Large LNG Storage Tank Construction Update

- **LNG Storage Tank:**
  - 5.2 Million gallon capacity
  - Double-walled full containment design
  - Scheduled Completion: Fall 2019

- Competitive RFP Process: August – October 2017
  - “EPC” Solicitation: Engineering, Procurement and Construction
  - Limited to companies with direct previous experience designing and constructing cryogenic LNG storage tanks

- Negotiations and Contractor Selection: November – December 2017

- **EPC Tank Contractor Selected: Preload Cryogenics**
- Begin work December 2017

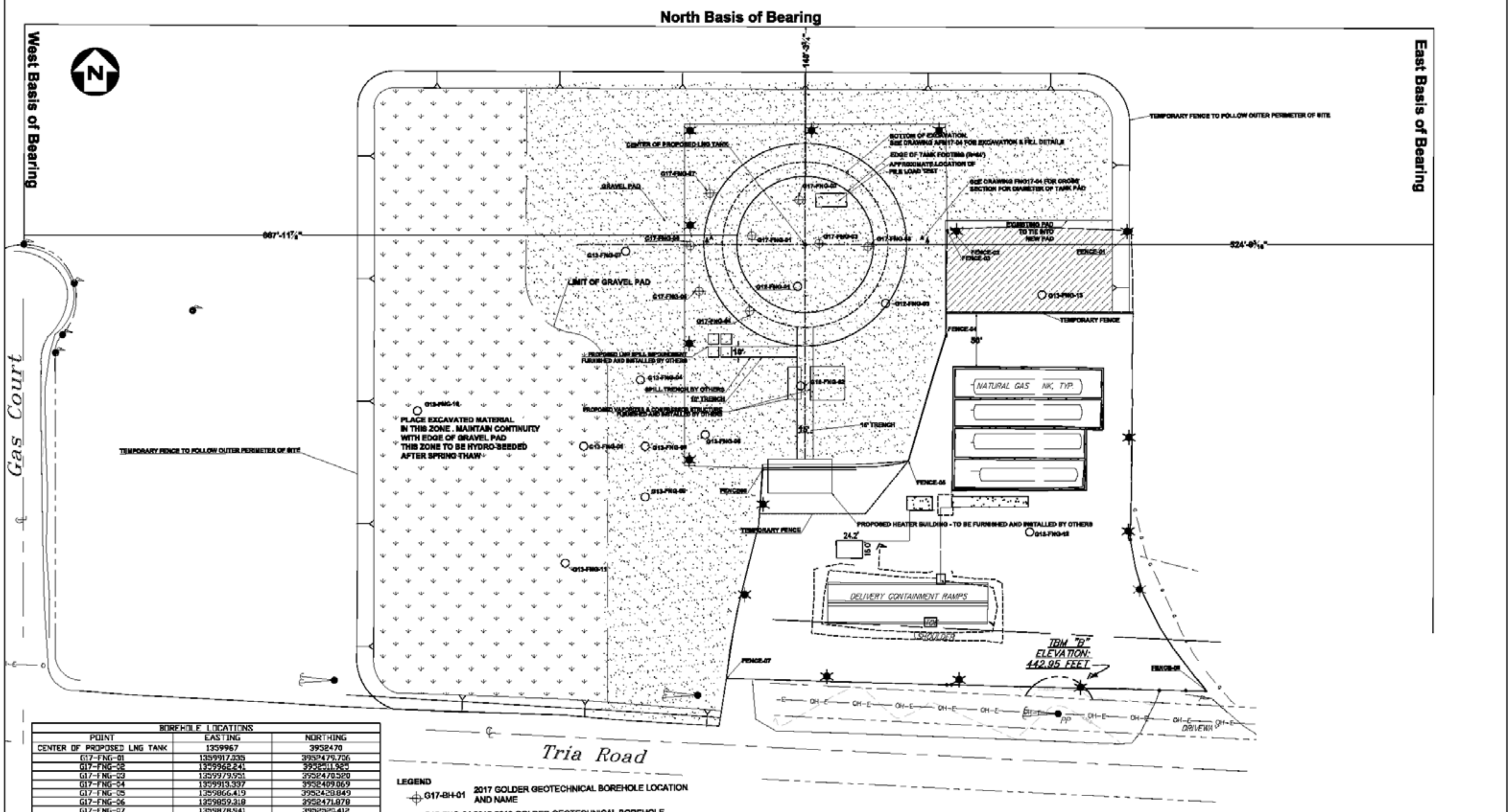
Large LNG Storage Tank Construction Update

Pentex Team

- Dan Britton, Pentex President & CEO, Principal
- CHI Engineering, Owner's Engineer
- Design Alaska, Balance of Plant Engineer
- David Prusak, IGU / Stantec Consulting Services, Project Manager
- DOWL, Materials Testing Quality Assurance

Preload Cryogenics Sub-contractors:

- Great Northwest – All site preparation, including clearing, excavation, construction of pad and tank foundation preparation
- Anchorage Sand & Gravel – Manufacture of Outer Tank Pre-Cast Panels
- Golder & Associates – Geotechnical Design
- Arctic Foundations – Thermo-syphons design, manufacture and installation
- Rady Concrete – Tank Foundation
- Fullford Electric – Site Power
- Diamond Fence – Construction Fencing
- Precision &/or Alaska Crane
- Mappa Testing or similar local lab
- Alaska X-Ray or similar local testing company



BOREHOLE LOCATIONS		
POINT	EASTING	NORTHING
CENTER OF PROPOSED LNG TANK	1359967	3952470
G17-FNG-01	1359917.035	3952479.706
G17-FNG-02	1359962.241	3952511.925
G17-FNG-03	1359979.951	3952470.520
G17-FNG-04	1359913.337	3952409.069
G17-FNG-05	1359866.419	3952420.849
G17-FNG-06	1359859.318	3952471.878
G17-FNG-07	1359878.941	3952520.412
G17-FNG-08	1360025.754	3952466.594
G12-FNG-01	1359958.825	3952430.887
G12-FNG-02	1359959.106	3952337.495
G12-FNG-03	1360040.82	3952412.772
G13-FNG-04	1359809.233	3952347.14
G13-FNG-05	1359754.479	3952286.49
G13-FNG-06	1359868.557	3952294.224
G13-FNG-07	1359798.639	3952468.196
G13-FNG-08	1359812.141	3952284.85
G13-FNG-09	1359810.789	3952237.319
G13-FNG-10	1359599.571	3952323.831
G13-FNG-11	1359734.216	3952177.29
G13-FNG-12	1360169.993	3952194.797
G13-FNG-13	1360187.514	3952416.856
Note: Northings and eastings in Alaska State Plane Zone 3, NAD83, US Feet		

LEGEND

- G17-BH-01 — 2017 GOLDER GEOTECHNICAL BOREHOLE LOCATION AND NAME
- G12-FNG-04 — 2012-2013 GOLDER GEOTECHNICAL BOREHOLE LOCATION AND NAME

THIS DRAWING IS PREPARED BASED ON SURVEY PERFORMED BY A LICENSED SURVEYING FIRM LIC. #7521-S

APPROVED FOR CONSTRUCTION

GLOBAL ENGINEERING SERVICES — PRELOAD CRYOGENICS
549 SOUTH STREET QUINCY, MA 02169 U.S.A.

ONE 125,000 BBL FULL CONTAINMENT LNG TANK
FAIRBANKS NATURAL GAS
FAIRBANKS, ALASKA
LNG TANK FOUNDATION LOCATION

DRAWN: RKS	SCALE: AS SHOWN	CONTRACT NUMBER:	
DESIGNED: SSM		DRAWING NUMBER:	FNG18-03
CHECKED: SSM	DATE: 01/08/2018		

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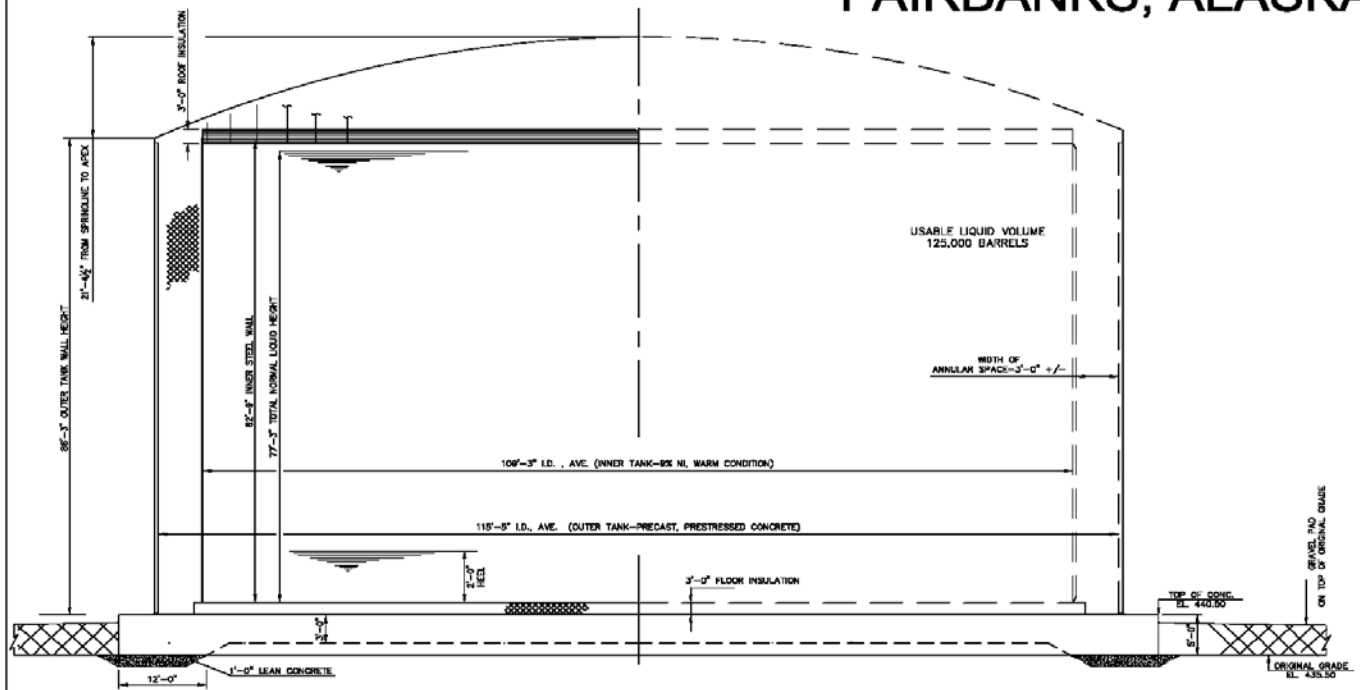
ONE 125,000 BBL FULL CONTAINMENT LNG TANK
FAIRBANKS, ALASKA



HALF SECTION

GENERAL ELEVATION – FULL CONTAINMENT TANK

HALF ELEVATION

LOADS FOR FOUNDATION DESIGN			
DESCRIPTION	MAGNITUDE	RADIUS ~ FEET	DIRECTION
WEIGHT ROOF	1933 lbs/ft	55'-5½"	DOWN
WEIGHT OUTER SHELL	14,000 lbs/ft	57'-5½"	DOWN
WEIGHT INNER SHELL	1005 lbs/ft	54'-7½"	DOWN
WEIGHT SUSPENDED DECK	97 lbs/ft	56'-6½"	DOWN
WEIGHT DECK INSULATION	164 lbs/ft	56'-6½"	DOWN
WEIGHT PERLITE	1,358 lbs/ft	56'-2½"	DOWN
DESIGN PRESSURE ON OUTER SHELL	10,340 lbs/ft	56'-6½"	UP
DESIGN PRESSURE ON BOTTOM	360 lbs/ft² WITHIN 115'-5"ø	N.A.	DOWN
TEST PRESSURE ON OUTER SHELL	12,900 lbs/ft	56'-6½"	UP
TEST PRESSURE ON BOTTOM	450 lbs/ft² WITHIN 115'-5"ø	N.A.	DOWN
SNOW	1,484 lbs/ft	55'-5½"	DOWN
WEIGHT PRODUCT	2286 lbs/ft² WITHIN 109'ø	N.A.	DOWN
WEIGHT TEST WATER	2841 lbs/ft² WITHIN 109'ø	N.A.	DOWN
WEIGHT BOTTOM PL. & INSULATION	19.22 lbs/ft² WITHIN 109'ø	N.A.	DOWN
WIND LOADS*			
WIND UPLIFT ON ROOF PER ASCE 7	3,201 lbs/f	55	UP
WIND OVERTURNING MOMENT PER ASCE 7	47,884 k-ft	56'-6½"	UP/DOWN
WIND OVERTURNING PER API 620, 5.11.2.2	–	N.A.	UP/DOWN
WIND SHEAR	807,600 lbs	N.A.	LATERAL
OBE SEISMIC LOADS			
OUTER TANK EQ OVERTURNING MOMENT ON WALL	168,363 k-ft	56'-6½"	UP/DOWN
INNER TANK EQ OVERTURNING MOMENT ON WALL	460,743 k-ft	54'-7½"	UP/DOWN
OUTER TANK BASE SHEAR	3,238,000 lbs	N.A.	LATERAL
INNER TANK BASE SHEAR	10,001,020 lbs	N.A.	LATERAL
TOTAL OVERTURNING MOMENT ON FOUNDATION**	652,206 k-ft OVER 125'ø	N.A	UP/DOWN
SSE SEISMIC LOADS			
OUTER TANK EQ OVERTURNING ON WALL	DOES NOT CONTROL	56'-6½"	UP/DOWN
INNER TANK EQ OVERTURNING ON WALL	402,545 k-ft	54'-7½"	UP/DOWN
OUTER TANK SHEAR	DOES NOT CONTROL	N.A	LATERAL
INNER TANK SHEAR	8,728,457 lbs	N.A.	LATERAL
PLATFORM LOADS*			
DEAD LOAD	1,070 lbs/ft	–	DOWN
FLUID LOAD	447 lbs/ft	–	DOWN
LIVE LOAD	888 lbs/ft	–	DOWN
* ESTIMATED VALUES. FINAL VALUES WILL BE LESS AND WILL BE REPORTED UPON COMPLETION OF DESIGN			
**CONTROLLING VALUE FROM INNER TANK ADDED TO CONTROLLING VALUE FROM OUTER TANK INCL. BASE PRESSURE AND FOUNDATION WT.			

DESCRIPTION	INNER TANK		OUTER TANK	
SERVICE PRODUCT	LNG		INSUL. & PRESS. CONTAINMENT	
NET WORKING LIQUID CAPACITY	125,000 BBL		–	
– MINIMUM NORMAL OPERATING LEVEL	2'-0"		–	
– MAXIMUM NORMAL OPERATING LEVEL	77'-3"		–	
– DESIGN LIQUID LEVEL	81'-8"		–	
FREEBOARD ABOVE DESIGN LIQUID LEVEL (COLD)	4'-8½"		–	
–HYDROSTATIC TEST LEVEL: INNER TANK (S.G. = 1.0)	49'-4"		–	
PRODUCT SPECIFIC GRAVITY	0.47		–	
PRODUCT DESIGN TEMPERATURE	–270F		–	
TANK DESIGN PRESSURE (INTERNAL)			2.5 PSIG	
TANK DESIGN PRESSURE (VACUUM)			2" OF WATER	
CORROSION ALLOWANCE	NONE		NONE	
DESIGN STANDARD	SEE NOTE 2			
WIND – STD/CODE	ASCE 7-05, 150 MPH (49CFR193)			
SNOW/ICE LOAD (ROOF) – STD/CODE	49CFR193, 50 PSF PER RFP			
SEISMIC DESIGN – STD/CODE	API 620 12TH ED. APP. L			
	OBE	SSE	OBE	SSE
HORIZONTAL PGA (g)	0.238	0.439	0.238	0.439
VERTICAL PGA (g)	0.10	0.21	0.10	0.21
TANK HORIZONTAL IMPULSIVE S_a (g) (See TABLE-7 GEOTECHNICAL REPORT)	0.353	0.889	0.376	–
TANK HORIZONTAL CONVECTIVE S_a (g) (SEE TABLE-7 GEOTECHNICAL REPORT	0.146	0.264	–	–
TANK MAXIMUM VERTICAL (g) (FIGURE-4 GEOTECHNICAL REPORT)	0.28	0.58	0.28	0.58
CALCULATED BOILOFF PER DAY AT 50% FULL	0.117%			
FOUNDATION	SLAB ON GRADE			

MATERIAL SPECIFICATION		
ITEM	MATIERAL – INNER TANK	MATERIAL – OUTER TANK
SHELL	A553 TYPE 1	A516-70
SECONDARY FLOOR	A553 TYPE 1	A 553 TYPE 1
ANNULAR PL & SKIRT PL.	A553 TYPE 1	A553 TYPE 1
SUSPENDED DECK	B209-5083-O	–
SUSPENDED DECK RODS (UPPER/LOWER)	A479 304	–
SHELL STIFFENERS	A553 TYPE 1	–
COMPRESSION BAR	–	A516-60
ROOF	–	A516-60
ROOF STRUCTURAL	–	A516-60
ANCHOR STRAP	A240 304	ASTM A-416, 7 WIRE STRAND
TABLE NOTES:		
1. NORMAL MAXIMUM OPERATING LEVEL IS USED IN COMBINATION WITH ANY ABNORMAL EVENT.		
2. APPLICABLE DESIGN STANDARDS ARE AS FOLLOWS: 49 CFR 193, NFPA 59A 2001, NFPA 59A 2006 (SEISMIC & NDE), API 620 11TH EDITION (ADDENDUM 1), API 625 (ADDENDUM 2) AND ACI 376-11		

DRAWINGS INDEX

NOTES:

OUTER TANK DESIGN BY GLOBAL ENGINEERING, CONSTRUCTION BY PRELOAD CRYOGENICS
FOUNDATION SLAB DESIGN BY GLOBAL ENGINEERING, CONSTRUCTION BY PRELOAD CRYOGENICS
INNER TANK, INSULATION DESIGN AND CONSTRUCTION BY AMERICAN TANK & VESSELS
TANK ROOF DESIGN AND CONSTRUCTION BY AMERICAN TANK & VESSELS
EXCAVATION, FILL AND SUBGRADE PROTECTION DESIGN BY GOLDER ASSOCIATES
THERMOSYPHON SYSTEM DESIGN AND INSTALLATION BY ARCTIC FOUNDATION
FOUNDATION HEATING DESIGN AND SUPPLY BY CH ENERGY SERVICES LLC.

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GLOBAL ENGINEERING SERVICES
PRELOAD CRYOGENICS
549 SOUTH STREET QUINCY, MA 02169 U.S.A.

ONE 125,000 BBL FULL CONTAINMENT LNG TANK
FAIRBANKS NATURAL GAS
FAIRBANKS, ALASKA
GENERAL ARRANGEMENT DRAWING

DRAWN:	RKS	SCALE: AS SHOWN	CONTRACT NUMBER:
DESIGNED:	SSM		
CHECKED:	SSM	DATE: 01/05/2018	DRAWING NUMBER: FNG18-01

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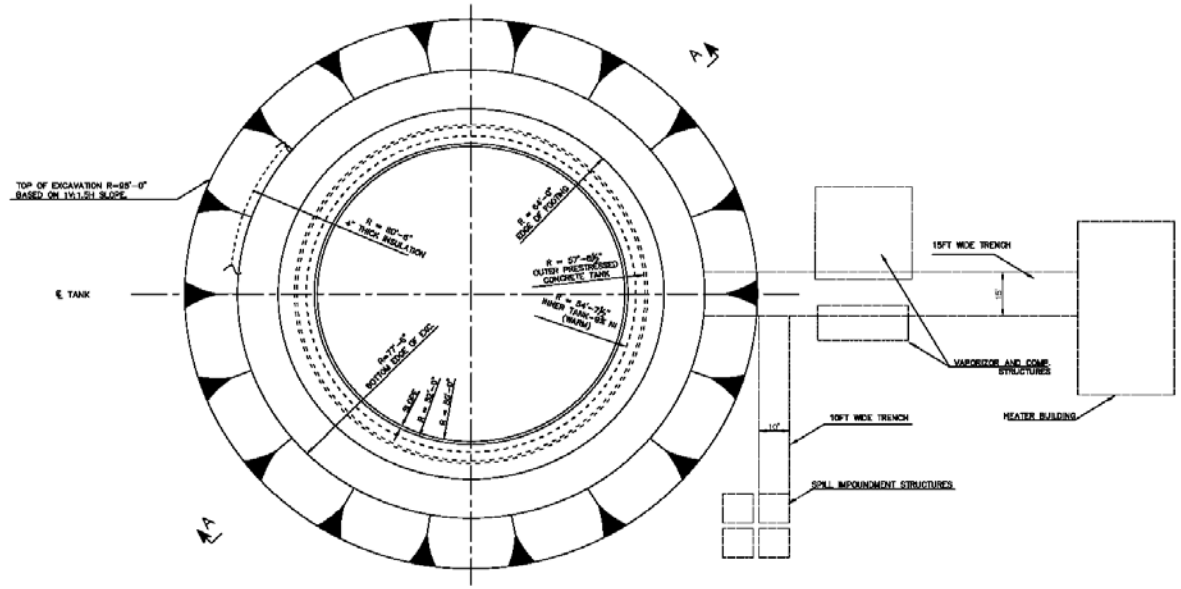
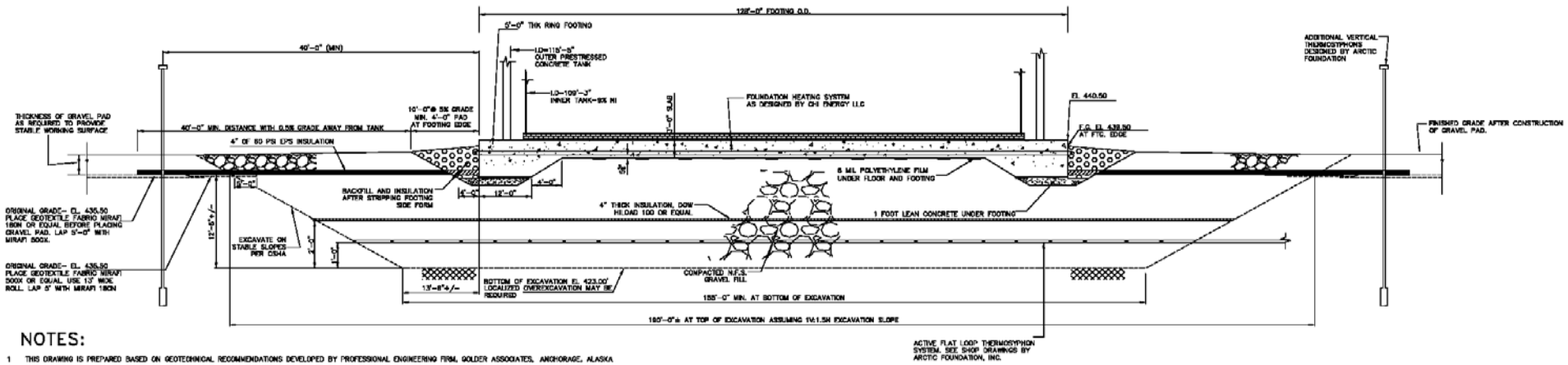


PLAN VIEW OF TANK EXCAVATION

0 10' 20' 40'

SCALE: 1"=20'-0"



SECTION A–A

(N.T.S.)

NOTES:

1. THIS DRAWING IS PREPARED BASED ON GEOTECHNICAL RECOMMENDATIONS DEVELOPED BY PROFESSIONAL ENGINEERING FIRM, GOLDER ASSOCIATES, ANCHORAGE, ALASKA
2. IT IS ASSUMED THAT THE SUBGRADE IMPROVEMENT WILL PROVIDE 4000PSF OF ALLOWABLE BEARING CAPACITY UNDER SUSTAINED LOADS WITHOUT EXCEEDING TOTAL AND DIFFERENTIAL SETTLEMENT LIMITS ESTABLISHED BY ACI 376.
3. FILL WILL BE PLACED IN 12" LOOSE LIFTS, WITH EACH LIFT COMPACTED TO 95% MODIFIED PROCTOR. COMPACTION TESTS SHALL BE PERFORMED FOR EVERY 5000 SQUARE FEET AREA OF EACH LIFT. NFS GRAVEL SHALL BE PLACED IN "THAWED" STATE SO AS TO BE ABLE TO ACHIEVE 95% MODIFIED PROCTOR COMPACTION
4. GRADATION OF NFS GRAVEL FILL SHALL BE SUBMITTED FOR APPROVAL BY GOLDER ASSOCIATES
5. IT IS ASSUMED THAT THE ACTIVE FLAT LOOP AND PASSIVE VERTICAL THERMOSYPHON SYSTEM DESIGNED BY ARCTIC FOUNDATION INC. BASED ON RECOMMENDATIONS BY GOLDER ASSOCIATES, WILL MAINTAIN AND PROTECT THE PERMAFROST SO AS TO AVOID EXCESSIVE TOTAL AND DIFFERENTIAL SETTLEMENT
6. IT IS ASSUMED THAT THE FOUNDATION HEATING SYSTEM DESIGNED BY CHI ENERGY SERVICES WILL MAINTAIN TOP OF THE SOIL TEMPERATURE WITHIN THE LIMITS SPECIFIED BY GOLDER ASSOCIATES.
7. GRAVEL PAD TO BE COMPACTED WITH TWO PASSES OF VIBRATORY ROLLER IN EACH DIRECTION
8. REFER TO EXCAVATION AND SUBGRADE PREPARATION RECOMMENDATIONS DEVELOPED BY GOLDER ASSOCIATES FOR ADDITIONAL INFORMATION

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GLOBAL ENGINEERING SERVICES | PRELOAD

549 SOUTH STREET QUINCY, MA 02169 U.S.A.

ONE 125,000 BBL FULL CONTAINMENT LNG TANK

FAIRBANKS NATURAL GAS

FAIRBANKS, ALASKA

EXCAVATION AND FILL DETAILS

DRAWN: RKS	SCALE: AS SHOWN	CONTRACT NUMBER:	
DESIGNED: SSM			
CHECKED: SSM	DATE: 01/06/2016	DRAWING NUMBER:	FNG15--02

1/11/2016 2:33 PM

Golder Associates
18300 NE Union Hill Road, Suite 200
Redmond, WA USA 98052-3333
Tel: (425) 883-0777
Fax: (425) 882-5498

TO: Preload International
549 South Street
Quincy MA 02169

DATE: Saturday, February 3, 2018	**JOB NO:** 1788335
PROJECT: Fairbanks LNG Tank	
LOCATION: 2942 Tria Road, Fairbanks, AK	
CONTRACTOR: Great Northwest Inc	**OWNER:** Fairbanks Natural Gas
WEATHER: Clear	**TEMP:** - 27 to -10 °F
PRESENT AT SITE: Golder – Ted Sager	
Great Northwest Inc. (GNI) – Sherman (Superintendent)	
Preload - Butch Sinkus	

ON SITE: 7:45 am **OFF SITE:** 5:30 pm

THE FOLLOWING WAS NOTED:

LNG Tank Excavation/Backfill

GNI continued excavating for the LNG tank pad today. GNI plans to excavate all areas to elevation 424 ft. (with the exception of some limited areas in the SW previously excavated to elevation 423 ft.).

GNI continued the circular tank excavation in the SE quadrant of the excavation using a tracked Hitachi EX400 excavator to rip and remove the silt and gravel soils to elevation 424 ft. The excess soil was stockpiled over much of the area cut today. GNI will load out excess soil and clean up for inspection early this coming week.

In the AM hours GNI used a temporary haul road through roughly the center of the excavation to load out previously stockpiled and freshly excavated silt form the north quadrants of the excavation. A Deere 350G excavator was used to rip/excavate the silt and load it into two Deere 330D haul trucks for stockpile to the SW of the work area. In the afternoon GNI used a CAT D8 in addition to the excavator to rip and push soil in the central and northern portions to staging piles within the excavation for future load out.

GNI reached approximately elevation 424 ft. for about 1/5 of the excavation, mainly in the south-southeast portion of the excavation today. The remaining areas appear to be about 1 to 1.5 feet above elevation 424 ft.

Southern Fill Pad

No work was performed on this pad today.

Loop Pipe Trench

GNI began excavation of the 15-foot wide (bottom depth) loop pipe trench to the south of the main LNG circular tank excavation. A CAT D8 was used to rip the upper snow ice and frozen silt. A CAT was used to excavate and load one Deere 300D haul truck for transport to the soil waste stockpile to the southwest of the excavation areas. About 100 feet of the trench excavation footprint south of the tank excavation was ripped to about 12 inches. A small approximately 15 ft. by 10 ft. area adjacent to the tank excavation was excavated to 3 feet below existing grade.

General Notes/Discussions/Recommendations

- GNI excavating tank subgrade to elevation 424 ft. Once that elevation is reached across the tank pad footprint GNI will present a plan for over excavation and backfill of any remaining silt and low areas, to Golder. Golder engineers will give recommendations after the excavation is at 424 and bottom conditions are observed and their plan is reviewed.
- We updated Dave Prusak with Stantec/IGU/FNG twice today via phone conversation and text photos.
- No Stantec/IGU/FNG personnel on site today.
- By the end of the shift GNI decided not to work tomorrow Sunday, February 4, 2018.

Large LNG Storage Tank Construction Update

- Other Items
  - Excavation continuing
  - Order 9% Nickel Steel
  - Order Rebar for foundation (cryosteel)
  - Flat-Loop Evaporators (thermosyphons) manufactured
  - Foundation Permit under review with Alaska State Fire Marshall
  - Outer Wall Design nearing completion, preparing for fabrication
  - Working with GVEA to bring in temporary power
  - Temporary fencing placed

Large LNG Storage Tank Construction Update

- Next Steps for February
  - Excavation completed for tank and Balance of Plant
  - Set Flat-Loop Evaporators (Thermosyphons)
  - Prepare to Backfill
  - Complete Design of outer wall for preparation to fabricate
  - Prepare list of long lead items to order for Balance of Plant
  - Install Temporary Power
  - Prepare next submittal to the Alaska State Fire Marshall
  - Continue dome roof design
  - Begin inner tank design