Streambank Erosion Monitor

Baseline Station	Streambank Monitor - Top of East Bank Locations See Drawing CE-CP00-144 Rev 6 for Survey Baseline Location						Description
	8/4/2002	7/12/2003	6/18/2004	8/4/2005	8/17/2006	8/28/2008	Date
13+90	991.4	991.4	991.4	991.4	991.4	991.4	Baseline Offset (In Feet)
14+00	988.1	988.1	988.1	988.1	988.1	988.1	Baseline Offset (In Feet)
14+10	984.8	984.8	984.8	984.8	984.8	984.8	Baseline Offset (In Feet)
14+20	981.5	981.5	981.5	981.5	981.5	981.5	Baseline Offset (In Feet)
14+30	978.2	978.2	978.2	978.2	978.2	978.2	Baseline Offset (In Feet)
14+40	976.2	976.2	976.2	976.2	976.2	976.2	Baseline Offset (In Feet)
14+50	975.6	975.6	975.6	975.6	975.6	975.6	Baseline Offset (In Feet)
14+60	975.0	975.0	975.0	975.0	975.0	975.0	Baseline Offset (In Feet)
14+70	974.4	974.4	974.4	974.4	974.4	974.4	Baseline Offset (In Feet)
14+80	973.8	973.8	973.8	973.8	973.8	973.8	Baseline Offset (In Feet)
14+90	973.0	973.0	973.0	973.0	973.0	973.0	Baseline Offset (In Feet)
15+00	972.1	972.1	972.1	972.1	972.1	972.1	Baseline Offset (In Feet)

Calc'd By: CZ
Date: 8/26/2008

Alpine CP 00

Alpine Pipeline Miluveach Crossing

Pile Monitor

Kuukpik/LCMF
Alpine Survey Office

Location	6/18/2004	8/3/2005	8/17/2006	8/28/2007	8/25/2008	Description
VSM 2046	57.611	57.595	57.590	57.510	57.527	Monitor Point Elev. at Bottom SE Cor Pile Cap
HSM 2046 (North)	57.791	57.785	57.780	57.700	57.686	Monitor Point Elev. at North End, Bottom NE Cor.
HSM 2046 (South)	57.631	57.620	57.610	57.530	57.521	Monitor Point Elev. at South End, Bottom SE Cor.
VSM 2047A	57.528	57.465	57.480	57.430	57.464	Monitor Point Elev. at Bottom SE Cor Pile Cap
HSM 2047A (North)	57.449	57.540	57.560	57.520	57.556	Monitor Point Elev. at North End, Bottom NE Cor.
VSM 2047B	57.433	57.450	57.460	57.420	57.459	Monitor Point Elev. at Bottom SE Cor Pile Cap
HSM 2047B (South)	57.527	57.540	57.560	57.520	57.556	Monitor Point Elev. at South End, Bottom SE Cor.
VSM 2048A	57.635	57.665	57.740	57.740	57.776	Monitor Point Elev. at Bottom SE Cor Pile Cap
HSM 2048A (North)	57.725	57.760	57.830	57.830	57.885	Monitor Point Elev. at North End, Bottom NE Cor.
VSM 2048B	57.591	57.615	57.680	57.680	57.727	Monitor Point Elev. at Bottom SE Cor Pile Cap
HSM 2048B (South)	57.691	57.710	57.770	57.770	57.824	Monitor Point Elev. at South End, Bottom SE Cor.
VSM 2049	57.494	57.475	57.470	57.400	57.398	Monitor Point Elev. at Bottom SE Cor Pile Cap
HSM 2049 (North)	57.564	57.550	57.540	57.470	57.465	Monitor Point Elev. at North End, Bottom NE Cor.
HSM 2049 (South)	57.587	57.565	57.560	57.490	57.487	Monitor Point Elev. at South End, Bottom SE Cor.