

**Site Specific - Akiak Low Earth Orbit Broadband
Infrastructure Development**

Environmental Assessment

September 2021

**Akiak Home Relocation and Managed Retreat Project
and
Other Disaster Related Infrastructure Development**

Project Information

Project Name: Akiak Low Earth Orbit Broadband Infrastructure Development

Responsible Entity: Akiak Technology, a subsidiary of Akiak Native Community (tribe)

Grant Recipient (if different than Responsible Entity): Akiak Native Community

Preparer: Joel Neimeyer, P.E. & Michael Willmon, P.E.

Certifying Officer Name and Title: Michael P. Williams, Sr., Akiak Tribal Chief

Consultant (if applicable): Joel Neimeyer, P.E. & Michael Willmon, P.E.

Direct Comments to:

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Project Location: Akiak, Alaska

Tiered Environmental Review: This document is the sixth environmental review document of what is envisioned to be nine documents that will communicate the potential environmental impacts associated with the Akiak Home Relocation and Managed Retreat Project (Project) and other disaster related infrastructure development. The proposed Akiak low earth orbit (LEO) broadband infrastructure development project is included in the “other disaster related infrastructure development”.

The reader is encouraged to review the Amendment No. 1 to the Akiak Broad Review Environmental Assessment (September 2021) and the original Akiak Broad Review Environmental Assessment (June 2020) which both complement this document.

While the tiered environmental review documents are generally written in the format specified by the US Department of Housing and Urban Development, the site specific environmental assessment for the Akiak LEO broadband project will conform to the Federal Communications Commission (FCC) requirements for environmental assessments.

Description of the Proposed Project - Alternative Selection: The tribe, through its subsidiary (Akiak Technology) has received a FCC [license](#) for the 2.5 GHz spectrum, normally reserved for an education broadband service, but recently the FCC has expanded for eligible tribes.

The tribe is a recipient of federal funding through the American Rescue Plan Act (ARP Act) to address the COVID-19 pandemic. The ARP Act allows tribes to build broadband facilities and the Akiak tribal council has dedicated \$1.3M for this purpose.

The ARP Act funding from the US Department of Treasury (Treasury) waives National Environmental Policy Act (NEPA) requirements with exceptions. With the proposed Akiak LEO broadband project, the FCC requires registering a tower which in consultation with FCC staff (August 31, 2021 e-mail from Jill A. Springer, FCC Wireless Telecommunications Bureau) triggers the need for an environmental assessment if required under 47 CFR § 1.1307. In other words, it is not the construction of the Akiak LEO broadband project that requires NEPA environmental review, but the FCC registration of a broadband tower.

Treasury requires that ARP Act funding used for broadband projects must bring service to households or businesses that are not currently serviced by a wireline connection that reliably delivers at least 25 Mbps download speed and 3 Mbps of upload speed. Such is the case with all residences and businesses in Akiak, as the current provider does not provide service at these speeds. The proposed Akiak LEO broadband project will provide internet service as the minimum speeds identified by Treasury.

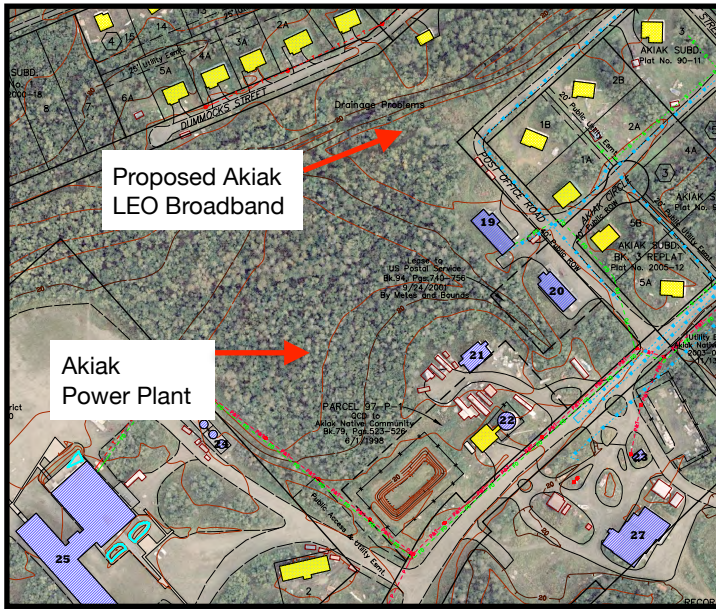
Three options are available to the tribe to improve broadband connectivity. The first option is the Akiak LEO broadband project which will require a modest sized tower centrally located in the community that will download internet service from low earth orbit satellites. The second option is fiber optics which is cost prohibitive. The third option is the “do nothing” alternative and accept the current slow level of service, but costly service, from the only commercial internet carrier in the Y-K Delta which uses a network of microwave relay towers that has limited capacity.

The Akiak tribal council has selected broadband service to be delivered by low earth orbit satellites as the most cost effective and reasonable solution for the community.

The current level of service in Akiak, typically \$300/month for a residential service provides 10 Mbps download speeds which is 100 times slower than what is offered in many US cities. Furthermore, monthly service is capped at 100 gigabytes per month. The LEO option will increase internet speeds to 25 Mbps and have a higher data cap of 150 gigabytes per month at less the cost. The Akiak LEO satellite feed will be directed to a central tower which will then rebroadcast the satellite feed to each home and commercial business.

47 CFR §1.1311 Environmental information to be included in the environmental assessment

- (1) For antenna towers and satellite earth stations, a description of the facilities as well as supporting structures and appurtenances, and a description of the site as well as the surrounding area and uses.



The proposed Akiak LEO broadband site is on undeveloped land. It is adjacent to a housing subdivision (homes are yellow), the community clinic (building 19), the post office (building 20), and is in an area where no future housing is proposed. The temporary steel tower will be 60 feet high to support the 2.5 Ghz base station equipment. The proposed permanent tower will be 150 feet high to support both the LTE radios and long haul point-to-point microwave for inter village networking requirements.

Adjacent to the tower will be an equipment shelter that will be constructed above the 1964 flood level.

Just north of the proposed site is a drainage swale that will not accommodate infrastructure development. The development of the proposed Akiak LEO broad band site will not impact the drainage swale. South of the proposed Akiak LEO broadband site is the tribe's water treatment plant and water storage tank (building 22). Building 21 is a tribal warehouse. Not shown in the aerial is the City-owned power plant which is adjacent to and north of the water treatment plant.

In short, the area the Akiak LEO broad band site is within a community commercial zone.

Additional site plan information is attached in the Appendix.

- (2) A statement as to the zoning classification of the site, and communications with, or proceedings before and determinations (if any) made by zoning, planning, environmental or other local, state or Federal authorities on matters relating to environmental effect.

Neither the City of Akiak or the tribe has zoning requirements or classifications. Nonetheless, the proposed Akiak LEO broadband site will be located in an area that has been reserved for non-residential structures.

(3) A statement as to whether construction of the facilities has been a source of controversy on environmental grounds in the local community.

The proposed Akiak LEO broadband project has not generated controversy in the community and many residents are looking forward to improved broadband service. The local cellular telephone service provider has a tower facility located over 1000 feet from the proposed Akiak LEO broad band site.

(4) A discussion of environmental and other considerations which led to the selection of the particular site and, if relevant, the particular facility; the nature and extent of any unavoidable adverse environmental effects, and any alternative sites or facilities which have been or might reasonably be considered.

There are two primary drivers in locating the proposed Akiak LEO broadband site. The first is that the site must be located away from the Kuskokwim River, given the recent significant riverine erosion. The proposed LEO broadband site is approximately 1800 feet from the river. The second driver is to be centrally located for optimum broadband service to all residences and commercial structures. The proposed site meets both of these requirements. As noted above, the proposed site is also located in a commercial zone in the community. The proposed site is on flat ground and the LEO broadband facilities will be located away from the existing drainage swale. Ground disturbance will be minimized; the site will be cleared of trees and other vegetation; and a fence will be installed around the proposed site.

While the community of Akiak is located within the Yukon Delta National Wildlife Refuge, as are many other tribal villages, conventional community infrastructure development such as towers are not prevented from being constructed. This is evidenced by the existing cellular telephone tower.



The proposed Akiak LEO broad band site is owned by the Kokarmiut Corporation, and the tribe and the corporation have agreed to a land lease option. Of note, the corporation leases land to the local cellular telephone provider, the US Post Office and to the Yukon-Kuskokwim Health Corporation which operates the local clinic.

The corporation board of directors are scheduled to meet on September 14, 2021 to approve the land lease, which has been recommended by corporation senior managers for approval.

(5) Any other information that may be requested by the Bureau or Commission.

Pending FCC review.

(6) If endangered or threatened species or their critical habitats may be affected, the applicant's analysis must utilize the best scientific and commercial data available, see 50 CFR 402.14(c).

No endangered or threatened species or their critical habits will be impacted by the proposed project. See further information below.

Statement of Purpose and Need for the Proposal: Akiak has already experienced one significant community outbreak of the COVID-19 virus in November to December 2020 when approximately 60% of the village residents were diagnosed with active COVID-19. With the new Delta variant the community has recently experienced a few residents diagnosed in August 2021 - active with the virus. The goal of the Akiak tribal council is to have the Akiak LEO broadband project up and running in the fall of 2021 so that if the community goes through a mandatory lock-down, as it did in late 2020, the school age children can continue with their education.

Existing Conditions and Trends: The proposed Akiak LEO broadband project site is located on land owned by the Kokarmiut Corporation (a village corporation created under the Alaska Native Claims Settlement Act of 1971). The corporation will lease the land to Akiak Technology. The proposed site is undeveloped with no prior disturbance or development, and is located in uplands as determined by wetland technicians that visited the site in August 2021.

The proposed site is in a floodplain, as is the entire village. Akiak only floods during spring break up of the Kuskokwim River when ice jams occur downriver from the village which create a temporary dam of the river. The highest level of flooding occurred in 1964 and all infrastructure development since is built to the 1964 flood level. Specific to the proposed site, it is approximately three to four feet lower in elevation than the 1964 flood level. In general, the community experiences spring time floods about once a decade.

The proposed Akiak LEO broadband project includes a temporary tower that will be located on a foundation pad that will be constructed below the 1964 flood level. In addition, the project

includes a secure equipment structure including a stand-by generator. The hardware assets will be placed on a platform above the 1964 flood level and the platform foundation, and the temporary tower, will be anchored and/or ballasted to withstand dynamic forces from a potential flood event.

It is the goal of the Akiak tribal council to seek funding for a permanent tower that will be constructed on the proposed site, adjacent to the temporary tower. Once the permanent tower is constructed, the temporary tower will be disassembled. The permanent tower will be installed on a driven pile foundation. In general, the underlying soils throughout Akiak are a silty sand deposited over time by the Kuskokwim River. There is no known permafrost soil in Akiak and there is no local source of gravel or rock structures.

FCC Environmental Assessment Requirements 47 CFR § 1.1307

Actions that may have a significant environmental effect, for which Environmental Assessments (EAs) must be prepared are identified below.

(1) Facilities that are to be located in an officially designated wilderness area.

Akiak is within the boundaries of the Yukon Delta National Wildlife Refuge.

(2) Facilities that are to be located in an officially designated wildlife preserve.

Akiak is within the boundaries of the Yukon Delta National Wildlife Refuge.

(3) Facilities that: (i) May affect listed threatened or endangered species or designated critical habitats; or (ii) are likely to jeopardize the continued existence of any proposed endangered or threatened species or likely to result in the destruction or adverse modification of proposed critical habitats, as determined by the Secretary of the Interior pursuant to the Endangered Species Act of 1973.

Not applicable. See Akiak Broad Review Environmental Assessment (June 2020), page 16.

(4) Facilities that may affect districts, sites, buildings, structures or objects, significant in American history, architecture, archeology, engineering or culture, that are listed, or are eligible for listing, in the National Register of Historic Places (*see* 54 U.S.C. 300308; 36 CFR parts 60 and 800), and that are subject to review pursuant to section 1.1320 and have been determined through that review process to have adverse effects on identified historic properties.

Not applicable. See Akiak Broad Review Environmental Assessment (June 2020), page 16.

(5) Facilities that may affect Indian religious sites.

Not applicable. Akiak Native Community, as the tribe, confirms that the proposed site will not affect Indian religious sites.

(6) Facilities to be located in floodplains, if the facilities will not be placed at least one foot above the base flood elevation of the floodplain.

The proposed broadband tower will be located in the floodplain, but as a metal structure it will not be impacted by flooding. The tower foundation and ballast system is designed to withstand the dynamic forces that may occur with a flood event. The proposed broadband shelter that houses electrical/mechanical components will be constructed above the 1964 flood plain to avoid damage in the event of a flood event.

The Federal Emergency Management Administration has not prepared flood maps for Akiak, so the 1964 flood level is what is used for project development elevation standards.

(7) Facilities whose construction will involve significant change in surface features (e.g., wetland fill, deforestation or water diversion). (In the case of wetlands on Federal property, *see* Executive Order 11990.)

Not applicable. There will be minimal change to the surface features and the proposed site is in uplands and not wetlands.

(8) Antenna towers and/or supporting structures that are to be equipped with high intensity white lights which are to be located in residential neighborhoods, as defined by the applicable zoning law.

Not applicable. No high intensity white lights will be mounted on the tower or the broadband shelter.

(b) In addition to the actions listed in paragraph (a) of this section, Commission actions granting construction permits, licenses to transmit or renewals thereof, equipment authorizations or modifications in existing facilities, require the preparation of an Environmental Assessment (EA) if the particular facility, operation or transmitter would cause human exposure to levels of radio frequency radiation in excess of the limits in §§ 1.1310 and 2.1093 of this chapter.

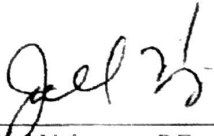
Not applicable. See attached analysis of radio frequency radiation prepared by Michael Willmon, P.E. in the Appendix. The conclusion of the analysis is that the OET/FCC Radiofrequency Electromagnetic Fields guidelines for Maximum Permissible Exposure (MPE) will only be exceeded, for both Occupational and General Population, up to 2.4 meters from the surface of the antenna. The Occupational and General Population MPE limits are always satisfied at in all other regions except near the surface of the antenna. The

areas where the MPE limits for the General Population are exceeded (Antenna Surface) are not accessible to the general population due to locked fencing and signage. Only trained RF personnel will have access to the antenna. Finally, the transmitter will be disabled during maintenance activities in these areas to protect personnel from exposure.

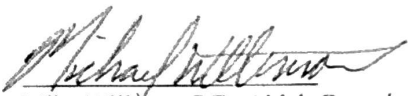
Summary of Findings and Conclusions:

1. There is no local controversy with the development of the proposed Akiak LEO broad band project.
2. The proposed Akiak LEO broad band site is located in a community commercial zone.
3. While the broadband infrastructure will be located in a floodplain, the assets will be designed and constructed to be protected from dynamic loading from potential flood events. In addition, the critical electrical/mechanical hardware will be located above the 1964 flood level.
4. The community desires increased broad band service.
5. Engineering analysis of radio frequency radiation shows that MPE limits are satisfied except near the surface of the antenna and only trained RF personnel will have access to the antenna.

Prepared by:

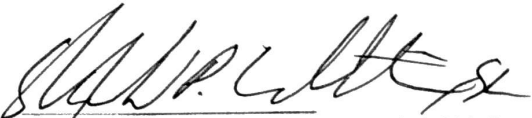

Joel Neimeyer, P.E., Akiak Consultant

9/3/2021
Date


Mike Willmon, P.E., Akiak Consultant

9/3/2021
Date

In Concurrence:


Michael P. Williams, Sr., Akiak Tribal Chief

9/7/2021
Date

**ANALYSIS OF NON-IONIZING RADIATION
FOR THE AKIAK 2.5GHZ LTE SITE IN AKIAK, ALASKA
Completed 08/30/2021**

This report analyzes the non-ionizing radiation levels for the 2.5Ghz LTE Base Station in Akiak, Alaska. The analysis and calculations performed in this report comply with the methods described in the FCC Office of Engineering and Technology Bulletin, No. 65 entitled "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields" - first published in 1985 and revised in 1997 in Edition 97-01. Bulletin No. 65 specifies that there are two separate tiers of exposure limits that are dependant on the situation in which the exposure takes place and/or the status of the individuals who are subject to the exposure. The Maximum Permissible Exposure (MPE) limits for persons in a General Population/Uncontrolled Environment are shown in Table 1, below. The General Population/Uncontrolled MPE is a function of the transmit frequency and is for an exposure period of thirty (30) minutes or less. The MPE limits for persons in an Occupational/Controlled environment are shown in Table 2, below. The Occupational/Controlled MPE is a function of the transmit frequency and is for an exposure period of six (6) minutes or less. The purpose of the analysis described in this report is to determine the power flux density levels of LTE site in the near-field, transition region, and the far field to compare these levels to the specified MPE limits.

This 2.5 Ghz LTE Base Station consists of three 120° sector antennas, at a height of 60 ft AGL, each with a pointing azimuth of 120° away from each adjacent neighbor. While this would typically be considered multiple sources, for the purposes of this analysis it will be presumed that the contribution of each sector to its adjacent neighbor at 120° away is insignificant and will not appreciably change the relatively low power densities in relation to the the limits on MPE.

The results of this analysis are summarized in Table 3 on the last page of this analysis.

Table 1. Limits for General Population/Uncontrolled Exposure (MPE)

Frequency Range (MHz)	Power Density(mW/cm ²)
30-300	0.2
300-1500	Frequency (MHz)/1500
1500-100,000	1.0

Table 2. Limits for Occupational/Controlled Exposure (MPE)

Frequency Range (MHz)	Power Density(mW/cm ²)
30-300	1.0
300-1500	Frequency (MHz)/300
1500-100,000	5.0

The following parameters were used to calculate the various power flux densities for this earth station:

Location:	Ambler Clinic	
Latitude:	60.909930	°N
Longitude:	161.226100	°W
Operating Frequency:	2500	MHz
Wavelength (λ)	0.11992	meters
Antenna Long Dimenion (H):	1.07	meters
Antenna Long Dimenion (W):	0.27	
Antenna Area (A):	0.29	meters ²
Transmit Antenna Gain:	16.0	dBi
Transmit Antenna Gain (G):	39.8	numeric
Maximum 5° Off Axis Gain:	4.5	dBi
Maximum 5° Off Axis Gain (G _{5°}):	2.8	numeric
Antenna Efficiency (η):	0.050	numeric
Feed Power (P):	3.98	Watts

1. Antenna/Main Reflector Surface Calculation

The power density in the main reflector region can be estimated by:

		Antenna Diameter	
		1.07	meters
Power Density at Antenna Surface,	S _{surface} =	4P/A	
	S _{surface} =	54.60	W/m ²
	S _{surface} =	5.46	mW/cm²

- S_{surface} = maximum power density at antenna surface
- P = power fed to the antenna
- A = physical area of the antenna

2. Near Field Calculations

In the near field region, of the main beam, the power density can reach a maximum before it begins to decrease with distance. The magnitude of the on axis (main beam) power density varies according to location in the near-field.

The distance to the end of the near field can be determined by the following equation:

		Antenna Diameter	
		1.07	meters
Extent of Near Field,	$R_{nf} =$	$D^2/4(\lambda)$	
	$R_{nf} =$	2.40	meters

R_{nf} = extent of near field

D = maximum dimension of antenna (diameter if circular)

λ = wavelength

The maximum near-field, on-axis, power density is determined by:

		Antenna Diameter	
		1.07	meters
On Axis Near Field Power Density,	$S_{nf} =$	$16\eta P/\pi D^2$	
	$S_{nf} =$	0.89	W/m ²
	$S_{nf} =$	0.09	mW/cm²

The maximum near-field, 5° off-axis, power density is determined by:

		Antenna Diameter	
		1.07	meters
Power Density at 5° Off Axis	$S_{nf\ 5^\circ} =$	$(S_{nf}/G)*G_{5^\circ}$	
	$S_{nf\ 5^\circ} =$	0.0063	mW/cm²

S_{nf} = maximum near-field power density

$S_{nf\ 5^\circ}$ = maximum near-field power density (5° off axis)

η = aperture efficiency

P = power fed to antenna

D = maximum dimension of antenna (diameter if circular)

3. Far Field Calculations

The power density in the far-field region decreases inversely with the square of the distance.

The distance to the beginning of the far field region can be found by the following equation:

		Antenna Diameter	
		1.07	meters
Distance to the Far Field Region,	$R_{ff} =$	$0.6D^2/\lambda$	
	$R_{ff} =$	5.75	meters

R_{ff} = distance to beginning of far field

D = maximum dimension of antenna (diameter if circular)

λ = wavelength

The maximum main beam power density in the far field can be calculated as follows:

		Antenna Diameter	
		1.07	meters
On-Axis Power Density in the Far Field,	$S_{ff} =$	$(P)(G)/4\pi(R_{ff})^2$	
	$S_{ff} =$	0.38	W/m ²
	$S_{ff} =$	0.04	mW/cm²

The maximum far-field, 5° off-axis, power density is determined by:

		Antenna Diameter	
		1.07	meters
Power Density at 5° Off Axis	$S_{ff\ 5^\circ} =$	$(S_{ff}/G)*G_{5^\circ}$	
	$S_{ff\ 5^\circ} =$	0.0027	mW/cm²

S_{ff} = power density (on axis)

$S_{ff\ 5^\circ}$ = power density (5° off axis)

P = power fed to antenna

G = power gain of antenna in the direction of interest relative to an isotropic radiator

R_{ff} = distance to beginning of far field

4. Transition Region Calculations

The transition region is located between the near and far field regions. The power density decreases inversely with distance in the transition region, while the power density decreases inversely with the *square* of the distance in the far-field region. The maximum power density in the transition region will not exceed that calculated for the near-field region. The power density in the near field region, as shown above will not exceed:

	Antenna Diameter	
	1.07	meters
$S_t =$	$(S_{nf} * R_{nf}) / R$	
$S_{t5^\circ} =$	$(S_{nf5^\circ} * R_{nf}) / R$	
$S_t =$	0.09	mW/cm²
$S_{t5^\circ} =$	0.0063	mW/cm²

Table 3

Summary of Expected Radiation Levels				
Region	Calculated Maximum Radiation Level (mW/cm ²)	Distance to Region (m)	Maximum Permissible Exposure (MPE)	
			Occupational	General Population
3.8m Earth Station Antenna				
1. Antenna Surface	$S_{surface} = 5.46$		Potential Hazard	Potential Hazard
2. Near Field	$S_{nf} = 0.09$	2.4	Satisfies MPE	Satisfies MPE
3. Far Field	$S_{ff} = 0.04$	5.7	Satisfies MPE	Satisfies MPE
4. Transition Region	$S_t = 0.09$		Satisfies MPE	Satisfies MPE
5. Near Field 5° Off Axis	$S_{nf5^\circ} = 0.0063$		Satisfies MPE	Satisfies MPE
6. Far Field 5° Off Axis	$S_{ff5^\circ} = 0.00$		Satisfies MPE	Satisfies MPE
7. Transition Region 5° Off Axis	$S_{t5^\circ} = 0.0063$		Satisfies MPE	Satisfies MPE

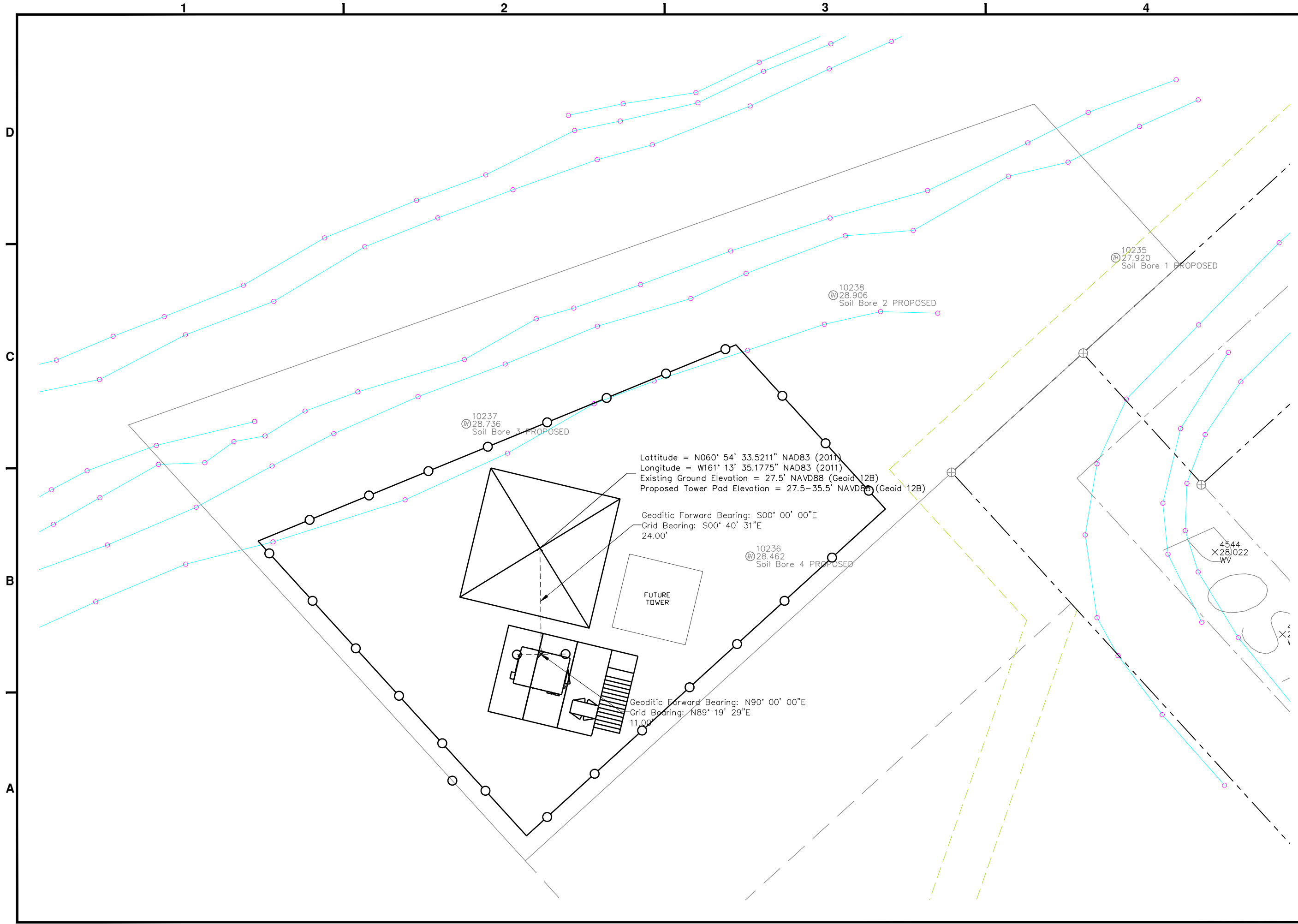
7. Conclusions

Based on the above analysis, it is concluded that the OET/FCC Radiofrequency Electromagnetic Fields guidelines for Maximum Permissible Exposure (MPE) will only be exceeded, for both Occupational and General Population, up to 2.4 m from the surface of the antenna. The Occupational and General Population MPE limits are always satisfied at in all other regions except near the surface of the antenna. The areas where the MPE limits for the General Population are exceeded (Antenna Surface) are not accessible to the general population due locked fencing and signage.

Only trained RF personnel will have access to the antenna. Finally, the transmitter will be disabled during maintenance activities in these areas to protect personnel from exposure.

Michael Willmon, PE, CEM. 08/30/2021
 Sr. Telecom Engineer
 North Slope Telecom, Inc.

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AKIAK LEO BROADBAND SITE DEVELOPMENT

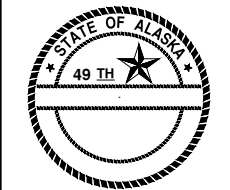
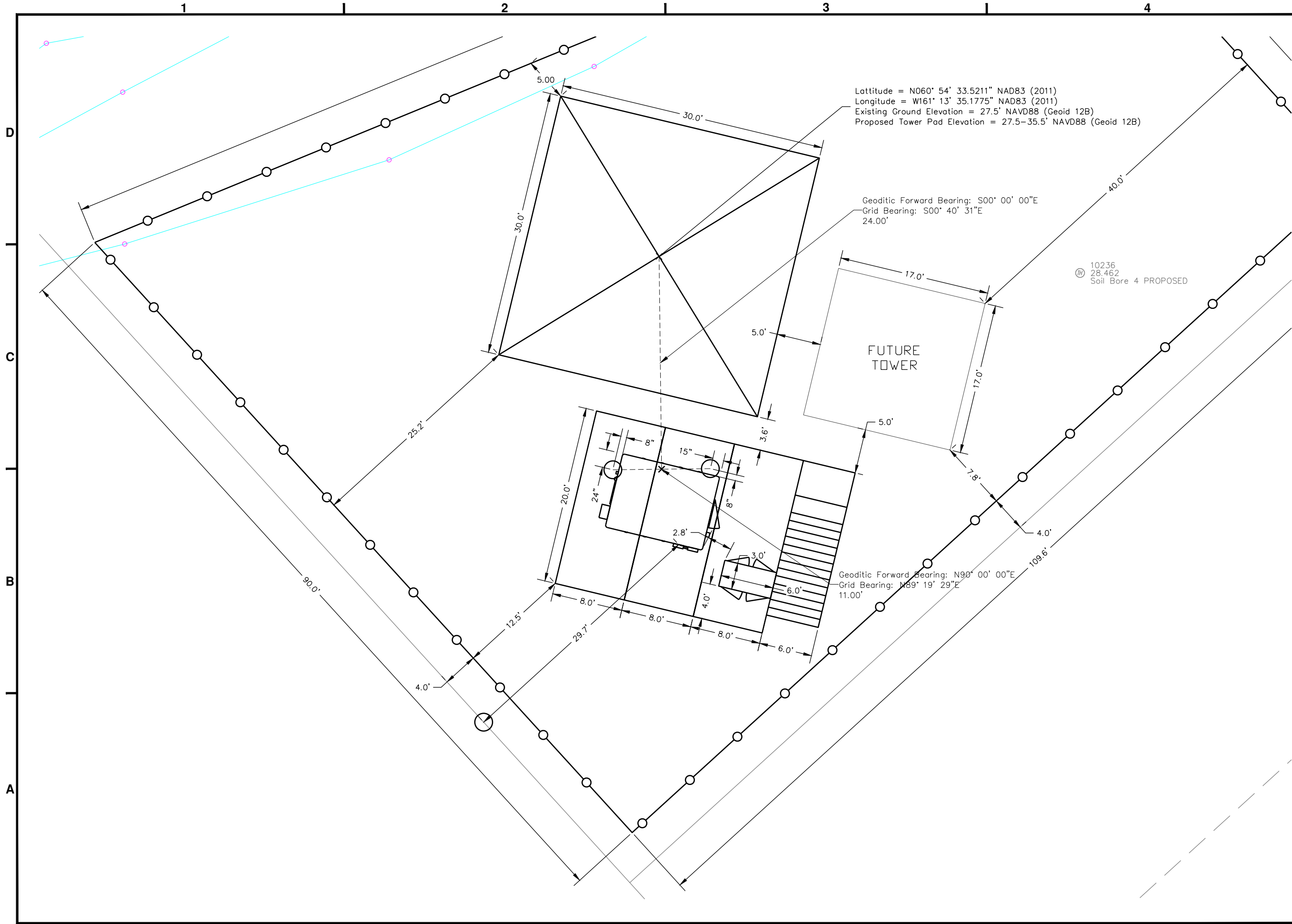
MRK	DATE	DESCRIPTION	INIT

PLAN SET:
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PRELIMINARY SITE PLAN

FIGURE
 SHEET 1 OF 2

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AKIAK LEO BROADBAND SITE DEVELOPMENT

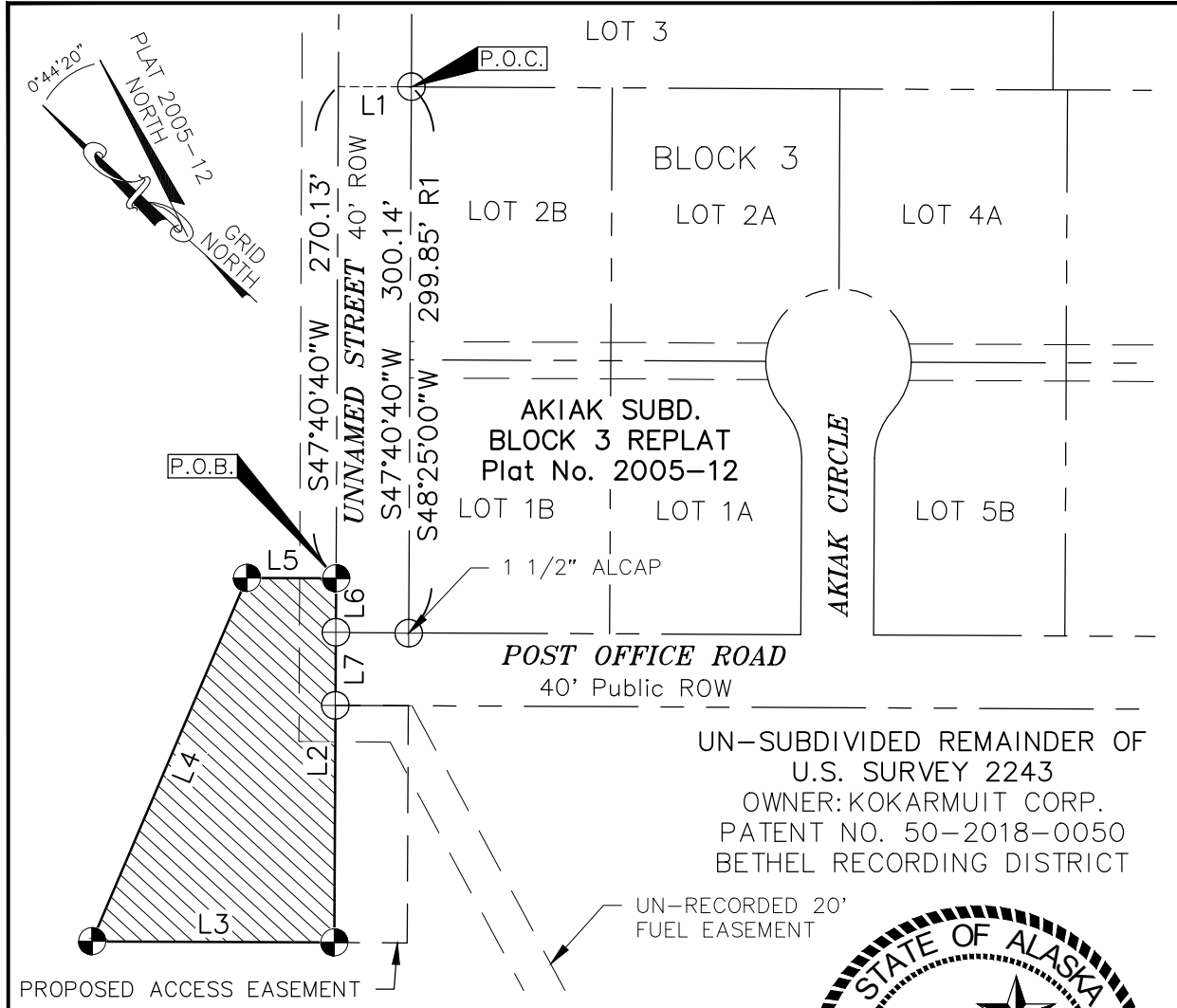
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 PROJ ENG: CMS
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SHEET TITLE
PRELIMINARY LAYOUT

FIGURE
 SHEET **2** OF **2**

LEASE LOT EXHIBIT

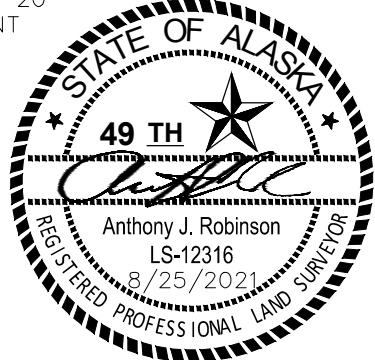


LINE TABLE		
LINE NO.	DIST.	BEARING
L1	40.00'	N42° 19' 20"W
L2	200.00'	S47° 40' 40"W
L3	133.12'	N42° 19' 20"W
L4	216.97'	N70° 29' 21"E
L5	49.00'	S42° 19' 20"E
L6	29.72'	S47° 40' 40"W
L7	40.00'	S47° 40' 40"W

BASIS OF BEARING =
KUSKOKWIM RIVER 2015 LDP
DEVELOPED BY STATE OF
ALASKA, DOT.

LEGEND

- AKIAK LEO LEASE PARCEL
- FOUND 5/8" x 30" REBAR WITH A 2" ALUMINUM CAP
- SET 5/8" x 30" REBAR WITH A 2" ALUMINUM CAP
- R1 = RECORD PLAT 2005-12
- P.O.C. = POINT OF COMMENCEMENT
- P.O.B. = POINT OF BEGINNING



**VILLAGE OF AKIAK
AKIAK, ALASKA**

ACQUISITION TYPE: LEASE
ACQUISITION AREA: ± 18,212 S.F.

**LEASE LOT EXHIBIT A
AKIAK LEO BROADBAND SITE**

LEGAL: UN-SUBDIVIDED REMAINDER,
U.S. SURVEY 2243
SCALE: 1"=100' DATE: 08/20/2021

