

**APPENDIX G**

**Site-Specific Trenchless Crossing Plans**

## **APPENDIX G: SITE-SPECIFIC TRENCHLESS CROSSING PLANS**

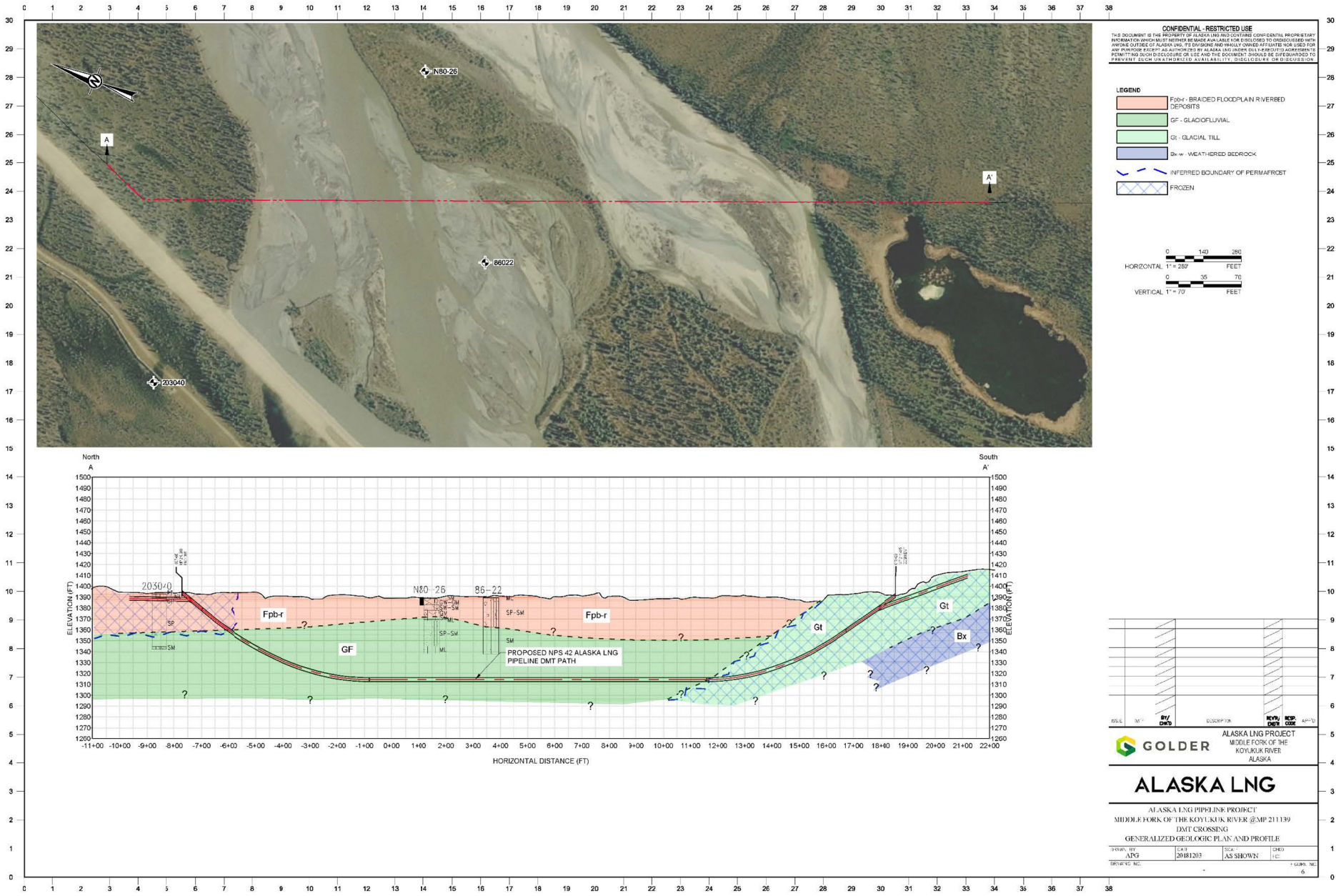
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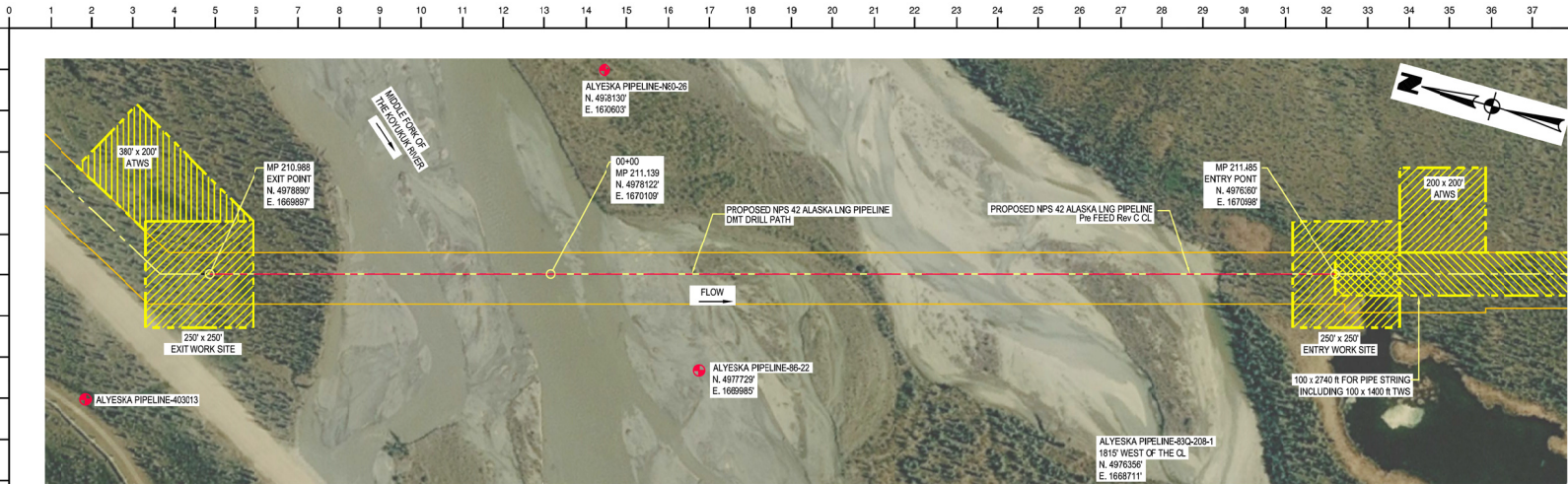
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Chulitna River MP 641.930 .....	G-7
Deshka River MP 704.867 .....	G-9

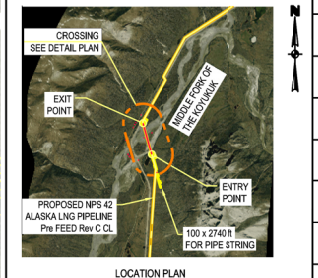
# Generalized Geologic Plan and Profile

G-1





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**REFERENCE DRAWINGS**


- ABBREVIATIONS & ACRONYMS**
- API - AMERICAN PETROLEUM INSTITUTE
  - ATWS - ADDITIONAL TEMPORARY WORK SPACE
  - CVR - COVER
  - DMT - DIRECTIONAL MICROTUNNELLING
  - HDD - HORIZONTAL DRILLING
  - LIDAR - LIGHT DETECTION AND RANGING
  - MIN - MINIMUM
  - MP - MILE POST
  - MOP - MAXIMUM OPERATING PRESSURE
  - MSL - MEAN SEA LEVEL
  - NAD - NORTH AMERICAN DATUM
  - NAVD88 - NORTH AMERICAN VERTICAL DATUM OF 1988
  - NSRS 2007 - NATIONAL SPATIAL REFERENCE SYSTEM 2007
  - psig - POUNDS PER SQUARE INCH GAUGE
  - 3LPE - THREE LAYER POLYETHYLENE

**LEGEND:**  
 ● - BOREHOLE

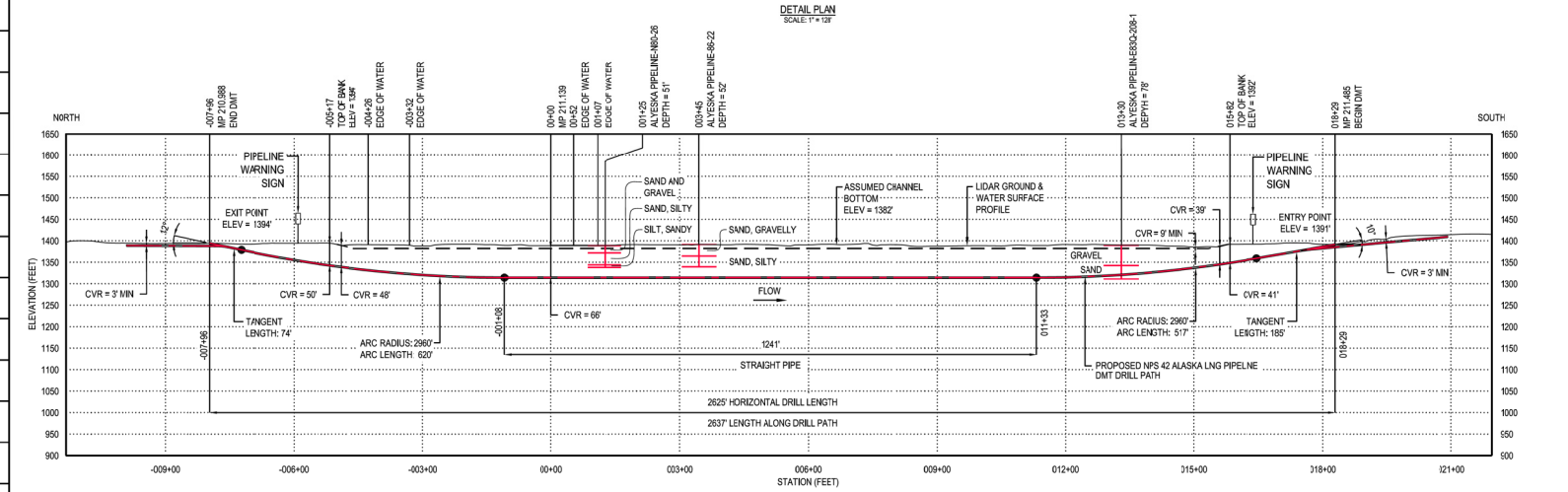
**PRELIMINARY ONLY  
 NOT FOR  
 CONSTRUCTION**

NO.	DATE	BY	CHKD	DESCRIPTION	REV	DATE	APP'D
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1	20180602	UV		REISSUED FOR USE			JT
0	20151103	UV		ISSUED FOR USE			JT

**WorleyParsons** resources & energy  
 ALASKA LNG PROJECT  
 LNG FACILITIES  
 NISK, Alaska

**Alaska LNG™**  
 ALASKA LNG PIPELINE PROJECT  
 MIDDLE FORK OF THE KOYUK RIVER @ MP 211.139  
 WPC 127  
 DMT CROSSING PLAN & PROFILE

<b>DRAWN BY</b>	<b>DATE</b>	<b>SCALE</b>	<b>CHWD</b>	<b>ISSUE NO.</b>
LW	20150303	AS SHOWN	APP'D	2
<b>DRAWING NO.</b>	USAP-WP-YDLX-00-000026-00			



**PROFILE ALONG PROPOSED NPS 42 ALASKA LNG PIPELINE**  
 HORIZONTAL SCALE 1" = 120'  
 VERTICAL SCALE 1" = 10'

**PIPE SPECIFICATION TABLE**

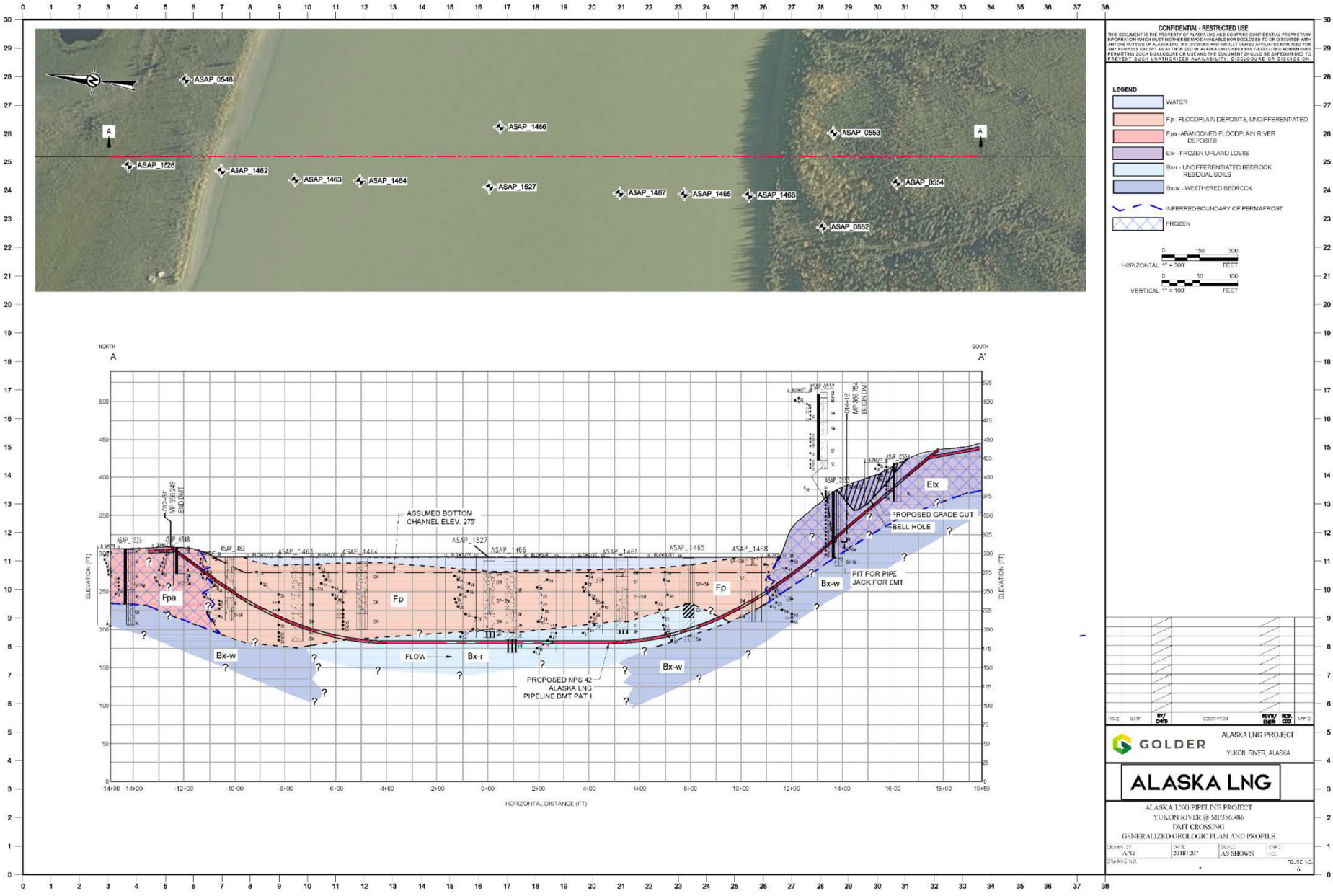
PIPE TYPE	PIPE SIZE	OD	WT	PIPE SPECIFICATION	MOP	DESIGN PRESSURE	COATING	CATHODIC PROTECTION
		in	in		psig	psig		
LINE PIPE	NPS 42	47	0.677	API 5L Grade X80M PSL2	2075	2075	3 LPE	YES
HEAVY WALL	NPS 42	42	1.24	API 5L Grade X70M PSL2	2075	2075	3 LPE	YES

**COORDINATES TABLE**

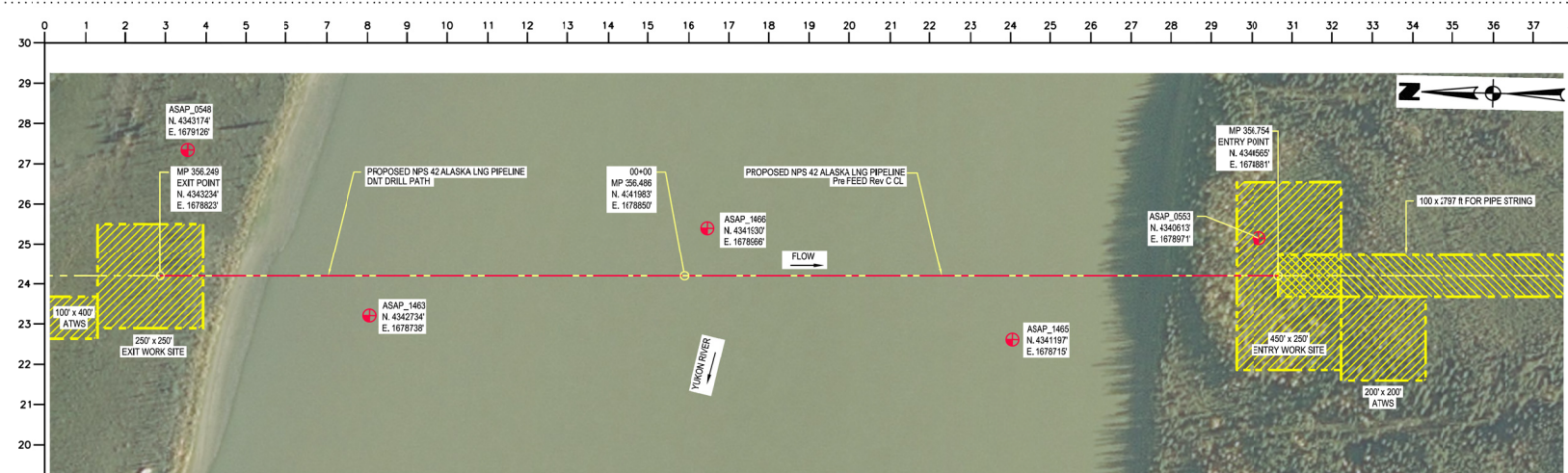
COORD. SYSTEM	DATUM	ZONE
GCS_NAD_1983_NSR5 2007	NAD 83_NSR5 2007	ALASKA ZONE 4
CROSSING COORDINATES @ MP 211.139		
N. 4978122		
E. 1670109		

- NOTES:**
- ALL DIMENSIONS IN FEET UNLESS OTHERWISE NOTED.
  - LIMITED SUBSOIL INFORMATION IS AVAILABLE.
  - THE GROUND PROFILE IS BASED ON LIDAR OBTAINED IN 2014. ELEVATIONS ARE GEODETIC.
  - THE CROSSING DESIGN IS CONCEPTUAL AND IS TO BE CONFIRMED DURING DETAILED ENGINEERING.
  - THE CONSTRUCTION PERIOD IS TENTATIVELY SCHEDULED DURING SUMMER.
  - THE EXPECTED SOIL CONDITIONS BASED ON AVAILABLE SUBSURFACE DATA OR TERRAIN MAPPING, CONSIST OF FLOODPLAIN RIVERBED DEPOSITS OF GRAVEL AND SAND WITH FREQUENT COBBLES AND BOULDERS OVER CLAUSTRINE SILT AND CLAY. THE SOIL IS GENERALLY FROZEN OUTSIDE THE CHANNEL WITH UP TO 20% ICE. FURTHER INVESTIGATION IS REQUIRED TO CONFIRM THE EXPECTED CONDITIONS.
  - FOR ADDITIONAL GEOTECHNICAL INFORMATION SEE FEDERAL ENERGY REGULATORY COMMISSION MAJOR WATERBODIES SITE CHARACTERISTICS AND INSTALLATION METHODOLOGY REPORT - USAP-WP-GRZZ-00-000054-000.

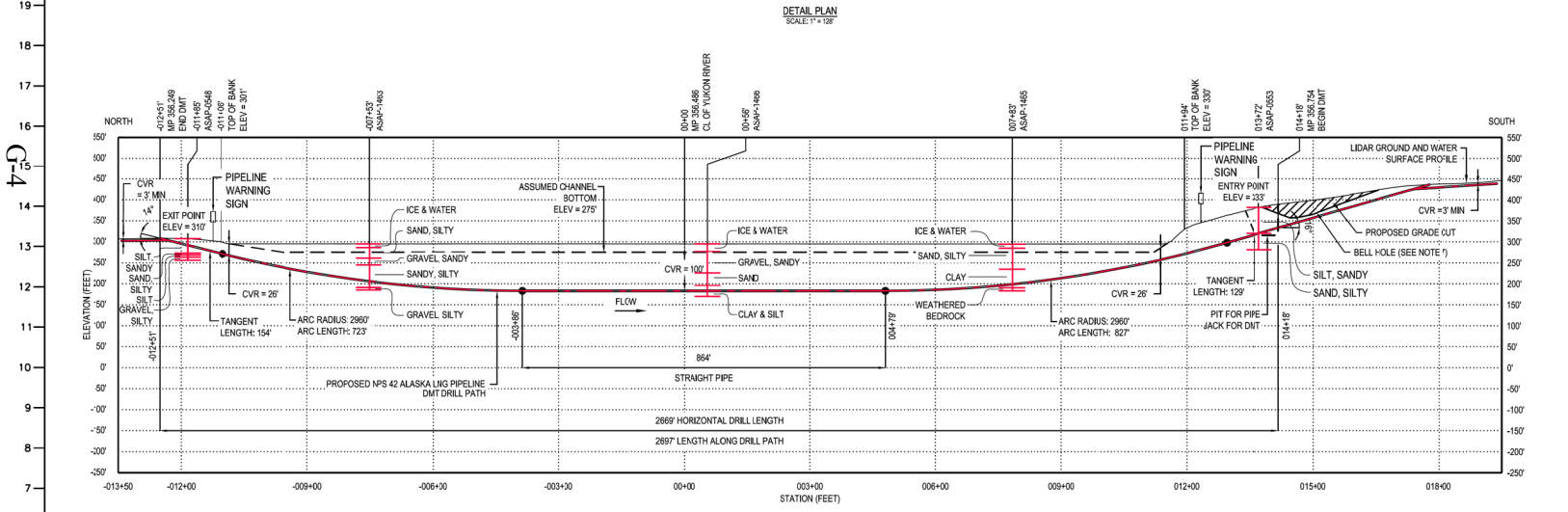
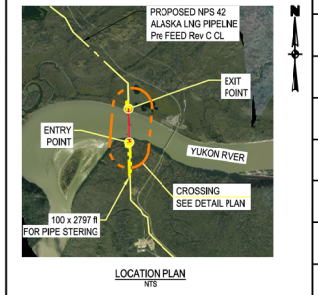
# Generalized Geologic Plan and Profile



G-3



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**PIPE SPECIFICATION TABLE**

PIPE TYPE	PIPE SIZE	OD	WT	PIPE SPECIFICATION	MOP	DESIGN PRESSURE	COATING	CATHODIC PROTECTION
		inch	lb/ft		psig	psig		
LINE PIPE	NPS 42	42	0.677	API 5L Grade X80M PSL2	2075	2075	3 LPE	YES
HEAVY WALL	NPS 42	42	1.24	API 5L Grade X70M PSL2	2075	2075	3 LPE	YES

**COORDINATES TABLE**

COORD. SYSTEM	DATUM	ZONE
GCS_NAD_1983_NRSR 2007	NAD 83_NRSR 2007	ALASKA ZONE 4
CROSSING COORDINATES @ MP 356.486		
N. 4341983° E. 1678950°		

**NOTES:**

- ALL DIMENSIONS IN FEET UNLESS OTHERWISE NOTED.
- SUBSOIL INFORMATION IS AVAILABLE.
- THE GROUND PROFILE IS BASED ON LIDAR OBTAINED IN 2014. ELEVATIONS ARE GEODETIC.
- THE CROSSING DESIGN IS CONCEPTUAL AND IS TO BE CONFIRMED DURING DETAILED ENGINEERING.
- THE CONSTRUCTION PERIOD IS TENTATIVELY SCHEDULED DURING SUMMER.
- THE EXPECTED SOIL CONDITIONS, BASED ON AVAILABLE SUBSURFACE DATA OR TERRAIN MAPPING, CONSIST OF RIVERBED DEPOSITS OF GRAVEL AND SAND WITH FREQUENT COBBLES AND BOLDERS OVER WEATHERED IGNEOUS AND SEDIMENTARY BEDROCK. A THAW BULB IS EXPECTED BELOW THE YUKON RIVER THAT MAY EXTEND INTO THE NORTH FLOODPLAIN. THE SOUTH BANK CONSISTS OF SILTS WITH INTERMITTENT GRAVEL LAYERS WITH SIGNIFICANT SUBSURFACE ICE.
- CURRENT TECHNOLOGY LIMITS THE DMT TO MAXIMUM LENGTH OF APPROXIMATELY 2700 FT. HENCE, A BELL HOLE AND SLOPE GRADINGS ARE REQUIRED. FUTURE TECHNOLOGY MAY REDUCE THE REQUIRED BELL HOLE LENGTH.
- FOR ADDITIONAL GEOTECHNICAL INFORMATION SEE FEDERAL ENERGY REGULATORY COMMISSION MAJOR WATERBODIES SITE CHARACTERISTICS AND INSTALLATION METHODOLOGY REPORT - USAP-WP-GRZZ-00-000054-000.

**REFERENCE DRAWINGS**

1	20160803	REVISED FOR USE			JT
2	20160828	ISSUED FOR USE			JT

**ABBREVIATIONS & ACRONYMS**

API - AMERICAN PETROLEUM INSTITUTE  
 ATWS - ADDITIONAL TEMPORARY WORK SPACE  
 CVR - COVER  
 DMT - DIRECTIONAL MICROTUNNELLING  
 HDD - HORIZONTAL DIRECTIONAL DRILLING  
 LIDAR - LIGHT DETECTION AND RANGING  
 MIN - MINIMUM  
 MP - MILE POST  
 MOP - MAXIMUM OPERATING PRESSURE  
 MS - MEAN SEA LEVEL  
 NAD - NORTH AMERICAN DATUM  
 NAVD83 - NORTH AMERICAN VERTICAL DATUM OF 1988  
 NRSR 2007 - NATIONAL SPATIAL REFERENCE SYSTEM 2007  
 psig - POUNDS PER SQUARE INCH GAUGE  
 3LPE - THREE LAYER POLYETHYLENE

**LEGEND:**

• BOREHOLE

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NO.	DATE	BY	CHKD	DESCRIPTION	REV/	RESP	APP'D
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2	20160828	JT		ISSUED FOR USE			JT

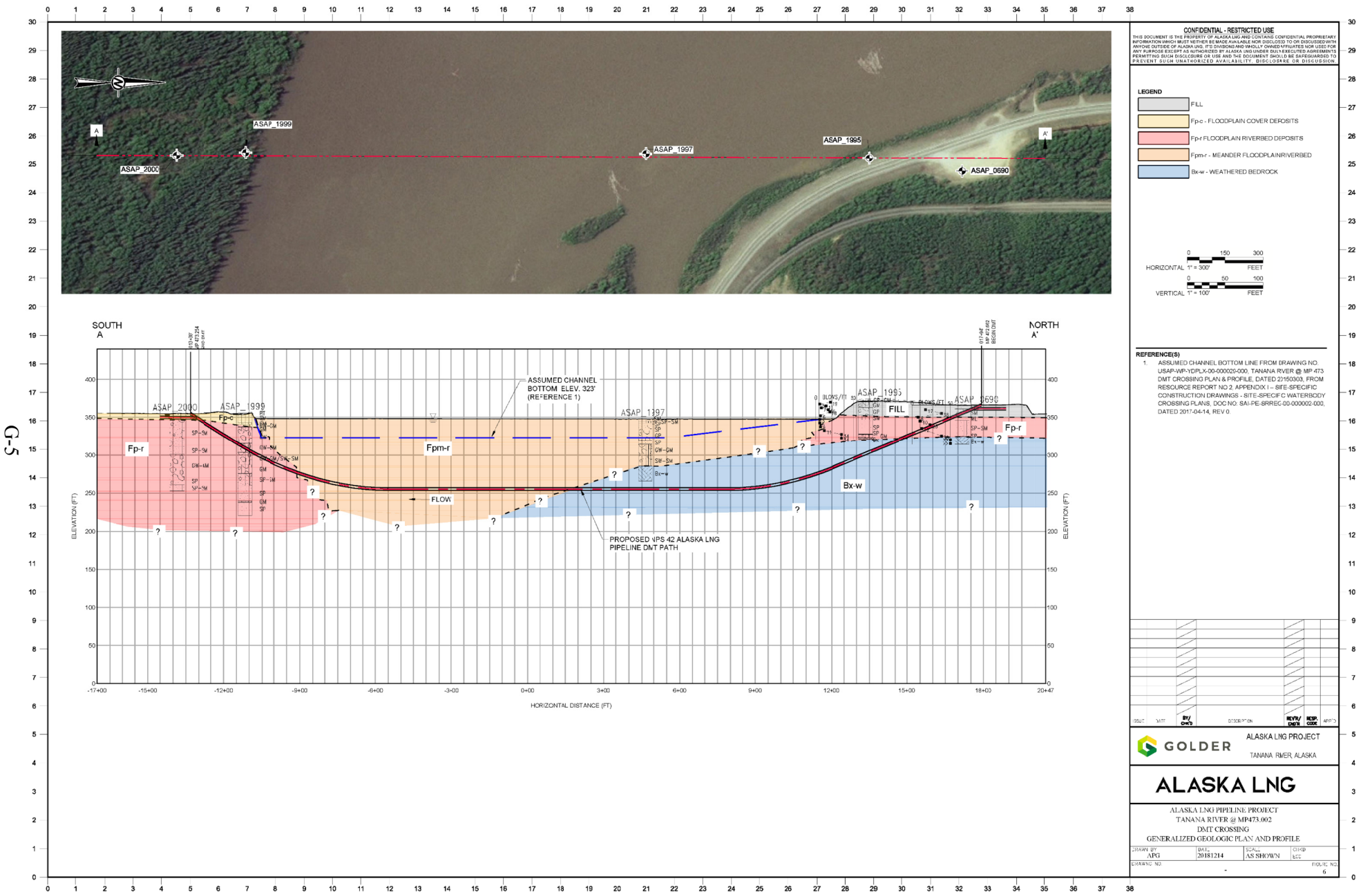
**WorleyParsons** ALASKA LNG PROJECT  
 resources & energy LNG FACILITIES  
 NISK, Alaska

**Alaska LNG**

ALASKA LNG PIPELINE PROJECT  
 YUKON RIVER @ MP 356.486  
 WPC 217  
 DMT CROSSING PLAN & PROFILE

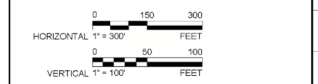
DRAWN BY: LW DATE: 20160421 SCALE: AS SHOWN CHWD: JT  
 DRAWING NO.: USAP-WP-YDPLX-00-000062-000 ISSUE NO.: 1

# Generalized Geologic Plan and Profile



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- LEGEND**
- FILL
  - Fp-c - FLOODPLAIN COVER DEPOSITS
  - Fp-r FLOODPLAIN RIVERBED DEPOSITS
  - Fpm-r - MEANDER FLOODPLAIN RIVERBED
  - Bx-w - WEATHERED BEDROCK



- REFERENCES:**
1. ASSUMED CHANNEL BOTTOM LINE FROM DRAWING NO. USAF-WP-YDPLX-00-000002-000, TANANA RIVER @ MP 473 DMT CROSSING PLAN & PROFILE, DATED 2/15/03, FROM RESOURCE REPORT NO. 2 APPENDIX I - SITE SPECIFIC CONSTRUCTION DRAWINGS - SITE SPECIFIC WATER RESIDUOUS CROSSING PLANS, DOC NO. SAI/PE-SRREG-00-000002-000, DATED 2017-04-14, REV 0.

DATE	BY	CHKD	APP'D
03/08/2016	APG	APG	APG

**GOLDER**  
 ALASKA LNG PROJECT  
 TANANA RIVER, ALASKA

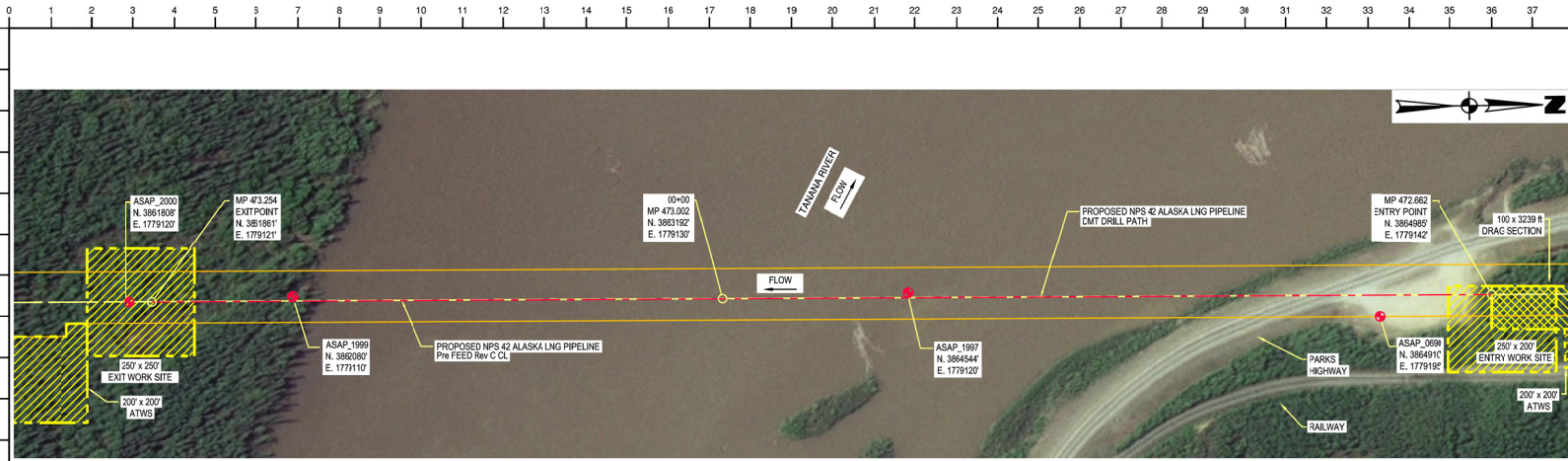
## ALASKA LNG

ALASKA LNG PIPELINE PROJECT  
 TANANA RIVER @ MP473.002  
 DMT CROSSING  
 GENERALIZED GEOLOGIC PLAN AND PROFILE

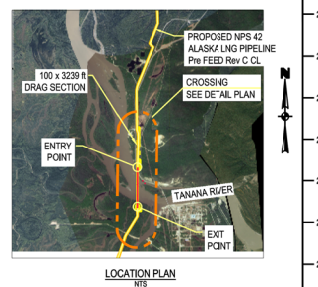
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APG	20181214	AS SHOWN	SLC

DRAWING NO. FIGURE NO. 6

G-5



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  - LIDAR - LIGHT DETECTION AND RANGING
  - MIN - MINIMUM
  - MILE - MILE POST
  - MOP - MAXIMUM OPERATING PRESSURE
  - MSL - MEAN SEA LEVEL
  - NAD - NORTH AMERICAN DATUM
  - NAVD88 - NORTH AMERICAN VERTICAL DATUM OF 1988
  - NSRS 2007 - NATIONAL SPATIAL REFERENCE SYSTEM 2007
  - psig - POUNDS PER SQUARE INCH GAUGE
  - 3LPE - THREE LAYER POLYETHYLENE

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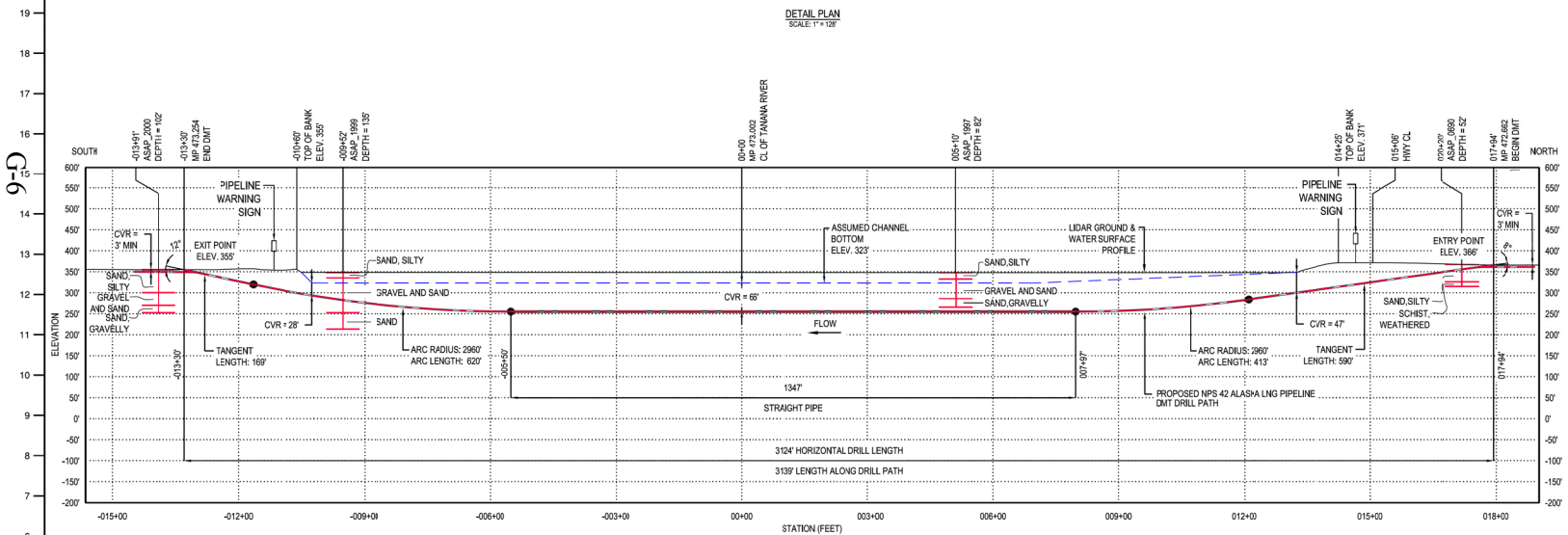
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0	20150708		ISSUED FOR USE			JT

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 LNG FACILITIES  
 NISK, Alaska

**Alaska LNG**<sup>TM</sup>

ALASKA LNG PIPELINE PROJECT  
 TANANA RIVER @ MP 473.002  
 WPC 276 - B  
 DMT CROSSING PLAN & PROFILE

DRAWN BY: LW DATE: 20150303 SCALE: AS SHOWN CWD: JT  
 DRIVING NO.: USAP-WP-YDPLX-00-000029-000 ISSUE NO.: 1



9-6

PIPE SPECIFICATION TABLE

PIPE TYPE	PIPE SIZE	OD	WT	PIPE SPECIFICATION	MOP	DESIGN PRESSURE	COATING	CATHODIC PROTECTION
		inch			psig	psig		
LINE PIPE	NPS 42	42	0.677	API 5L Grade X80M PSL2	2075	2075	3 LPE	YES
HEAVY WALL	NPS 42	42	1.24	API 5L Grade X70M PSL2	2075	2075	3 LPE	YES

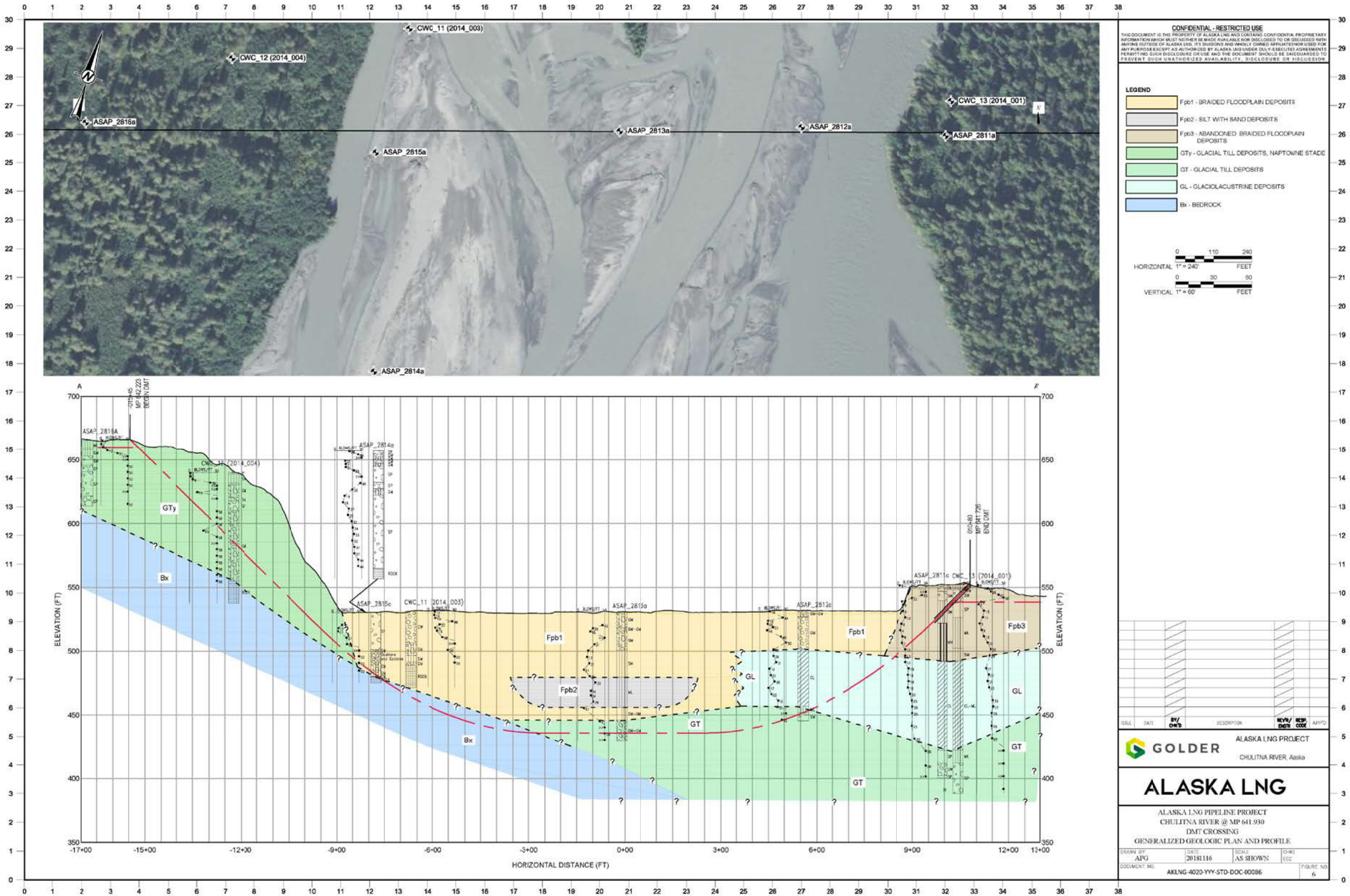
COORDINATES TABLE

COORD. SYSTEM	DATUM	ZONE
GCS_NAD_1983_NSR5 2007	NAD 83_MSR5 2007	ALASKA ZONE 4
CROSSING COORDINATES @ MP 473.002		
N. 3863192 E. 1779107		

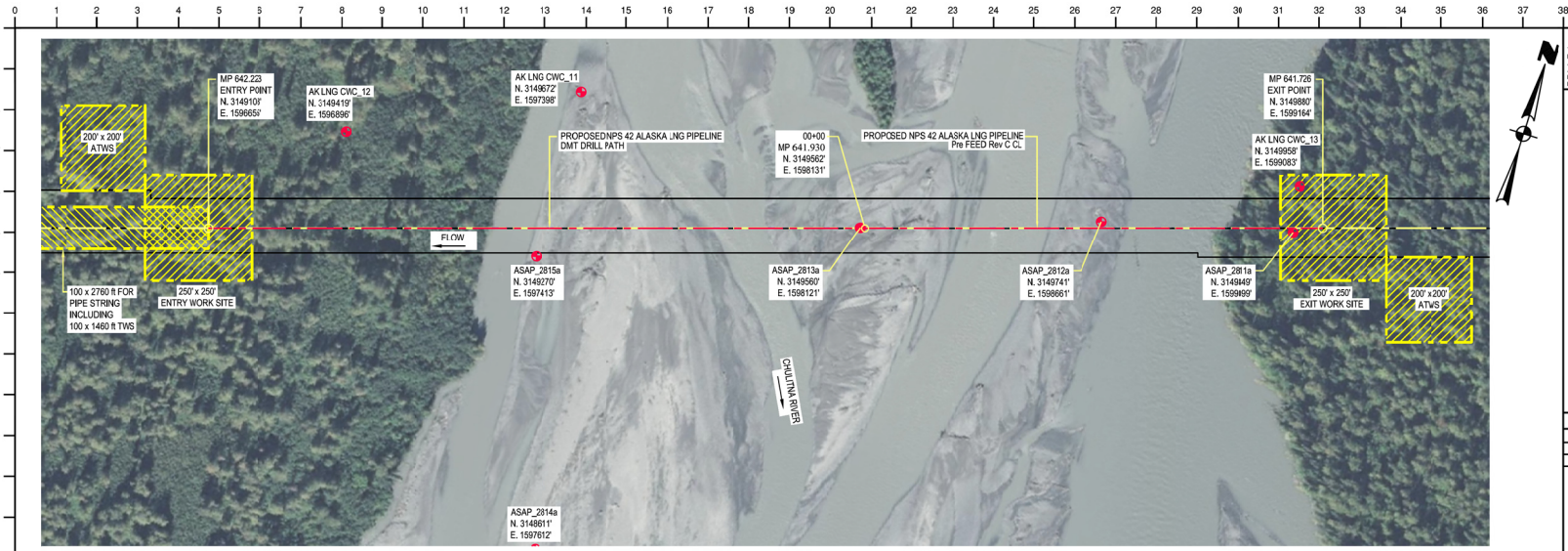
- NOTES:
- ALL DIMENSIONS IN FEET UNLESS OTHERWISE NOTED.
  - LIMITED SUBSOIL INFORMATION IS AVAILABLE.
  - THE GROUND PROFILE IS BASED ON LIDAR OBTAINED IN 2014. ELEVATIONS ARE GEODETIC.
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  - THE CONSTRUCTION PERIOD IS TENTATIVELY SCHEDULED DURING SUMMER.
  - THE EXPECTED SOIL CONDITIONS, BASED ON AVAILABLE SUBSURFACE DATA OR TERRAIN MAPPING, CONSIST OF SAND, SILT AND FINE TO COARSE, SUB-ANGULAR GRAVEL OVERLYING HIGHLY WEATHERED SCHIST. SOILS ARE GENERALLY UNFROZEN.
  - FOR ADDITIONAL GEOTECHNICAL INFORMATION SEE FEDERAL ENERGY REGULATORY COMMISSION MAJOR WATERBODIES SITE CHARACTERISTICS AND INSTALLATION METHODOLOGY REPORT - USAP-WP-GRZZZ-00-000054-000.



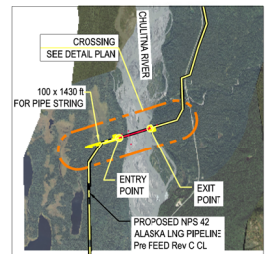
# Generalized Geologic Plan and Profile



G-7



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**LOCATION PLAN**  
 NPS

**REFERENCE DRAWINGS**

1	
2	
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20	

**ABBREVIATIONS & ACRONYMS**

- API - AMERICAN PETROLEUM INSTITUTE
- ATWS - ADDITIONAL TEMPORARY WORK SPACE
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- HDD - HORIZONTAL DIRECTIONAL DRILLING
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- MSL - MEAN SEA LEVEL
- NAD - NORTH AMERICAN DATUM
- NAVD88 - NORTH AMERICAN VERTICAL DATUM OF 1988
- NSRS 2007 - NATIONAL SPATIAL REFERENCE SYSTEM 2007
- psig - POUNDS PER SQUARE INCH GAUGE
- 3LPE - THREE LAYER POLYETHYLENE

**LEGEND:**  
 ● - BOREHOLE

**PRELIMINARY ONLY  
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 CONSTRUCTION**

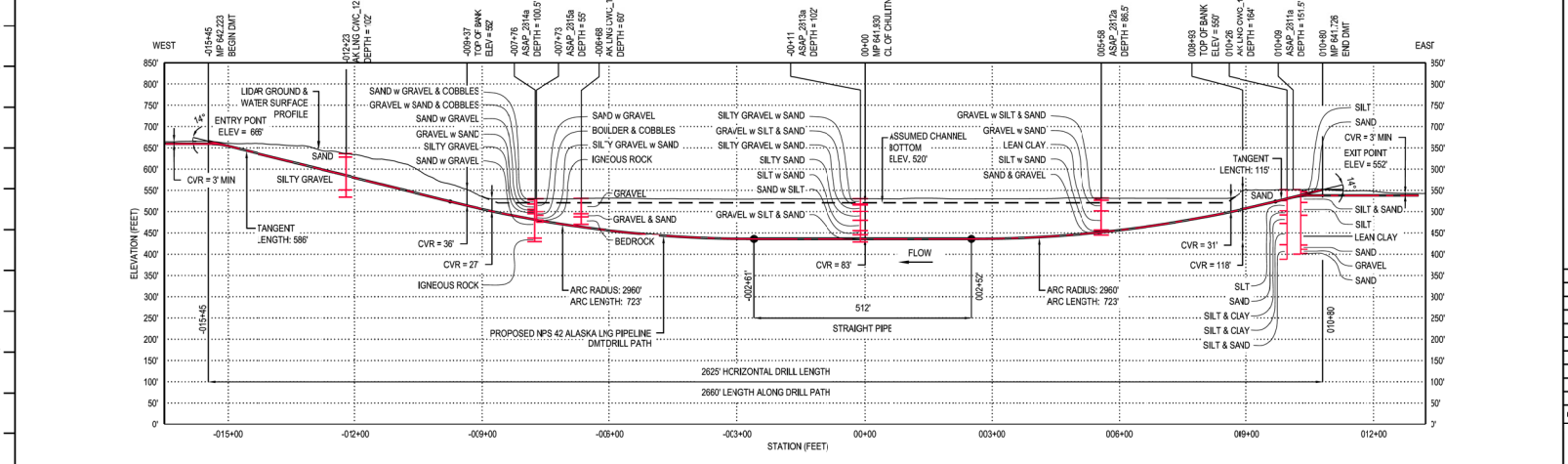
NO.	DATE	BY / CHK'D	DESCRIPTION	REV'D / ENDR	RESP. CODE	APP'D
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2	20180929		REVISED FOR USE			JT
1	20180829		REVISED FOR USE			JT
0	20180114		ISSUED FOR USE			JT

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**Alaska LNG™**

ALASKA LNG PIPELINE PROJECT  
 CHULITNA RIVER @ MP 641.930  
 WPC 350  
 DMT CROSSING PLAN & PROFILE

DRAWN BY	DATE	SCALE	CHWD	ISSUE NO.
LW	20150908	AS SHOWN	APPRO	2
DRAWING NO.	USAP-WP-YDPLX-00-000030-000			



**PROFILE ALONG PROPOSED NPS 42 ALASKA LNG PIPELINE**  
 HORIZONTAL SCALE 1" = 120'  
 VERTICAL SCALE 1" = 100'

**PIPE SPECIFICATION TABLE**

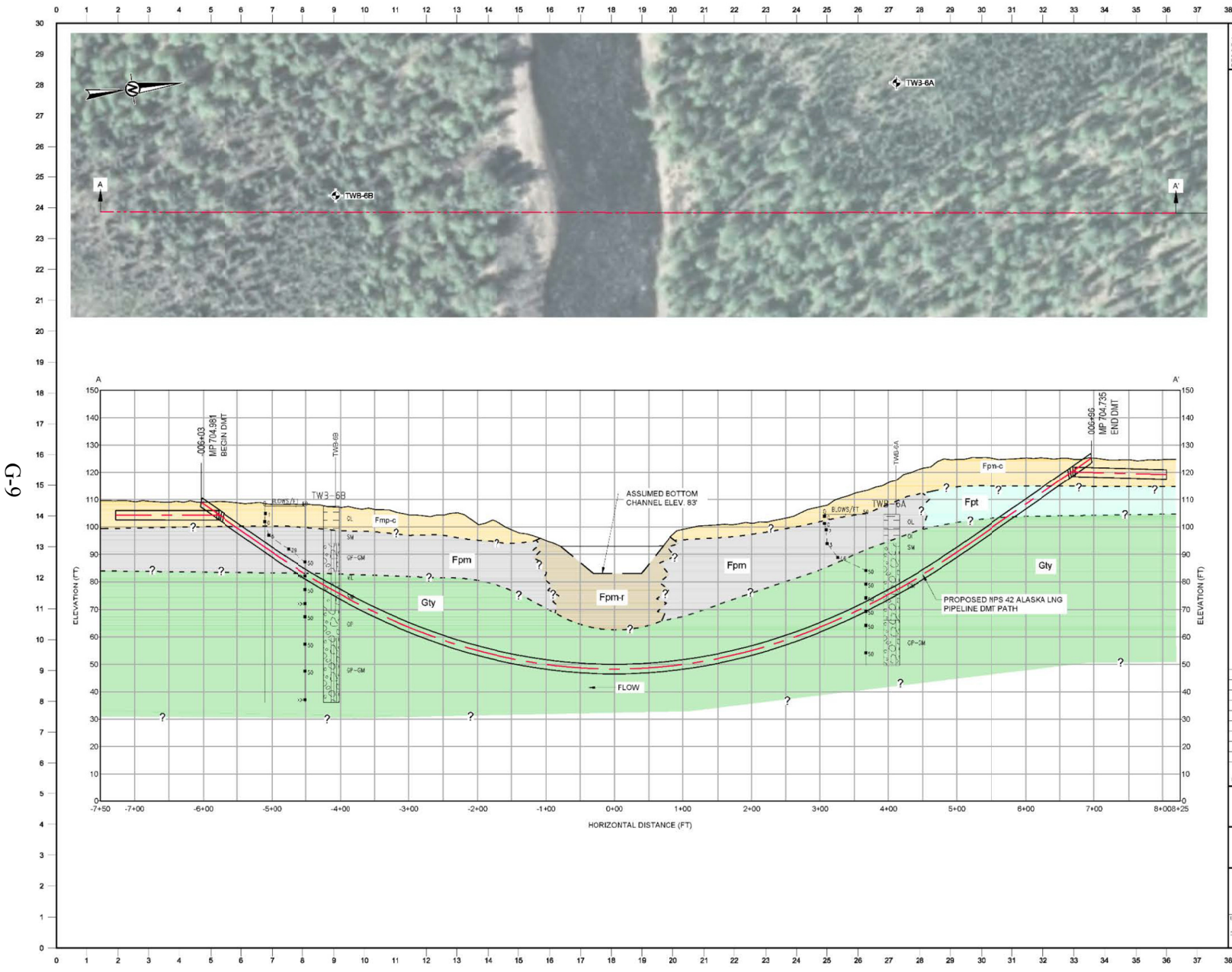
PIPE TYPE	PIPE SIZE	OD	WT	PIPE SPECIFICATION	MOP	DESIGN PRESSURE	COATING	CATHODIC PROTECTION
		inch			psig	psig		
LINE PIPE	NPS 42	42	0.677	API 5L Grade X80M PSL2	2075	2075	3 LPE	YES
HEAVY WALL	NPS 42	42	1.24	API 5L Grade X70M PSL2	2075	2075	3 LPE	YES

**COORDINATES TABLE**

COORD. SYSTEM	DATUM	ZONE
GCS_NAD_1983_NSR5 2007	NAD 83_NRS 2007	ALASKA ZONE 4
CROSSING COORDINATES @ MP 641.930		
N. 3149562 E. 1598131		

- NOTES:**
- ALL DIMENSIONS IN FEET UNLESS OTHERWISE NOTED.
  - SUBSOIL INFORMATION IS AVAILABLE.
  - THE GROUND PROFILE IS BASED ON LIDAR OBTAINED IN 2014. ELEVATIONS ARE GEODETIC.
  - THE CROSSING DESIGN IS CONCEPTUAL AND IS TO BE CONFIRMED DURING DETAILED ENGINEERING.
  - THE CONSTRUCTION PERIOD IS TENTATIVELY SCHEDULED DURING SUMMER.
  - THE EXPECTED SOIL CONDITIONS WITHIN THE CHANNEL, BASED ON AVAILABLE SUBSURFACE DATA OR TERRAIN MAPPING, CONSIST OF SILTY AND SAND OVERLYING SILTY CLAY. IGNEOUS ROCK IS EXPECTED AT DEPTH NEAR THE WEST BANK. FURTHER INVESTIGATION IS REQUIRED TO CONFIRM THE EXPECTED CONDITIONS.
  - FOR ADDITIONAL GEOTECHNICAL INFORMATION SEE FEDERAL ENERGY REGULATORY COMMISSION MAJOR WATERBODIES SITE CHARACTERISTICS AND INSTALLATION METHODOLOGY REPORT - USAP-WP-GRZZZ-00-00054-000.

# Generalized Geologic Plan and Profile



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**LEGEND**

- Fpm-c - MEANDER FLOODPLAIN COVER DEPOSITS
- Fpm - MEANDER FLOODPLAIN DEPOSITS
- Fpm-t - MEANDER FLOODPLAIN TERRACE DEPOSITS
- Fpt - FLUVIAL DEPOSITS (OLD HIGH LEVEL TERRACE)
- Gly - GLACIAL TILL DEPOSITS, NAPATOWNE GLACIATION

**HORIZONTAL SCALE:** 1" = 120' FEET

**VERTICAL SCALE:** 1" = 30' FEET

**ISSUE:** M-1  
**REV:** 01/20  
**DESCRIPTION:** ALASKA LNG PROJECT  
**DESIGN:** DESKIA RIVER, ALASKA  
**APP'D:** [Signature]

**GOLDER**

**ALASKA LNG**

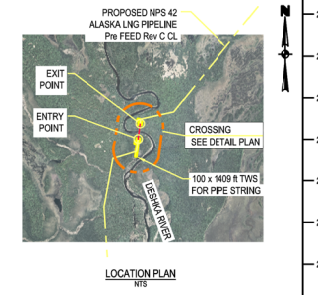
ALASKA LNG PIPELINE PROJECT  
 DESKIA RIVER #P MP704.867  
 DMT CROSSING  
 GENERALIZED GEOLOGIC PLAN AND PROFILE

DESIGNED BY: APG  
 DATE: 20181127  
 SCALE: AS SHOWN  
 CHECKED BY: ECC  
 DRAWING NO.: [Blank]  
 FIGURE NO.: 6



DETAIL PLAN  
SCALE: 1" = 64'

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LOCATION PLAN  
NPS

REFERENCE DRAWINGS

ABBREVIATIONS & ACRONYMS

- API - AMERICAN PETROLEUM INSTITUTE
- ATWS - ADDITIONAL TEMPORARY WORK SPACE
- CVR - COVER
- DEM - DIGITAL ELEVATION MODEL
- DMT - DIRECTIONAL MICROTUNNELLING
- HDD - HORIZONTAL DIRECTIONAL DRILLING
- LIDAR - LIGHT DETECTION AND RANGING
- MOP - MAXIMUM OPERATING PRESSURE
- MSL - MEAN SEA LEVEL
- NAVD88 - NORTH AMERICAN VERTICAL DATUM OF 1988
- NOZ - NO DRILL ZONE
- psig - POUNDS PER SQUARE INCH GAUGE
- 3LPE - THREE LAYER POLYETHYLENE
- 3LPP - THREE LAYER POLYPROPYLENE

LEGEND:  
• - 2016 BOREHOLE

**PRELIMINARY ONLY  
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CONSTRUCTION**

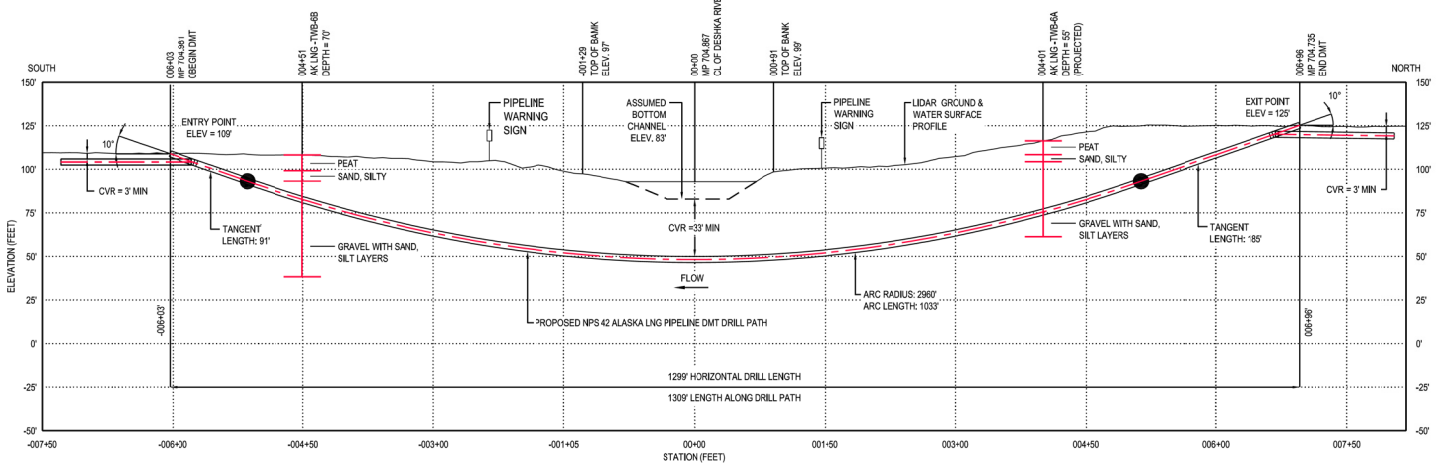
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**WorleyParsons** resources & energy  
ALASKA LNG PROJECT  
LNG FACILITIES  
NIMSK, Alaska

**Alaska LNG**  
ALASKA LNG PIPELINE PROJECT  
DESHKA RIVER @ MP 704.867  
WPC 373-B  
DMT CROSSING PLAN & PROFILE

DRAWN BY	DATE	SCALE	CHK'D	APP'D
LW	20160418	AS SHOWN	WPC	WPC

DRAWING NO. USAP-WP-YDPLX-00-000065-000 ISSUE NO. 1



PROFILE ALONG PROPOSED NPS 42 ALASKA LNG PIPELINE  
HORIZONTAL SCALE 1" = 64'  
VERTICAL SCALE 1" = 32'

- NOTES:
- ALL DIMENSIONS IN FEET UNLESS OTHERWISE NOTED.
  - SUBSOIL INFORMATION IS LIMITED.
  - THE GROUND PROFILE IS BASED ON LIDAR OBTAINED IN 2014. ELEVATIONS ARE GEODETIC.
  - THE CROSSING DESIGN IS CONCEPTUAL AND IS TO BE CONFIRMED DURING DETAILED ENGINEERING.
  - THE CONSTRUCTION PERIOD IS TENTATIVELY SCHEDULED DURING SUMMER.
  - THE EXPECTED SOIL CONDITIONS, BASED ON AVAILABLE SUBSURFACE DATA OR TERRAIN MAPPING, CONSIST OF SAND OVERLYING SILTY SAND AND GRAVEL. FURTHER INVESTIGATION IS REQUIRED TO CONFIRM THE EXPECTED CONDITIONS.
  - FOR ADDITIONAL GEOTECHNICAL INFORMATION SEE FEDERAL ENERGY REGULATORY COMMISSION MAJOR WATERBODIES SITE CHARACTERISTICS AND INSTALLATION METHODOLOGY REPORT - USAP-WP-GRZZ-00-000054-000.

PIPE SPECIFICATION TABLE

PIPE TYPE	PIPE SIZE	OD	WT	PIPE SPECIFICATION	MOP	DESIGN PRESSURE	COATING	CATHODIC PROTECTION
		inch	lb/ft		psig	psig		
LINE PIPE	NPS 42	42	0.677	API 5L Grade X80M PSL2	2075	2075	3 LPE	YES
HEAVY WALL	NPS 42	42	1.24	API 5L Grade X70M PSL2	2075	2075	3 LPE	YES

COORDINATES TABLE

COORD. SYSTEM	DATUM	ZONE
GCS_NAD_1983_NRSR 2007	NAD 83_NRSR 2007	ALASKA ZONE 4

CROSSING COORDINATES @ MP 704.867  
N. 2847593'  
E. 1580878'

G-10