Environment

Submitted to:
ConocoPhillips Company
Anchorage, Alaska

Submitted by:
AECOM
Fort Collins, Colorado
60307916 task 11000
December 2013

ConocoPhillips Alaska, Inc.
Greater Mooses Tooth 1
Alternative D (Roadless)
Air Quality Impact Analysis

Final

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1.0 Introduction

The purpose of this ambient air quality impact analysis is to compare model predicted air quality impacts from the ConocoPhillips Alaska, Inc. (CPAI) Greater Mooses Tooth (GMT) 1 wellsite development project (Project) Alternative D (Roadless Alternative) to applicable National and Alaska Ambient Air Quality Standards (NAAQS/AAAQS) and Prevention of Significant Deterioration (PSD) Class II (Increments) in the near-field and NAAQS/AAAQS and Air Quality Related Values (AQRVs) at locations within the Gates of the Arctic National Park and Preserve and the Alaska National Wildlife Refuge.

This ambient air quality impact analysis covers various activities related to the construction, and routine operation of a wellsite, seasonal ice road, airstrip, access road, pipelines and ancillary facilities to support the development of petroleum resources within the GMT Unit in the National Petroleum Reserve in Alaska (NPRA). CPAI proposes to develop initially 9 wells but, over time, in an extreme best case, could develop up to 33 wells on a single wellsite designated GMT1.

The proposed GMT1 Project Roadless Alternative is located in the northeastern portion of the NPRA immediately west of the Colville River Delta. The GMT1 wellsite is approximately 14 miles west of the CPAI operated Alpine field on the North Slope of Alaska. GMT1 will be the first wellsite developed in the recently established Greater Mooses Tooth Unit. Maps of the GMT1 Project area are provided in **Figure 1-1** and **Figure 1-2**.

1.1 Project Description

1.1.1 Existing Development

Development in the Colville River Delta began with the Alpine CD1 and CD2 wellsites and associated facilities. Oil production from CD1 commenced in November 2000 and from CD2 in November 2001. In January 2003, the Bureau of Land Management (BLM) and cooperating agencies (U.S. Army Corps of Engineers [USACE], the USEPA, the U.S. Coast Guard [USCG] and the State of Alaska) initiated the Alpine Satellite Development Plan (ASDP) Environmental Impact Statement (EIS) for five proposed drill sites (CD3 through CD7) (BLM 2004). The Final EIS was issued in September 2004 and the BLM’s Record of Decision, which governs the two drill sites located on BLM lands (GMT1 and GMT2, formerly known as CD6 and CD7), was issued in November 2004.

On August 23, 2004, CPAI requested prioritization of permits for CD3 and CD4 to meet the construction schedule for those two wellsites. Most permits were issued by December 2004 and construction of CD3 and CD4 began in January 2005 and production began in 2006. Permitting for CD5 was completed in 2012 and construction is on-going.

1.1.2 Proposed Roadless Alternative Development

The GMT1 Roadless Alternative differs from Alternative A (Preferred Alternative) in that there would be no permanent access road connecting the GMT1 wellsite and the Alpine CPF. In lieu of a permanent access road, manpower and supplies to GMT1 would be trucked in seasonally by ice road and/or flown in to an airstrip located approximately 1.5 kilometer southeast of the wellsite. A road would connect the airstrip to the wellsite.

The Roadless Alternative activities are similar to those for the Preferred Alternative, with the exception that the Roadless Alternative:

- Will not have a permanent access road connecting the wellsite to the Alpine CPF,
- Will include an airstrip and related equipment,
- Will have an access road connecting the wellsite and airstrip,

- Will have a large storage pad connected by road to the wellsite,
- Will have a mud and bulk plant facility to produce drilling muds, and
- Will include an injection well for disposal of drilling muds and cuttings.

CPAI proposes placement of 87.3 acres of fill material to construct the GMT1 wellsite, an airstrip, a connecting road, pipeline valve pads, pipelines, bridge abutments, communication equipment, communication lines and power lines for oil and gas production. The proposed GMT1 Project Roadless Alternative will consist of the following components:

GMT1 wellsite facilities include:

- 15.7-acre gravel pad with space for 33 wells;
- Emergency shutdown valve skid;
- Test separator;
- Electrical control module;
- Pig launching/receiving facility;
- Chemical injection module (including tanks, containment, and truck loading facility);
- Production heater;
- Communication tower; and
- Lighting as needed.

Other Project components will include:

- 21.7 acre airplane runway;
- 24.7 acre airplane hangar pad;
- 14.9 acre storage pad;
- 1.2 mile (9.6 acre) gravel access road from GMT1 to the airstrip;
- Two manual valve pads (0.7 acre);
- approx. 18.7-acre Clover Material Source;
- 8.4 miles of pipelines from GMT1 to CD5 on new Vertical Support Members (VSMs);
- 3.3-mile-long pipeline rack on new VSMs from CD4 to CD1;
- Pipeline tie-ins at CD5 and CD1; and
- 8.4-mile power and fiber optic communication lines from CD5 supported by pipeline horizontal support members.

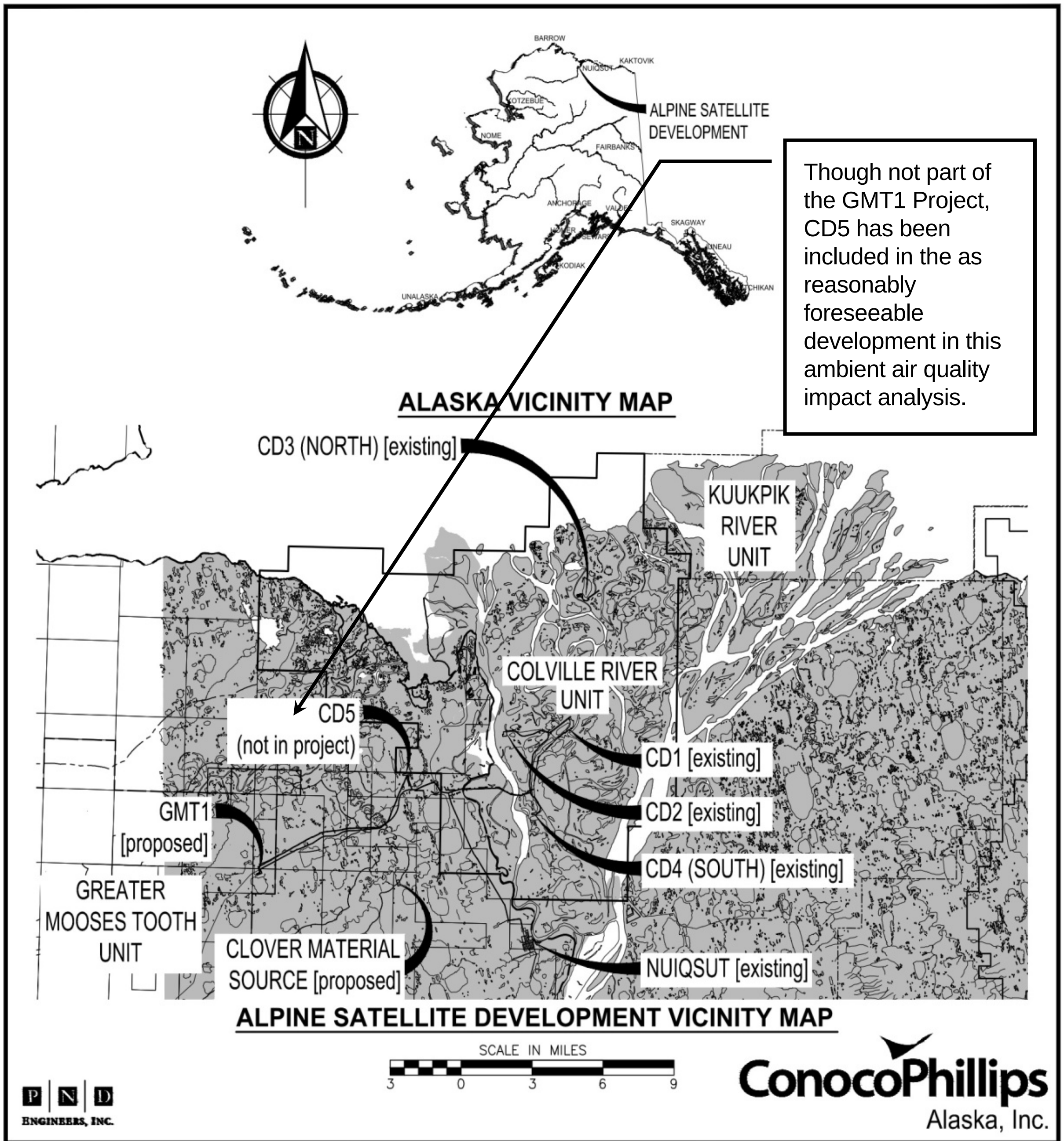
A close up map of the GMT1 Project Alternative D Wellsite and Airstrip are shown in **Figure 1-3** and **Figure 1-4**, respectively.

1.2 Overview of the Ambient Air Quality Impact Analysis

This air quality impact analysis addresses the impacts on ambient air quality and AQRVs from air contaminant emissions that could result from the GMT1 Project Roadless Alternative construction and future operation. Cumulative impacts from the GMT1 Project Roadless Alternative and Reasonably Foreseeable Development (RFD) sources are also quantified. In this document, the potential ambient air quality impacts have been quantified and compared to applicable state and federal standards, PSD

Class II Increments, and AQRV impacts (impacts on visibility [regional haze] and atmospheric deposition) have been quantified and compared to applicable thresholds as defined in the Federal Land Managers' (FLMs') Air Quality Related Values Workgroup (FLAG) guidance document (FLAG 2010), and other state and federal agency guidance. This ambient air quality impact analysis also describes the development of the GMT1 Project Roadless Alternative construction and routine operations emissions inventory and how that inventory has been translated into several dispersion modeling scenarios selected for their potential to produce the highest air quality impacts from among all possible scenarios.

Figure 1-1 Overview of the Greater Mooses Tooth 1 Project Area



PURPOSE: CONSTRUCT A GRAVEL DRILLING PAD AND ROAD ACCESS FOR OILFIELD DEVELOPMENT DATUM: BPMSL, NAD83 ASP ZONE 4 ADJACENT PROPERTY OWNERS: 1. KUUKPIK VILLAGE CORP 2. BUREAU OF LAND MANAGEMENT 3. ARCTIC SLOPE REGIONAL CORP 4. STATE OF ALASKA DNR	APPLICANT: CONOCO PHILLIPS ALASKA, INC 2013 LOCATION: T10N, R3E UMIAT MERIDIAN ADDRESS:	PROPOSED: GMT1 ROAD, PAD & PIPELINE CONSTRUCTION IN: GREATER MOOSES TOOTH UNIT NEAR/AT: ALPINE COUNTY: ANS BOROUGH STATE: ALASKA SHEET 1 of 36 7-12-13

Figure 1-2 Map of the GMT1 Project Location, Associated Facilities, and Ambient Air Quality and Meteorological Monitoring Stations

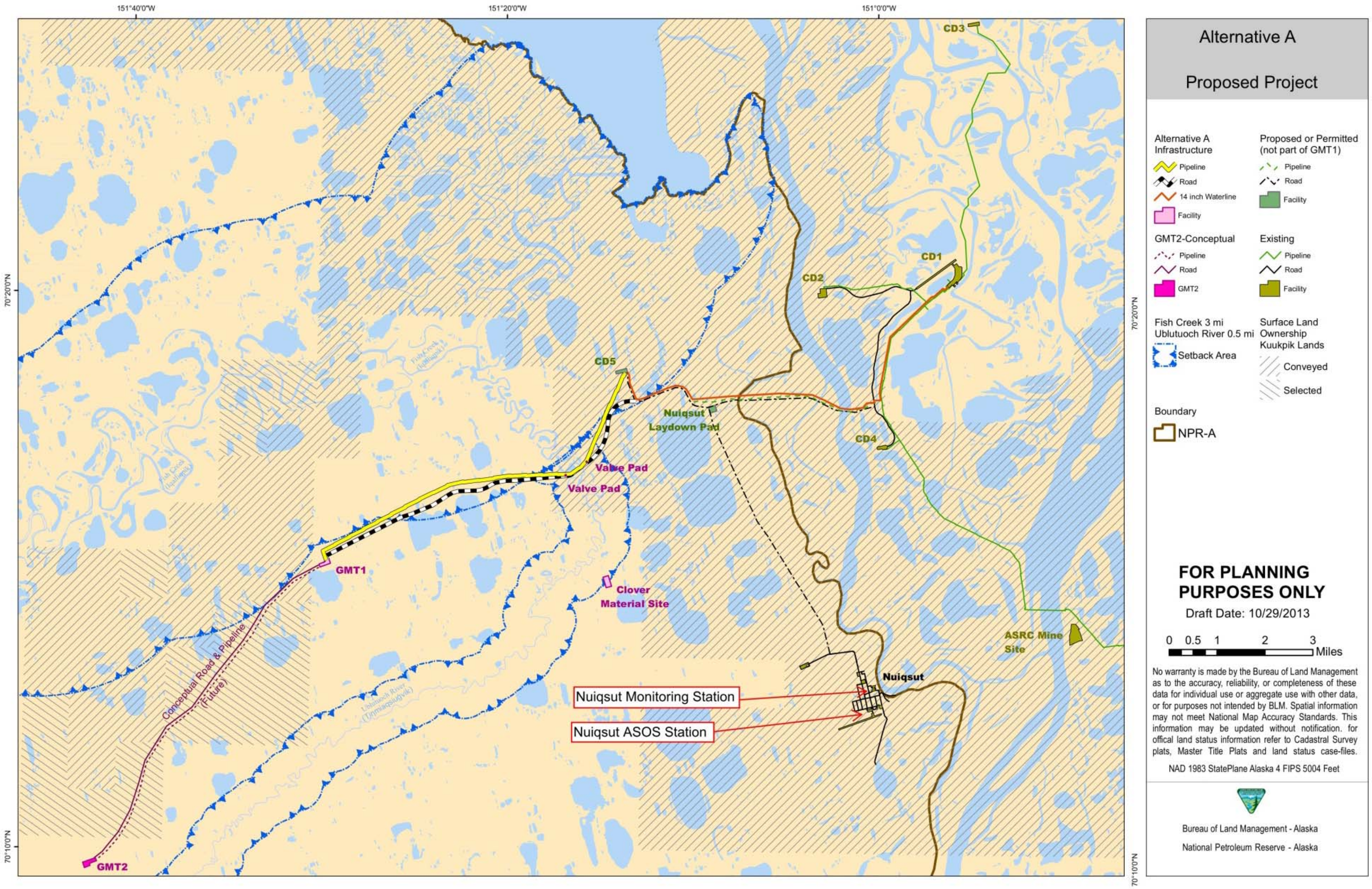


Figure 1-3 Plot Plan of the GMT1 Well Site

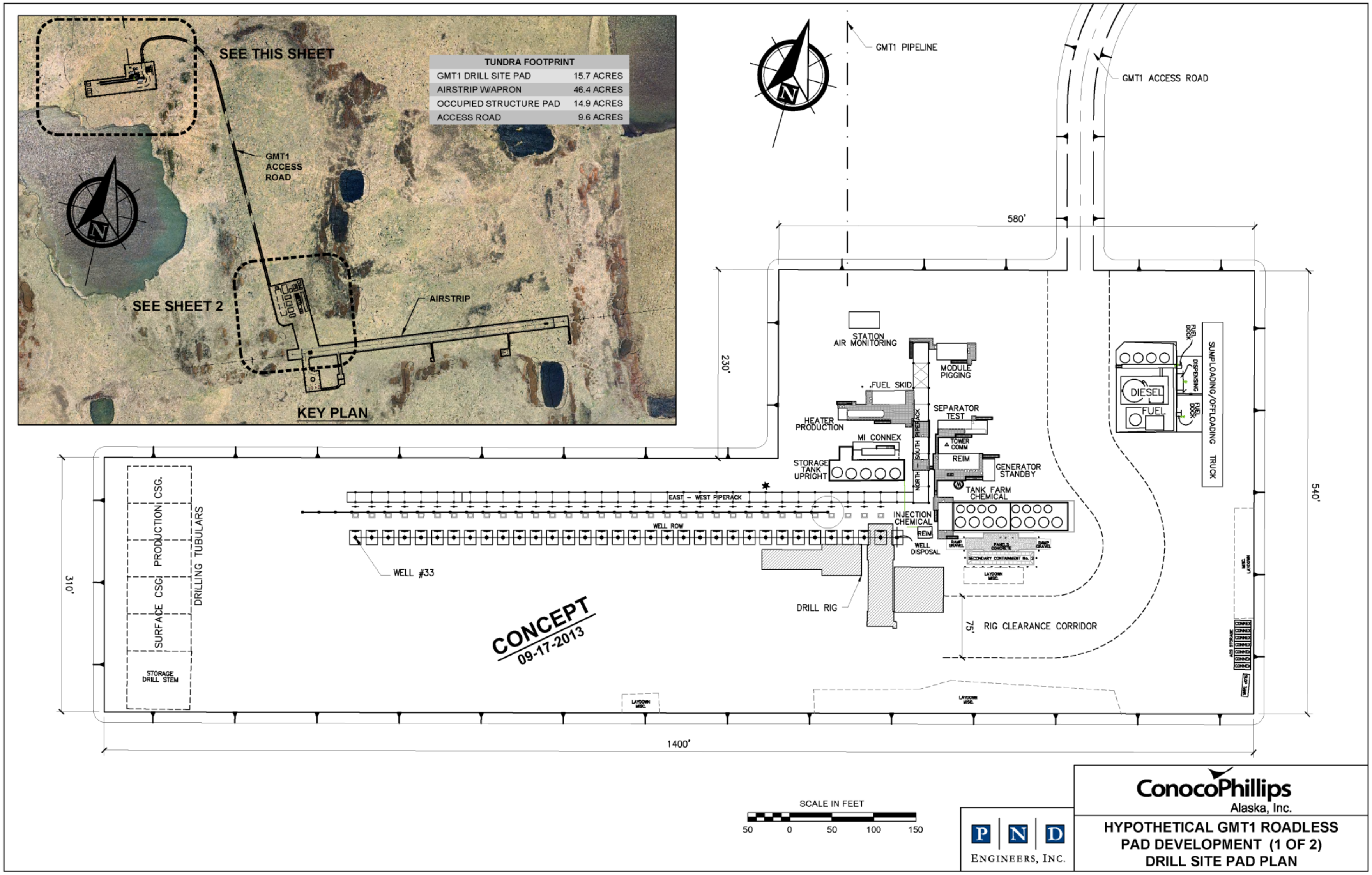
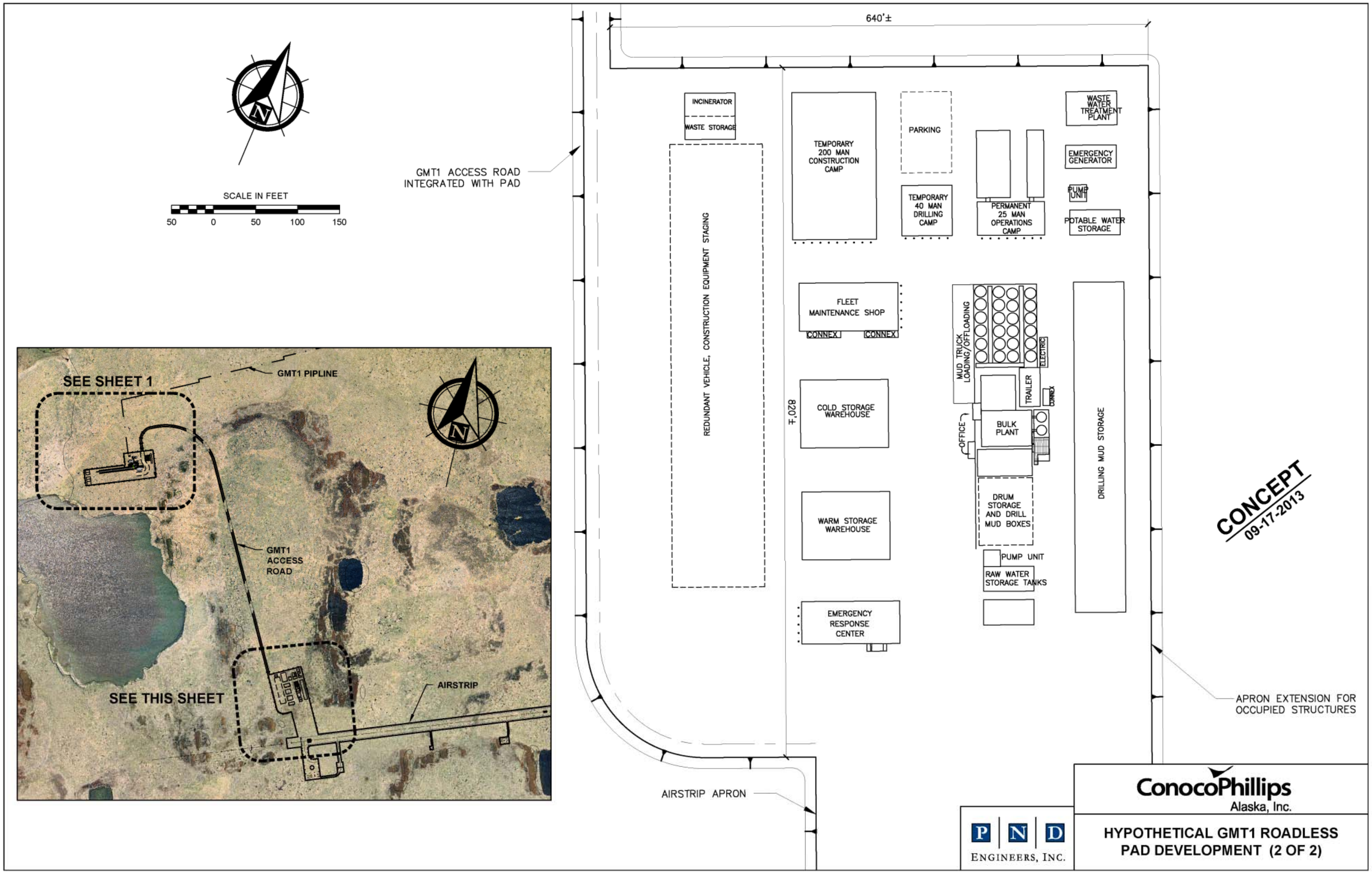


Figure 1-4 Plot Plan of the GMT1 Storage Pad



2.0 Project Emission Inventory

This chapter discusses the emissions of NO_x, CO, VOC, SO_2, PM_{10}, $PM_{2.5}$, Greenhouse Gases (GHGs), Total Reduced Sulfur (TRS) and Hazardous Air Pollutants (HAPs) expected to result from construction, operation and routine maintenance of the wellsite, access road, ice road, airstrip, pipelines and ancillary facilities related to the GMT1 Project Roadless Alternative. The emissions inventory for the full GMT1 Project Roadless Alternative is presented in **Section 2.1**. **Section 2.2** discusses the refinements and assumptions made in order to translate these emissions into a worst-case modeled emissions inventory for the GMT1 Project Roadless Alternative. Each section was broken up into several subsections which describe a particular set of activities related to the GMT Project Roadless Alternative.

2.1 GMT1 Roadless Alternative Project Emissions Inventory Summary

The following figures show the Emissions Inventory developed for the GMT1 Project Roadless Alternative. **Figure 2-1** through **Figure 2-18** show the total emissions during the entire construction period (October 2015 to December 2018), as well as emissions related specifically the Infill Drilling and emissions during a typical production year. Emissions from routine operations extend beyond December 2018. **Figure 2-19** details in which spreadsheet(s) emissions from each activity were calculated.

For Section 2.1, the subsections representing the sets of emissions activities include GMT1 construction activities, developmental drilling, well intervention activities, routine operations and infill drilling. GMT1 construction activities include all emissions associated with construction of pipelines, gravel roads, power lines, fiber optic communication lines, Vertical Support Members (VSMs), airplane travel to and from GMT1, other facilities-related construction and initial construction of the ice road. Developmental drilling activities are associated with initial production of the first 9 wells at the GMT1 wellsite. Well interventions includes activities pertaining to well diagnostics, production management, and any other maintenance activities required to optimize the production of the well, which is expected to occur for one month a year. Routine operations are routine activities associated with production including road and airplane travel, combustion equipment and fugitive equipment leaks. Lastly, infill drilling is the expected future activities related to drilling additional wells at the GMT1 wellsite (up to 33) after developmental drilling is complete.

Regardless of Alternative, the GMT1 wellsite will require a number of portable storage tanks for construction and developmental drilling and a small number of permanent storage tanks for long-term operations. Some of these tanks will have VOC and hazardous air pollutant emissions. Because Alternative D requires more storage to hold materials because of the mud/bulk plant, and to sustain construction and operations through the period when there is no ice road, the Roadless Alternative will require more and larger storage tanks. **Table 2-1** details the materials stored in tanks for both Alternative A and the Roadless Alternative. As **Table 2-1** indicates only some of the tanks will be sources of criteria and hazardous air pollutant emissions based on working, standing and breathing losses from the tanks.

Because of low ambient temperatures and the low volatility of tank contents, emissions from these tanks will be small compared to emissions from combustion equipment, equipment leaks and fluids from well flowbacks. Emissions from this inventory has been estimated based on a comprehensive analysis of the tank inventory and throughput currently documented for the Alpine development which includes the Alpine CPF; and Alpine CD1, CD2, CD3, and CD4. This inventory was recently documented in the Title V permit renew application for Alpine (CPAI 2013) currently being reviewed by the State of Alaska. Emissions from tanks located throughout Alpine result in 3.4 tons per year of VOC and 1.4 tons per year of hazardous air pollutants. In both cases, emissions are dominated by venting from the Methanol tanks. VOC and HAP emissions from GMT1 Alternative D will be no larger than this.

Table 2-1 Inventory and Description of Fluids Stored in Tanks as Part of the GMT1 Alternative A and Roadless Alternative

Content	Primary Use	Source of Criteria and HAP emissions? (Y/N)
Water (potable and non-potable)	Potable water for human consumption and non-potable water for producing drilling fluids	No
Diesel	Fuel	Yes
Scale Inhibitor (typically phosphate- or polymer-based)	Treatment of water associated with oil and gas to reduce the concentration of scale forming compounds that can accumulate in production wells, water and disposal wells, flowlines and surface equipment.	No
Corrosion Inhibitor	Used to control corrosion, neutralize acid gas and prevent scale in production wells, water and disposal wells, flowlines and surface equipment. Typically amine and phosphorus-based products and other specially engineered chemicals.	No
Methanol	Freeze protection of production wells, water and disposal wells, flowlines and surface equipment.	Yes
Glycol	Heating medium	No
Brine	Inorganic salts used as a well-control fluid during the completion and workover phases of well operations.	No
Mineral Oil Based Mud and Associated Mineral Oil Storage	Paraffinic-based mineral oil drilling muds used during the continuous phase of well drilling. Used in place of diesel-based muds.	No
Water Based Mud	Water based drilling muds used during the continuous phase of well drilling. Used in place of diesel-based muds.	No

Figure 2-1 NO_x Project Emissions Inventory During Construction – Roadless Alternative

					Year 1												Year 2												Year 3											
	Emission Producing Activities	**10**	**11**	**12**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
GMT1 Construction	Use of 2 Camps in Nuiqsut	0.0	0.0	1.2	1.2	1.2	1.5	1.2	1.2	1.5	1.2	1.2	0.3	0.0	0.0	1.2	1.2	1.2	1.5	1.2	1.2	1.5	1.2	1.2	1.5	1.2	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Aircraft Activity in GMT1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.1	0.1	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.1	0.5	0.5	0.4	0.5	0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0
	40' Bridge Construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Ublutuoch River Bridge Construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Pipeline Installation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.4	4.9	3.4	0.6	0.4	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Power Line Installation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.5	0.4	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Fiber Optic Line Installation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Seasonal Ice Road Construction	0.0	1.6	5.8	4.7	3.3	2.3	1.8	0.5	0.0	0.0	0.0	0.0	0.0	1.2	4.0	3.2	2.5	2.2	1.8	0.4	0.0	0.0	0.0	0.0	0.0	1.6	5.8	4.7	3.3	2.3	1.8	0.5	0.0	0.0	0.0	0.0	0.0	1.6	5.8
	Gravel Roads, Pad Construction and Gravel Mining	0.3	16.0	15.3	0.0	12.3	19.3	14.5	0.0	1.5	1.5	1.5	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Blasting Emissions	1.3	5.1	1.3	0.0	1.3	5.1	1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Construction Fugitive Emissions	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.0	0.0	0.0	0.0	0.0	0.0
	GMT1 Facilities Installation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.4	3.2	2.3	1.9	2.2	1.6	1.3	1.6	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Alpine ACF and CD5 Facilities Installation Related to GMT1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	1.5	1.1	0.9	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Vertical Support Member (VSM) Construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	1.5	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Developmental Drilling	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	0.0	0.0	0.0	0.0	0.0	0.0
	Developmental Drilling Non-Mobile Support Equipment	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	0.0	0.0	0.0	0.0	0.0	0.0
	Developmental Drilling Mobile Support Equipment	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.30	0.05	0.05	0.05	0.05	0.05	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.05	0.0	0.0	0.0	0.0	0.0	0.0
	Well Flowback	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.0	0.0	0.0	0.0	0.0	0.0
GMT1 Routine Operations	Permanent Line Heater	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	Back-up Generator Set	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.15	5.15	5.15	5.15	5.15	5.15	5.15	5.15	5.15	5.15	5.15	5.15	5.15	5.15
	Solid Waste Incinerator	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22
	Routine Operations - Mobile Equipment Emissions	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.01	0.01	0.01	0.01	0.02	0.02
	Routine Operations - Fugitive Dust Emissions	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NE	NE	NE	NE	NE	NE
	Routine Operations - Aircraft Emissions	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.1	0.1	0.1	0.1
	Fugitive Equipment Leaks	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NE	NE	NE	NE	NE	NE
GMT1 Future Construction	Infill Drilling	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Infill Drilling Non-Mobile Support Equipment	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Infill Drilling Mobile Support Equipment	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Infill Drilling - Fugitive Dust Emissions	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Infill Drilling - Aircraft Emissions	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Well Flowback	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GMT1 Well Interventions	Well Interventions - Non-Mobile Support Equipment	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Well Interventions - Mobile Support Equipment	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Well Interventions - Fugitive Dust Emissions	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Well Interventions	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total (ton per month) =	1.5	22.7	23.6	5.9	18.0	28.1	18.8	1.8	3.2	2.8	2.8	0.7	0.1	1.3	5.3	4.4	11.6	15.6	11.3	11.7	10.4	9.0	8.6	9.1	7.8	14.6	18.5	17.2	15.8	14.8	14.4	13.0	12.3	6.6	6.6	6.5	6.5	8.1	12.3
	Rolling Total (ton per year) =	na	na	na	na	na	na	na	na	na	na	na	na	130	128	107	88.7	87.3	80.9	68.3	60.8	70.7	77.9	84.1	89.9	98.3	106	119	133	145	150	149	152	153	155	153	151	148	147	140

NE - No Emissions of this pollutant for this source.

Figure 2-2 NO_x Project Emissions Inventory During a Typical Production Year and During the Infill Drilling Period – Roadless Alternative

Typical Production Year											
1	2	3	4	5	6	7	8	9	10	11	12
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4.7	3.3	2.3	1.8	0.5	0.0	0.0	0.0	0.0	0.0	1.6	5.8
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
5.15	5.15	5.15	5.15	5.15	5.15	5.15	5.15	5.15	5.15	5.15	5.15
0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22
0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.02	0.02
NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
0.0	0.0	0.0	0.0	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1
NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	NE	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	3.4	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	NE	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	77.3	0.0	0.0	0.0	0.0	0.0	0.0
11.1	9.7	8.7	8.3	7.1	87.3	6.6	6.6	6.5	6.5	8.1	12.3
178.9											

Infill Drilling											
1	2	3	4	5	6	7	8	9	10	11	12
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4.7	3.3	2.3	1.8	0.5	0.0	0.0	0.0	0.0	0.0	1.6	5.8
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
5.15	5.15	5.15	5.15	5.15	5.15	5.15	5.15	5.15	5.15	5.15	5.15
0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22
0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.02	0.02
NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4
0.30	0.30	0.30	0.30	0.30	0.05	0.05	0.05	0.05	0.05	0.30	0.30
NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
0.3	0.3	0.3	0.3	0.5	0.5	0.4	0.4	0.3	0.3	0.3	0.3
NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
17.2	15.8	14.9	14.4	13.2	12.5	12.4	12.4	12.3	12.3	14.2	18.5
170											

Figure 2-3 CO Project Emissions Inventory During Construction – Roadless Alternative

					Year 1												Year 2												Year 3											
	Emission Producing Activities	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
GMT1 Construction	Use of 2 Camps in Nuiqsut	0.0	0.0	1.0	1.0	1.0	1.3	1.0	1.0	1.3	1.0	1.0	0.3	0.0	0.0	1.0	1.0	1.0	1.3	1.0	1.0	1.3	1.0	1.0	1.3	1.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Aircraft Activity in GMT1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	4.1	4.4	2.6	2.6	0.6	0.7	0.1	0.1	0.0	0.0	0.0	0.9	7.3	7.3	5.3	5.3	3.4	3.4	3.4	3.5	3.5	1.0	1.0	1.6	4.5	4.5	0.0	0.0	0.0	0.0	0.0	0.0
	40' Bridge Construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Ublutuoch River Bridge Construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Pipeline Installation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	2.1	1.5	0.3	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Power Line Installation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Fiber Optic Line Installation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Seasonal Ice Road Construction	0.0	0.5	1.7	1.4	1.0	0.8	0.6	0.2	0.0	0.0	0.0	0.0	0.0	0.4	1.2	1.0	0.8	0.7	0.6	0.1	0.0	0.0	0.0	0.0	0.0	0.5	1.7	1.4	1.0	0.8	0.6	0.2	0.0	0.0	0.0	0.0	0.0	0.5	1.7
	Gravel Roads, Pad Construction and Gravel Mining	0.1	11.4	11.1	0.0	8.7	14.0	10.7	0.0	0.8	0.8	0.8	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Blasting Emissions	5.0	20.0	5.0	0.0	5.0	20.0	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Construction Fugitive Emissions	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.0	0.0	0.0	0.0	0.0	0.0
	GMT1 Facilities Installation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	1.9	1.4	1.3	1.5	1.1	0.8	0.9	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Alpine ACF and CD5 Facilities Installation Related to GMT1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.9	0.7	0.6	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Vertical Support Member (VSM) Construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.7	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Developmental Drilling	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.0	0.0	0.0	0.0	0.0	0.0
	Developmental Drilling Non-Mobile Support Equipment	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	0.0	0.0	0.0	0.0	0.0	0.0
	Developmental Drilling Mobile Support Equipment	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.14	0.02	0.02	0.02	0.02	0.02	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.02	0.0	0.0	0.0	0.0	0.0	0.0
	Well Flowback	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.0	0.0	0.0	0.0	0.0	0.0
GMT1 Routine Operations	Permanent Line Heater	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
	Back-up Generator Set	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.82	2.82	2.82	2.82	2.82	2.82	2.82	2.82	2.82	2.82	2.82	2.82	2.82	2.82
	Solid Waste Incinerator	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12
	Routine Operations - Mobile Equipment Emissions	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.01	0.01
	Routine Operations - Fugitive Dust Emissions	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NE	NE	NE	NE	NE	NE
	Routine Operations - Aircraft Emissions	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.5	2.5	0.5	0.5	0.5	0.5
	Fugitive Equipment Leaks	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NE	NE	NE	NE	NE	NE
GMT1 Future Construction	Infill Drilling	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Infill Drilling Non-Mobile Support Equipment	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Infill Drilling Mobile Support Equipment	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Infill Drilling - Fugitive Dust Emissions	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Infill Drilling - Aircraft Emissions	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Well Flowback	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GMT1 Well Interventions	Well Interventions - Non-Mobile Support Equipment	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Well Interventions - Mobile Support Equipment	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Well Interventions - Fugitive Dust Emissions	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Well Interventions	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total (ton per month) =	5.1	31.9	18.9	2.5	15.8	36.1	17.4	5.2	6.5	4.4	4.4	1.1	0.7	0.5	2.4	2.0	5.9	8.1	6.8	13.3	12.9	10.0	9.7	8.1	7.3	10.6	11.7	11.3	8.5	8.2	8.7	11.1	10.8	6.3	6.3	4.4	4.4	4.9	6.1
	Rolling Total (ton per year) =	na	na	na	na	na	na	na	na	na	na	na	na	149	145	114	97	96.5	86.7	58.7	48.1	56.1	62.5	68.1	73.5	80.5	87.2	97.3	107	116	118	119	121	118	116	113	109	105	102	96.6

NE - No Emissions of this pollutant for this source.

Figure 2-4 CO Project Emissions Inventory During a Typical Production Year and During the Infill Drilling Period – Roadless Alternative

Typical Production Year											
1	2	3	4	5	6	7	8	9	10	11	12
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1.4	1.0	0.8	0.6	0.2	0.0	0.0	0.0	0.0	0.0	0.5	1.7
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
2.82	2.82	2.82	2.82	2.82	2.82	2.82	2.82	2.82	2.82	2.82	2.82
0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12
0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.01
NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
0.4	0.4	0.4	0.4	4.5	4.5	2.5	2.5	0.5	0.5	0.5	0.5
NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	NE	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	1.8	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	NE	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	30.8	0.0	0.0	0.0	0.0	0.0	0.0
5.6	5.2	5.0	4.8	8.5	40.9	6.3	6.3	4.4	4.4	4.9	6.1
102.3											

Infill Drilling											
1	2	3	4	5	6	7	8	9	10	11	12
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1.4	1.0	0.8	0.6	0.2	0.0	0.0	0.0	0.0	0.0	0.5	1.7
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
2.82	2.82	2.82	2.82	2.82	2.82	2.82	2.82	2.82	2.82	2.82	2.82
0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12
0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.01
NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
0.14	0.14	0.14	0.14	0.14	0.02	0.02	0.02	0.02	0.02	0.14	0.14
NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
1.6	1.6	1.6	1.6	5.7	5.7	3.7	3.7	1.8	1.8	1.8	1.8
NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9.5	9.1	8.9	8.7	12.3	12.1	10.1	10.1	8.1	8.1	8.7	10.0
116											

Figure 2-5 SO_2 Project Emissions Inventory During Construction – Roadless Alternative

	Emission Producing Activities				Year 1												Year 2												Year 3											
		10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
GMT1 Construction	Use of 2 Camps in Nuiqsut	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Aircraft Activity in GMT1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
	40' Bridge Construction	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Ublutuoch River Bridge Construction	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Pipeline Installation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Power Line Installation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Fiber Optic Line Installation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Seasonal Ice Road Construction	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	Gravel Roads, Pad Construction and Gravel Mining	0.00	0.03	0.03	0.00	0.03	0.04	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Blasting Emissions	0.15	0.60	0.15	0.00	0.15	0.60	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Construction Fugitive Emissions	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.00	0.00	0.00	0.00	0.00	0.00
	GMT1 Facilities Installation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Alpine ACF and CD5 Facilities Installation Related to GMT1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Vertical Support Member (VSM) Construction	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Developmental Drilling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00
	Developmental Drilling Non-Mobile Support Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Developmental Drilling Mobile Support Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Well Flowback	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.00	0.00	0.00	0.00	0.00	0.00
GMT1 Routine Operations	Permanent Line Heater	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
	Back-up Generator Set	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	Solid Waste Incinerator	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Routine Operations - Mobile Equipment Emissions	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
	Routine Operations - Fugitive Dust Emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	NE	NE	NE	NE	NE	NE
	Routine Operations - Aircraft Emissions	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0
	Fugitive Equipment Leaks	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	NE	NE	NE	NE	NE	NE
GMT1 Future Construction	Infill Drilling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Infill Drilling Non-Mobile Support Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Infill Drilling Mobile Support Equipment	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Infill Drilling - Fugitive Dust Emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Infill Drilling - Aircraft Emissions	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Well Flowback	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GMT1 Well Interventions	Well Interventions - Non-Mobile Support Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Well Interventions - Mobile Support Equipment	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Well Interventions - Fugitive Dust Emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Well Interventions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total (ton per month) =	0.15	0.63	0.19	0.02	0.19	0.65	0.19	0.08	0.09	0.05	0.05	0.01	0.01	0.01	0.02	0.01	0.03	0.04	0.05	0.17	0.16	0.12	0.13	0.09	0.09	0.15	0.16	0.14	0.13	0.12	0.12	0.17	0.16	0.11	0.11	0.07	0.07	0.07	0.08
	Rolling Total (ton per year) =	na	na	na	na	na	na	na	na	na	na	na	na	2.32	2.18	1.56	1.38	1.37	1.22	0.61	0.47	0.56	0.63	0.7	0.77	0.85	0.92	1.06	1.2	1.33	1.43	1.51	1.59	1.58	1.58	1.57	1.55	1.53	1.51	1.44

NE - No Emissions of this pollutant for this source.

Figure 2-6 SO_2 Project Emissions Inventory During a Typical Production Year and During the Infill Drilling Period – Roadless Alternative

Typical Production Year

1	2	3	4	5	6	7	8	9	10	11	12
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.00	0.00	0.00	0.00	0.00	NE	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.00	0.00	0.00	0.00	0.00	NE	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.00	0.00
0.07	0.07	0.07	0.07	0.15	0.21	0.11	0.11	0.07	0.07	0.07	0.08
1.15											

Infill Drilling

1	2	3	4	5	6	7	8	9	10	11	12
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.13	0.13	0.13	0.12	0.21	0.2	0.17	0.17	0.13	0.13	0.13	0.14
1.78											

Figure 2-7 PM_{10} Project Emissions Inventory During Construction – Roadless Alternative

					Year 1												Year 2												Year 3											
	Emission Producing Activities	**10**	**11**	**12**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
GMT1 Construction	Use of 2 Camps in Nuiqsut	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Aircraft Activity in GMT1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	40' Bridge Construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Ublutuoch River Bridge Construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Pipeline Installation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.3	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Power Line Installation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Fiber Optic Line Installation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Seasonal Ice Road Construction	0.00	0.07	0.26	0.21	0.15	0.11	0.09	0.02	0.00	0.00	0.00	0.00	0.00	0.06	0.18	0.14	0.12	0.11	0.09	0.02	0.00	0.00	0.00	0.00	0.00	0.07	0.26	0.21	0.15	0.11	0.09	0.02	0.00	0.00	0.00	0.00	0.00	0.07	0.26
	Gravel Roads, Pad Construction and Gravel Mining	0.0	1.3	1.3	0.0	1.0	1.6	1.2	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Blasting Emissions	0.1	0.5	0.1	0.0	0.1	0.5	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Construction Fugitive Emissions	NE	NE	NE	NE	NE	NE	NE	NE	17.4	17.4	17.4	17.4	NE	NE	NE	NE	NE	NE	NE	NE	24.8	24.0	23.6	23.6	NE	NE	NE	NE	NE	NE	NE	NE	23.6	0.0	0.0	0.0	0.0	0.0	0.0
	GMT1 Facilities Installation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.3	0.2	0.2	0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Alpine ACF and CD5 Facilities Installation Related to GMT1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Vertical Support Member (VSM) Construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Developmental Drilling	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0
	Developmental Drilling Non-Mobile Support Equipment	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0
	Developmental Drilling Mobile Support Equipment	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Well Flowback	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.0	0.0	0.0	0.0	0.0	0.0
GMT1 Routine Operations	Permanent Line Heater	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
	Back-up Generator Set	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19
	Solid Waste Incinerator	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29
	Routine Operations - Mobile Equipment Emissions	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
	Routine Operations - Fugitive Dust Emissions	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	19.2	19.2	19.2	NE	NE	NE
	Routine Operations - Aircraft Emissions	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Fugitive Equipment Leaks	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NE	NE	NE	NE	NE	NE
GMT1 Future Construction	Infill Drilling	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Infill Drilling Non-Mobile Support Equipment	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Infill Drilling Mobile Support Equipment	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Infill Drilling - Fugitive Dust Emissions	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Infill Drilling - Aircraft Emissions	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Well Flowback	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GMT1 Well Interventions	Well Interventions - Non-Mobile Support Equipment	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Well Interventions - Mobile Support Equipment	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Well Interventions - Fugitive Dust Emissions	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Well Interventions	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total (ton per month) =	0.1	1.9	1.8	0.3	1.4	2.3	1.5	0.1	17.7	17.7	17.7	17.5	0.0	0.1	0.2	0.2	0.8	1.1	0.8	0.9	25.5	24.7	24.3	24.3	0.6	1.1	1.3	1.2	1.1	1.1	1.1	1.0	24.6	19.7	19.7	19.7	0.6	0.6	0.8
	Rolling Total (ton per year) =	na	na	na	na	na	na	na	na	na	na	na	na	80	79.9	78	76.5	76.4	75.8	74.6	73.8	74.5	82.4	89.4	96	103	103	104	105	106	107	107	107	107	106	101	96.8	92.2	92.2	91.8

NE - No Emissions of this pollutant for this source.

Figure 2-8 PM_{10} Project Emissions Inventory During a Typical Production Year and During the Infill Drilling Period – Roadless Alternative

Typical Production Year											
1	2	3	4	5	6	7	8	9	10	11	12
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.21	0.15	0.11	0.09	0.02	0.00	0.00	0.00	0.00	0.00	0.07	0.26
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19
0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NE	NE	NE	NE	NE	19.2	19.2	19.2	19.2	NE	NE	NE
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	NE	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	4.5	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	2.3	0.0	0.0	0.0	0.0	0.0	0.0
0.8	0.7	0.7	0.7	0.6	27	19.7	19.7	19.7	0.6	0.6	0.8
91.5											

Infill Drilling											
1	2	3	4	5	6	7	8	9	10	11	12
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.3
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19
0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NE	NE	NE	NE	NE	19.2	19.2	19.2	19.2	NE	NE	NE
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.01
NE	NE	NE	NE	NE	4.5	4.5	4.5	4.5	NE	NE	NE
0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1.2	1.1	1.1	1.1	1.0	25	25	25	25	1.0	1.1	1.2
107											

Figure 2-9 $PM_{2.5}$ Project Emissions Inventory During Construction – Roadless Alternative

					Year 1												Year 2												Year 3											
	Emission Producing Activities	**10**	**11**	**12**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
GMT1 Construction	Use of 2 Camps in Nuiqsut	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Aircraft Activity in GMT1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	40' Bridge Construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Ublutuoch River Bridge Construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Pipeline Installation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.3	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Power Line Installation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Fiber Optic Line Installation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Seasonal Ice Road Construction	0.0	0.07	0.25	0.20	0.15	0.11	0.09	0.02	0.00	0.00	0.00	0.00	0.00	0.06	0.17	0.14	0.11	0.11	0.09	0.02	0.00	0.00	0.00	0.00	0.00	0.07	0.25	0.20	0.15	0.11	0.09	0.02	0.00	0.00	0.00	0.00	0.00	0.07	0.25
	Gravel Roads, Pad Construction and Gravel Mining	0.0	1.3	1.3	0.0	1.0	1.6	1.3	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Blasting Emissions	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Construction Fugitive Emissions	NE	NE	NE	NE	NE	NE	NE	NE	2.6	2.6	2.6	2.6	NE	NE	NE	NE	NE	NE	NE	NE	3.5	3.4	3.3	3.3	NE	NE	NE	NE	NE	NE	NE	NE	3.3	0.0	0.0	0.0	0.0	0.0	0.0
	GMT1 Facilities Installation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.3	0.2	0.2	0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Alpine ACF and CD5 Facilities Installation Related to GMT1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Vertical Support Member (VSM) Construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Developmental Drilling	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0
	Developmental Drilling Non-Mobile Support Equipment	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0
	Developmental Drilling Mobile Support Equipment	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Well Flowback	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.0	0.0	0.0	0.0	0.0	0.0
GMT1 Routine Operations	Permanent Line Heater	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
	Back-up Generator Set	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19
	Solid Waste Incinerator	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29
	Routine Operations - Mobile Equipment Emissions	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
	Routine Operations - Fugitive Dust Emissions	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.3	3.3	3.3	NE	NE	NE
	Routine Operations - Aircraft Emissions	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Fugitive Equipment Leaks	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NE	NE	NE	NE	NE	NE
GMT1 Future Construction	Infill Drilling	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Infill Drilling Non-Mobile Support Equipment	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Infill Drilling Mobile Support Equipment	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Infill Drilling - Fugitive Dust Emissions	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Infill Drilling - Aircraft Emissions	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Well Flowback	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GMT1 Well Interventions	Well Interventions - Non-Mobile Support Equipment	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Well Interventions - Mobile Support Equipment	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Well Interventions - Fugitive Dust Emissions	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Well Interventions	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total (ton per month) =	0.0	1.4	1.6	0.3	1.3	1.9	1.4	0.1	2.9	2.8	2.8	2.7	0.0	0.1	0.2	0.2	0.8	1.1	0.8	0.9	4.3	4.0	3.9	4.0	0.5	1.1	1.2	1.2	1.1	1.1	1.1	1.0	4.3	3.9	3.9	3.9	0.6	0.6	0.8
	Rolling Total (ton per year) =	na	na	na	na	na	na	na	na	na	na	na	na	19.3	19.3	17.9	16.5	16.4	16.0	15.2	14.6	15.3	16.7	17.9	19.0	20.3	20.8	21.8	22.8	23.8	24.1	24.1	24.3	24.5	24.5	24.4	24.3	24.3	24.3	23.9

NE - No Emissions of this pollutant for this source.

Figure 2-10 $PM_{2.5}$ Project Emissions Inventory During a Typical Production Year and During the Infill Drilling Period – Roadless Alternative

Typical Production Year											
1	2	3	4	5	6	7	8	9	10	11	12
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.20	0.15	0.11	0.09	0.02	0.00	0.00	0.00	0.00	0.00	0.07	0.25
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19
0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NE	NE	NE	NE	NE	3.3	3.3	3.3	3.3	NE	NE	NE
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	NE	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	2.3	0.0	0.0	0.0	0.0	0.0	0.0
0.8	0.7	0.7	0.7	0.6	7.2	3.9	3.9	3.9	0.6	0.6	0.8
24.3											

Infill Drilling											
1	2	3	4	5	6	7	8	9	10	11	12
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.20	0.15	0.11	0.09	0.02	0.00	0.00	0.00	0.00	0.00	0.07	0.25
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19
0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NE	NE	NE	NE	NE	3.3	3.3	3.3	3.3	NE	NE	NE
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.01
NE	NE	NE	NE	NE	0.7	0.7	0.7	0.7	NE	NE	NE
0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1.2	1.1	1.1	1.1	1.0	5.0	5.0	5.0	5.0	1.0	1.0	1.2
28.7											

Figure 2-11 VOC Project Emissions Inventory During Construction – Roadless Alternative

					Year 1											
	Emission Producing Activities	**10**	**11**	**12**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
GMT1 Construction	Use of 2 Camps in Nuiqsut	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.1
	Aircraft Activity in GMT1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9	1.0	0.6	0.6	0.1	0.1	0.0	0.0
	40' Bridge Construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Ublutuoch River Bridge Construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Pipeline Installation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Power Line Installation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Fiber Optic Line Installation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Seasonal Ice Road Construction	0.0	0.1	0.4	0.4	0.2	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.3
	Gravel Roads, Pad Construction and Gravel Mining	0.0	1.2	1.1	0.0	0.9	1.4	1.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0
	Blasting Emissions	NE	NE	NE	0.0	NE	NE	NE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Construction Fugitive Emissions	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
	GMT1 Facilities Installation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Alpine ACF and CD5 Facilities Installation Related to GMT1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Vertical Support Member (VSM) Construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Developmental Drilling	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Developmental Drilling Non-Mobile Support Equipment	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Developmental Drilling Mobile Support Equipment	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Well Flowback	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GMT1 Routine Operations	Permanent Line Heater	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Back-up Generator Set	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Solid Waste Incinerator	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Routine Operations - Mobile Equipment Emissions	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Routine Operations - Fugitive Dust Emissions	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Routine Operations - Aircraft Emissions	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Fugitive Equipment Leaks	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GMT1 Future Construction	Infill Drilling	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Infill Drilling Non-Mobile Support Equipment	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Infill Drilling Mobile Support Equipment	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Infill Drilling - Fugitive Dust Emissions	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Infill Drilling - Aircraft Emissions	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Well Flowback	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GMT1 Well Interventions	Well Interventions - Non-Mobile Support Equipment	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Well Interventions - Mobile Support Equipment	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Well Interventions - Fugitive Dust Emissions	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Well Interventions	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total (ton per month) =	0.0	1.3	1.6	0.4	1.2	1.7	1.3	1.0	1.2	0.8	0.8	0.2	0.1	0.1	0.4
	Rolling Total (ton per year) =	na	na	na	na	na	na	na	na	na	na	na	na	11.6	11.7	10.5

		Year 2												Year 3											
	Emission Producing Activities	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
GMT1 Construction	Use of 2 Camps in Nuiqsut	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Aircraft Activity in GMT1	0.0	0.0	0.0	0.2	1.6	1.6	1.2	1.2	0.7	0.7	0.7	0.7	0.8	0.2	0.2	0.3	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
	40' Bridge Construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Ublutuoch River Bridge Construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Pipeline Installation	0.0	0.3	0.4	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Power Line Installation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Fiber Optic Line Installation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Seasonal Ice Road Construction	0.2	0.2	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.4	0.4	0.2	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.4
	Gravel Roads, Pad Construction and Gravel Mining	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Blasting Emissions	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Construction Fugitive Emissions	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.0	0.0	0.0	0.0	0.0	0.0
	GMT1 Facilities Installation	0.0	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Alpine ACF and CD5 Facilities Installation Related to GMT1	0.0	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Vertical Support Member (VSM) Construction	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Developmental Drilling	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
	Developmental Drilling Non-Mobile Support Equipment	0.0	0.0	0.0	0.0	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.0	0.0	0.0	0.0	0.0	0.0
	Developmental Drilling Mobile Support Equipment	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Well Flowback	0.0	0.0	0.0	0.0	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	0.8	0.8	0.8	0.8	0.8	0.8	0.0	0.0	0.0	0.0	0.0	0.0
GMT1 Routine Operations	Permanent Line Heater	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
	Back-up Generator Set	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19
	Solid Waste Incinerator	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
	Routine Operations - Mobile Equipment Emissions	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
	Routine Operations - Fugitive Dust Emissions	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NE	NE	NE	NE	NE	NE
	Routine Operations - Aircraft Emissions	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.6	0.1	0.1	0.1	0.1
	Fugitive Equipment Leaks	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.4	1.4	1.4	1.4	1.4	1.4
GMT1 Future Construction	Infill Drilling	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Infill Drilling Non-Mobile Support Equipment	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Infill Drilling Mobile Support Equipment	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Infill Drilling - Fugitive Dust Emissions	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Infill Drilling - Aircraft Emissions	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Well Flowback	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GMT1 Well Interventions	Well Interventions - Non-Mobile Support Equipment	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Well Interventions - Mobile Support Equipment	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Well Interventions - Fugitive Dust Emissions	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Well Interventions	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total (ton per month) =	0.3	0.9	1.2	1.0	4.1	4.0	3.4	3.4	3.0	2.8	3.3	3.7	3.2	2.5	2.5	2.6	3.2	3.1	2.5	2.5	2.0	2.0	2.1	2.4
	Rolling Total (ton per year) =	9.3	9.2	8.9	8.4	8.2	11.2	13.9	16.5	19.1	21.9	24.6	27.8	31.1	34.0	35.6	36.9	38.4	37.5	36.7	35.8	34.9	33.9	33.1	31.9

NE - No Emissions of this pollutant for this source.

Figure 2-12 VOC Project Emissions Inventory During a Typical Production Year and During the Infill Drilling Period – Roadless Alternative

Typical Production Year											
1	2	3	4	5	6	7	8	9	10	11	12
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.4	0.2	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.4
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19
0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
0.1	0.1	0.1	0.1	1.0	1.0	0.6	0.6	0.1	0.1	0.1	0.1
1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	NE	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0
2.3	2.2	2.2	2.1	3.0	8.4	2.5	2.5	2.0	2.0	2.1	2.4
33.8											

Infill Drilling											
1	2	3	4	5	6	7	8	9	10	11	12
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.4	0.2	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.4
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19
0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
0.03	0.03	0.03	0.03	0.03	0.00	0.00	0.00	0.00	0.00	0.03	0.03
NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
0.3	0.3	0.3	0.3	1.3	1.3	0.8	0.8	0.3	0.3	0.3	0.3
0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4.2	4.1	4.1	4.0	4.9	4.8	4.3	4.3	3.9	3.9	4.0	4.3
50.9											

Figure 2-13 HAPs Project Emissions Inventory During Construction – Roadless Alternative

	Emission Producing Activities				Year 1												Year 2												Year 3											
		10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
GMT1 Construction	Use of 2 Camps in Nuiqsut	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Aircraft Activity in GMT1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.1	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0
	40' Bridge Construction	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Ublutuoch River Bridge Construction	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Pipeline Installation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.07	0.05	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Power Line Installation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Fiber Optic Line Installation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Seasonal Ice Road Construction	0.00	0.01	0.03	0.03	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.03	0.03	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.03
	Gravel Roads, Pad Construction and Gravel Mining	0.00	0.15	0.15	0.00	0.12	0.18	0.14	0.00	0.02	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Blasting Emissions	NE	NE	NE	0.00	NE	NE	NE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Construction Fugitive Emissions	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.00	0.00	0.00	0.00	0.00	0.00
	GMT1 Facilities Installation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.04	0.03	0.02	0.03	0.02	0.02	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Alpine ACF and CD5 Facilities Installation Related to GMT1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Vertical Support Member (VSM) Construction	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Developmental Drilling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.00	0.00	0.00	0.00	0.00	0.00
	Developmental Drilling Non-Mobile Support Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.00	0.00	0.00	0.00	0.00	0.00
	Developmental Drilling Mobile Support Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Well Flowback	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00
GMT1 Routine Operations	Permanent Line Heater	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
	Back-up Generator Set	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	Solid Waste Incinerator	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17
	Routine Operations - Mobile Equipment Emissions	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00
	Routine Operations - Fugitive Dust Emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	NE	NE	NE	NE	NE	NE
	Routine Operations - Aircraft Emissions	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0
	Fugitive Equipment Leaks	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.07	0.07	0.07	0.07	0.07
GMT1 Future Construction	Infill Drilling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Infill Drilling Non-Mobile Support Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Infill Drilling Mobile Support Equipment	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Infill Drilling - Fugitive Dust Emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Infill Drilling - Aircraft Emissions	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Well Flowback	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GMT1 Well Interventions	Well Interventions - Non-Mobile Support Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Well Interventions - Mobile Support Equipment	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Well Interventions - Fugitive Dust Emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Well Interventions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total (ton per month) =	0	0.16	0.18	0.03	0.14	0.2	0.15	0.15	0.18	0.11	0.11	0.03	0.02	0.01	0.03	0.02	0.12	0.17	0.16	0.45	0.43	0.34	0.34	0.28	0.26	0.49	0.52	0.52	0.39	0.39	0.41	0.51	0.5	0.4	0.4	0.3	0.3	0.3	0.35
	Rolling Total (ton per year) =	na	na	na	na	na	na	na	na	na	na	na	na	1.47	1.49	1.34	1.18	1.17	1.16	1.12	1.12	1.42	1.67	1.9	2.12	2.38	2.61	3.1	3.59	4.08	4.35	4.56	4.82	4.88	4.9	5	5	5.1	5.1	5

NE - No Emissions of this pollutant for this source.

Figure 2-14 HAPs Project Emissions Inventory During a Typical Production Year and During the Infill Drilling Period – Roadless Alternative

Typical Production Year											
1	2	3	4	5	6	7	8	9	10	11	12
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.03	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.03
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
0.0	0.0	0.0	0.0	0.2	0.2	0.1	0.1	0.0	0.0	0.0	0.0
0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.00	0.00	0.00	0.00	0.00	NE	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
0.34	0.33	0.33	0.33	0.46	0.52	0.39	0.39	0.32	0.32	0.33	0.35
4.4											

Infill Drilling											
1	2	3	4	5	6	7	8	9	10	11	12
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.03	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.03
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
0.1	0.1	0.1	0.1	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.50	0.49	0.49	0.48	0.62	0.61	0.54	0.54	0.47	0.47	0.48	0.51
6											

Figure 2-15 GHGs (CO_2e) Project Emissions Inventory During Construction – Roadless Alternative

					Year 1												Year 2												Year 3											
	Emission Producing Activities	**10**	**11**	**12**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
GMT1 Construction	Use of 2 Camps in Nuiqsut	0	0	206	206	206	257	206	206	257	206	206	51	0	0	206	206	206	257	206	206	257	206	206	257	206	51	0	0	0	0	0	0	0	0	0	0	0	0	0
	Aircraft Activity in GMT1	0	0	0	13	7	6	6	194	212	121	121	29	35	19	19	7	7	6	45	336	336	244	252	168	160	167	175	126	103	100	105	213	213	0	0	0	0	0	0
	40' Bridge Construction	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ublutuoch River Bridge Construction	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pipeline Installation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1049	1424	989	192	75	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Power Line Installation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	70	174	139	35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Fiber Optic Line Installation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	123	123	31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Seasonal Ice Road Construction	0	368	1335	1068	736	506	405	101	0	0	0	0	0	286	921	737	568	498	399	100	0	0	0	0	0	368	1335	1068	736	506	405	101	0	0	0	0	0	368	1335
	Gravel Roads, Pad Construction and Gravel Mining	69	3831	3688	0	2942	4645	3536	0	401	401	401	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blasting Emissions	25	100	25	0	25	100	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Construction Fugitive Emissions	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0	0	0	0	0	0
	GMT1 Facilities Installation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	801	1172	709	487	506	376	318	380	152	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Alpine ACF and CD5 Facilities Installation Related to GMT1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	413	592	383	265	56	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Vertical Support Member (VSM) Construction	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	160	298	129	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Developmental Drilling	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1252	1252	1252	1252	1252	1252	1252	1252	1252	1252	1252	1252	1252	1252	0	0	0	0	0	0
	Developmental Drilling Non-Mobile Support Equipment	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	302	302	302	302	302	302	302	302	302	302	302	302	302	302	0	0	0	0	0	0
	Developmental Drilling Mobile Support Equipment	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	186	37	37	37	37	37	186	186	186	186	186	186	186	37	0	0	0	0	0	0
	Well Flowback	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	49	49	49	49	49	49	49	49	6	6	6	6	6	6	0	0	0	0	0	0
GMT1 Routine Operations	Permanent Line Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150
	Back-up Generator Set	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	559	559	559	559	559	559	559	559	559	559	559	559	559	559
	Solid Waste Incinerator	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	297	297	297	297	297	297	297	297	297	297	297	297	297	297
	Routine Operations - Mobile Equipment Emissions	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.27	0.27	0.27	0.27	12.79	12.79
	Routine Operations - Fugitive Dust Emissions	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	NE	NE	NE	NE	NE	NE
	Routine Operations - Aircraft Emissions	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	121	121	29	29	29	29
	Fugitive Equipment Leaks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	37	37	37	37	37	37
GMT1 Future Construction	Infill Drilling	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Infill Drilling Non-Mobile Support Equipment	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Infill Drilling Mobile Support Equipment	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Infill Drilling - Fugitive Dust Emissions	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Infill Drilling - Aircraft Emissions	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Well Flowback	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GMT1 Well Interventions	Well Interventions - Non-Mobile Support Equipment	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Well Interventions - Mobile Support Equipment	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Well Interventions - Fugitive Dust Emissions	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Well Interventions	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total (ton per month) =	94	4299	5254	1288	3916	5515	4179	501	870	728	728	181	35	305	1147	950	3273	4546	3122	3441	2871	2492	2416	2446	2159	4383	5306	4947	4593	4359	4263	4067	3818	2166	2166	2074	2074	2455	3422
	Rolling Total (ton per year) =	na	na	na	na	na	na	na	na	na	na	na	na	27553	27494	23500	19393	19055	18412	17443	16387	19326	21327	23091	24779	27044	29167	33244	37403	41401	42720	42532	43673	44300	45246	44920	44670	44298	44213	42286

NE - No Emissions of this pollutant for this source.

Figure 2-16 GHGs (CO_2e) Project Emissions Inventory During a Typical Production Year and During the Infill Drilling Period – Roadless Alternative

Typical Production Year											
1	2	3	4	5	6	7	8	9	10	11	12
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
1068	736	506	405	101	0	0	0	0	0	368	1335
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
1150	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150
559	559	559	559	559	559	559	559	559	559	559	559
297	297	297	297	297	297	297	297	297	297	297	297
12.79	12.79	12.79	12.79	12.79	0.27	0.27	0.27	0.27	0.27	12.79	12.79
NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
9	9	9	9	213	213	121	121	29	29	29	29
37	37	37	37	37	37	37	37	37	37	37	37
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0	0	0	0	0	0	0	0	0	0	0	0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0	0	0	0	0	6	0	0	0	0	0	0
0	0	0	0	0	302	0	0	0	0	0	0
0.0	0.0	0.0	0.0	0.0	36.9	0.0	0.0	0.0	0.0	0.0	0.0
0	0	0	0	0	NE	0	0	0	0	0	0
0	0	0	0	0	6395	0	0	0	0	0	0
3134	2802	2572	2470	2371	8998	2166	2166	2074	2074	2455	3422
36703											

Infill Drilling											
1	2	3	4	5	6	7	8	9	10	11	12
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
1068	736	506	405	101	0	0	0	0	0	368	1335
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
1150	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150
559	559	559	559	559	559	559	559	559	559	559	559
297	297	297	297	297	297	297	297	297	297	297	297
12.79	12.79	12.79	12.79	12.79	0.27	0.27	0.27	0.27	0.27	12.79	12.79
NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
37	37	37	37	37	37	37	37	37	37	37	37
1252	1252	1252	1252	1252	1252	1252	1252	1252	1252	1252	1252
302	302	302	302	302	302	302	302	302	302	302	302
186	186	186	186	186	37	37	37	37	37	186	186
NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
109	109	105	105	310	310	218	218	126	126	126	126
6	6	6	6	6	6	6	6	6	6	6	6
0	0	0	0	0	0	0	0	0	0	0	0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
4980	4648	4414	4313	4214	3952	3860	3860	3768	3768	4298	5264
51338											

Figure 2-17 TRS Project Emissions Inventory During Construction – Roadless Alternative

					Year 1												Year 2												Year 3											
	Emission Producing Activities	**10**	**11**	**12**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
GMT1 Construction	Use of 2 Camps in Nuiqsut	0.0	0.0	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.0	0.0	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Aircraft Activity in GMT1	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.0	0.0	0.0	0.0	0.0	0.0
	40' Bridge Construction	0.0	0.0	0.0	0.0	NE	NE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Ublutuoch River Bridge Construction	0.0	0.0	0.0	0.0	NE	NE	NE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Pipeline Installation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Power Line Installation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Fiber Optic Line Installation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Seasonal Ice Road Construction	0.0	NE	NE	NE	NE	NE	NE	NE	0.0	0.0	0.0	0.0	0.0	NE	NE	NE	NE	NE	NE	NE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Gravel Roads, Pad Construction and Gravel Mining	NE	NE	NE	0.0	NE	NE	NE	0.0	NE	NE	NE	NE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Blasting Emissions	NE	NE	NE	0.0	NE	NE	NE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Construction Fugitive Emissions	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.0	0.0	0.0	0.0	0.0	0.0
	GMT1 Facilities Installation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Alpine ACF and CD5 Facilities Installation Related to GMT1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NE	NE	NE	NE	NE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Vertical Support Member (VSM) Construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NE	NE	NE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Developmental Drilling	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.0	0.0	0.0	0.0	0.0	0.0
	Developmental Drilling Non-Mobile Support Equipment	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.0	0.0	0.0	0.0	0.0	0.0
	Developmental Drilling Mobile Support Equipment	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	0.0	0.0	0.0	0.0	0.0	0.0
	Well Flowback	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	0.8	0.8	0.8	0.8	0.8	0.8	0.0	0.0	0.0	0.0	0.0	0.0
GMT1 Routine Operations	Permanent Line Heater	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
	Back-up Generator Set	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
	Solid Waste Incinerator	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NE	NE	NE	NE	NE	NE
	Routine Operations - Mobile Equipment Emissions	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NE	NE	NE	NE	NE	NE
	Routine Operations - Fugitive Dust Emissions	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NE	NE	NE	NE	NE	NE
	Routine Operations - Aircraft Emissions	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NE	NE	NE	NE	NE	NE
	Fugitive Equipment Leaks	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GMT1 Future Construction	Infill Drilling	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Infill Drilling Non-Mobile Support Equipment	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Infill Drilling Mobile Support Equipment	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Infill Drilling - Fugitive Dust Emissions	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Infill Drilling - Aircraft Emissions	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Well Flowback	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GMT1 Well Interventions	Well Interventions - Non-Mobile Support Equipment	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Well Interventions - Mobile Support Equipment	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Well Interventions - Fugitive Dust Emissions	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Well Interventions	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total (ton per month) =	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	0.8	0.8	0.8	0.8	0.8	0.8	0.0	0.0	0.0	0.0	0.0	0.0
	Rolling Total (ton per year) =	na	na	na	na	na	na	na	na	na	na	na	na	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2	2.4	3.6	4.8	6.0	7.2	8.4	9.6	10.4	11.3	12.1	12.9	12.6	12.2	11.0	9.8	8.6	7.4	6.2

NE - No Emissions of this pollutant for this source.

Figure 2-18 TRS Project Emissions Inventory During a Typical Production Year and During the Infill Drilling Period – Roadless Alternative

Typical Production Year											
1	2	3	4	5	6	7	8	9	10	11	12
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.01	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	NE	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.01											

Infill Drilling											
1	2	3	4	5	6	7	8	9	10	11	12
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.1											

Figure 2-19 GMT1 Project Roadless Alternative Activities Information Regarding the Location of Emissions Calculations

		Spreadsheet(s) in Which Emissions Are Calculated										
	Activity	GMT1 Aircraft Inventory Emissions Roadless	GMT1 Construction Equipment Emissions Roadless	GMT1 Fugitive Dust Emissions Roadless	GMT1 Well Flowback Emissions Roadless	GMT1 Permanent Operations Criteria and GHG Emissions Roadless	GMT1 Permanent Operations Criteria and GHG Emissions Roadless, Pad Length	GMT1 Permanent Operations HAP Emissions Roadless	GMT1 Drilling Inventory Emissions Roadless	GMT1 Ice Road Emissions Roadless	GMT1 Mobile Drilling Inventory Emissions Roadless	GMT1 Mobile Drilling Inventory Emissions Roadless, Pad Length
GMT1 Construction	Use of 2 Camps in Nuiqsut		X									
	Aircraft Activity in GMT1	X										
	40' Bridge Construction		X									
	Ublutuoch River Bridge Construction		X									
	Pipeline Installation		X									
	Power Line Installation		X									
	Fiber Optic Line Installation		X									
	Seasonal Ice Road Construction		X							X		
	Gravel Roads, Pad Construction and Gravel Mining		X									
	Blasting Emissions		X									
	Construction Fugitive Emissions			X								
	GMT1 Facilities Installation		X									
	Alpine ACF and CD5 Facilities Installation Related to GMT1		X									
	Vertical Support Member (VSM) Construction		X									
	Developmental Drilling								X			
	Developmental Drilling Non-Mobile Support Equipment								X			
	Developmental Drilling Mobile Support Equipment										X	X
	Well Flowback				X							
GMT1 Routine Operations	Permanent Line Heater					X		X				
	Back-up Generator Set					X		X				
	Solid Waste Incinerator					X		X				
	Routine Operations - Mobile Equipment Emissions					X	X					
	Routine Operations - Fugitive Dust Emissions			X								
	Routine Operations - Aircraft Emissions	X										
	Fugitive Equipment Leaks					X						
GMT1 Future Construction	Infill Drilling								X			
	Infill Drilling Non-Mobile Support Equipment								X			
	Infill Drilling Mobile Support Equipment										X	X
	Infill Drilling - Fugitive Dust Emissions			X								
	Infill Drilling - Aircraft Emissions	X										
	Well Flowback				X							
GMT1 Well Interventions	Well Interventions - Non-Mobile Support Equipment								X			
	Well Interventions - Mobile Support Equipment										X	X
	Well Interventions - Fugitive Dust Emissions			X								
	Well Interventions					X		X				

2.1.1 GMT1 Construction Project Emissions Inventory

Emissions related to construction activities are a result of:

- fuel combustion in the nonroad and onroad equipment associated with the construction activities,
- heaters and engine generators (including the drill rig camp generator),
- airstrip emissions, and
- blasting emissions.

Emissions from nonroad construction equipment were calculated using the same methods used for the GMT1 Preferred Alternative AQIA. Criteria pollutants (NO_x, CO, VOC, SO_2, PM_{10}, $PM_{2.5}$) as well as carbon dioxide (CO_2) were calculated based on the emissions calculation procedures described in "Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression-Ignition", July2010, EPA-420-R-10-018. Emissions of greenhouse gases (GHGs) expressed as carbon dioxide equivalents (CO_2e) were calculated from emissions of CO_2, CH_4 and N_2O by applying the 100-year global warming potentials (GWPs) from Intergovernmental Panel on Climate Change's (IPCC's) Fourth Assessment Report (AR4). Emissions of hazardous air pollutants (HAPs) from nonroad engines were calculated based on emission factors presented in AP-42 Table 3.3-2 and Table 3.4-3. Equipment usage information specific to the GMT1 Project Roadless Alternative was used in order to determine daily, weekly and monthly emissions.

Emissions from onroad construction equipment were also calculated using the same methods used for the GMT1 Preferred Alternative AQIA, by using EPA's MOVES2010b motor vehicle emissions estimation program. Year 2011 is used as the base year for the North Slope Borough. The latest county-specific MOVES2010b input data available from Alaska Department of Environmental Conservation (ADEC) was used. MOVES generates emission factors in the units of grams per mile (g/mi) which are then multiplied by the average speed of vehicles (in this case, 20 miles per hour) to obtain hourly emissions. Emissions of GHGs (CO_2e) were calculated from emissions of CO_2, CH_4 and N_2O by applying the 100-year GWPs from IPCC's AR4. Equipment usage information specific to the GMT1 Project Roadless Alternative was used in order to determine daily, weekly and monthly emissions.

Emissions from heaters (boilers) were calculated in the same manner as presented in the GMT1 Preferred Alternative AQIA. Emissions of NO_x, CO, SO_2, PM_{10}, $PM_{2.5}$, VOC, and HAPs were based on emission factors presented in AP-42 Chapter 1.3. Emissions of SO_2 were estimated based on a fuel sulfur content of 15 ppmw. Emissions of GHGs were calculated based on emission factors presented in The Climate Registry General Reporting Protocol Chapter 12, Table 12.1 (CO_2) and 12.7 (CH_4 and N_2O). Equipment usage information specific to the GMT1 Project Roadless Alternative was used in order to determine daily, weekly and monthly emissions.

Emissions of NO_x, CO, and filterable PM from engines were calculated based on EPA Tier 3 Nonroad Exhaust Emission Standards (40 CFR 89.112). Total Organic Compounds (TOC) and condensable particulate emissions were calculated based on emission factors presented in AP-42 Table 3.3-1. Emissions of SO_2 were estimated based on a fuel sulfur content of 15 ppmw. Emissions of HAPs were based on emission factors presented in AP-42 Table 3.3-2. Emissions of GHGs were calculated based on emission factors presented in The Climate Registry General Reporting Protocol Chapter 12, Table 12.1 (CO_2) and 12.9 (CH_4 and N_2O). Emission factors were converted from the units of lb/MMBtu to lb/hp-hr using a brake specific fuel consumption of 7,000 Btu/hp-hr. The rated heat input was provided by CPAI and daily/weekly/annual activity levels for the engines specific to the GMT1 Project Roadless Alternative were used.

Emissions related to air traffic were estimated based on data provided by the Federal Aviation Administration (FAA) Emissions and Dispersion Modeling System (EDMS). The EDMS emissions during the construction phase were calculated using information for the following aircraft: A Boeing 737 to move passengers and cargo to Deadhorse, Boeing DC-6 to move cargo to GMT1, Lockheed C-130 to move large cargo to GMT1, de Havilland DHC-6-200 Twin Otter and a Casa 212-300 to move passengers and cargo into GMT1, and a Bell 407 helicopter to move gravel crews and for conducting special studies during the summer. With the exception of the Boeing 737, **Table 2-2** details the use of each aircraft during the construction phase. Boeing 737 usage was tied to the number of Casa/Otter flights through the number of passengers moved since all passengers using the Casa/Otter would have come to the North Slope using the Boeing 737. The Boeing 737 servicing the North Slope holds 136 passengers, the Casa, 26 and the Otter, 19. Aircraft emissions include ground taxiing, support equipment (diesel truck service and diesel generator), take off, and flight up to 1,000 feet altitude. The emissions are presented for October 2015 through June 2018. Emissions of GHGs include CO_2 only as appropriate emission factors for N_2O and CH_4 were not found.

Emissions of NO_x and CO associated with blasting were estimated based on emission factors presented in AP-42 Section 13.3. Emissions of PM_{10} and $PM_{2.5}$ resulting from blasting were calculated based on emission factors presented in AP-42 Section 11.9. Emissions of CO_2 resulting from blasting were calculated based on methods presented in Australian Greenhouse Office (AGO) Factors and Methods Workbook, December 2012, Section 2.3. Emissions of GHGs include CO_2 only as appropriate emission factors for N_2O and CH_4 were not found. Weekly emissions were based on a blasting frequency of 6 blasts per week and blasting is estimated to occur over a 12 week period.

2.1.2 Developmental Drilling Project Emissions Inventory

Developmental drilling emissions consist of emissions associated with the main Doyon 19 drill rig on highline power and several mobile and stationary units in a supporting role. The Doyon 19 emission units consist of three (3) heaters, two (2) boilers and three (3) engines as deployed in drilling operations for this project. Of these engines , 2 are cement pumps which rarely operate and the remaining engine is a primary power generation engine which operates in spinning reserve incase highline power becomes temporarily unavailable. The stationary support equipment consists of six (6) boilers and fifteen (15) engines. Mobile support equipment consists of eight (8) vacuum trucks, four (4) heavy duty diesel trucks and eight (8) light pickup trucks.

Emissions from boilers and engines were calculated using the same methods as in the GMT1 Preferred Alternative AQIA. Boiler emissions were based on emission factors presented in AP-42 Chapter 1.3. The Climate Registry General Reporting Protocol Chapter 12 was used for GHG emissions. Emissions from engines were calculated based on emission factor data supplied by Caterpillar, except HAPs which were based on emission factors presented in AP-42 Table 3.3-2 and GHGs which were based on emission factors presented in The Climate Registry General Reporting Protocol Chapter 12.

Emissions of NO_x, CO, VOC, SO_2, PM_{10}, $PM_{2.5}$, CO_2, CH_4, N_2O and HAPs from onroad equipment using the ice road to seasonally and on the road between the storage and GMT1 were estimated based on EPA's MOVES2010b motor vehicle emissions estimation program. The latest county-specific MOVES2010b input data available from ADEC was used. The MOVES generated emission factors (g/mi) were multiplied by the average speed of vehicles (20 miles per hour) to obtain hourly emissions (lb/hr). The annual operating hours per unit for the vehicles were calculated based on the assumption that the vehicle travels between two routes. One route is along the 26.2 mile ice road (roundtrip from the Alpine CPF to the GMT1 storage site at the airstrip) for the seven month winter period when the ice road is available (November-May). The second route occurs all year long, and is along the 1,960 meter gravel road (2.44 miles round trip) between the GMT1 bulk storage site and the GMT1 wellsite. Both routes assume that each heavy vehicle spends one (1) hour idling at the destination for unloading time per trip. The pickup trucks are assumed to have only 0.25 hour idle time.

Table 2-2 Aircraft Usage During Construction and Drilling (Combined Take-off and Landings Per Month at GMT1)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Year 1 - 2016												
Operations (Otter/Casa)	0	0	0	0	0	0	0	0	0	0	0	0
Construction (Otter/Casa)	10	5	5	5	5	5	5	5	5	10	15	15
Drilling (Otter/Casa)	0	0	0	0	0	0	0	0	0	0	0	0
Operations Cargo (DC-6)	0	0	0	0	0	0	0	0	0	0	0	0
Construction Cargo (DC-6)	0	0	0	0	0	0	1	1	1	1	0	0
Drilling Cargo (DC-6)	0	0	0	0	0	0	0	0	0	0	0	0
Large Cargo (C-130)	0	0	0	0	0	0	0	0	0	0	0	0
Construction (Helicopter)	0	0	0	0	10	60	60	60	60	60	0	0
Special Studies (Helicopter)	0	0	0	0	517	517	259	259	0	0	0	0
Year 2 - 2017												
Operations (Otter/Casa)	0	0	0	5	20	20	20	26	26	26	26	26
Construction (Otter/Casa)	5	5	5	5	10	10	10	10	10	10	15	15
Drilling (Otter/Casa)	0	0	0	20	70	70	70	70	70	70	70	70
Operations Cargo (DC-6)	0	0	0	0	0	0	0	0	0	0	0	0
Construction Cargo (DC-6)	0	0	0	0	0	0	0	0	0	0	0	0
Drilling Cargo (DC-6)	0	0	0	5	20	20	20	20	20	20	20	20
Large Cargo (C-130)	0	0	0	0	0	0	0	0	2	0	0	2
Construction (Helicopter)	0	0	0	0	0	0	0	0	0	0	0	0
Special Studies (Helicopter)	0	0	0	0	517	517	259	259	0	0	0	0

Continued on Next Page …

Table 2-2 Aircraft Usage During Construction and Drilling (Combined Take-off and Landings Per Month at GMT1) (CONTINUED)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Year 3 - 2018												
Operations (Otter/Casa)	4	4	4	4	20	20	20	20	20	20	20	20
Construction (Otter/Casa)	0	0	0	0	0	0	0	0	0	0	0	0
Drilling (Otter/Casa)	70	70	70	70	0	0	0	0	0	0	0	0
Operations Cargo (DC-6)	3	3	3	3	3	3	3	3	3	3	3	3
Construction Cargo (DC-6)	0	0	0	0	0	0	0	0	0	0	0	0
Drilling Cargo (DC-6)	20	0	0	5	0	0	0	0	0	0	0	0
Large Cargo (C-130)	0	0	0	0	0	0	0	0	0	0	0	0
Construction (Helicopter)	0	0	0	0	0	0	0	0	0	0	0	0
Special Studies (Helicopter)	0	0	0	0	517	517	259	259	0	0	0	0

Fugitive emissions of particulate matter result primarily from gravel sourcing from the Clover Material site, general disturbed areas during construction of wellsite, vehicle travel on the unpaved (gravel) road between the storage site and wellsite during wellsite construction, developmental drilling and wellsite routine operations and maintenance. It is assumed that the conditions from October through May are considered winter and are characterized by significant snow cover and/or frozen ground. Therefore, little, if any, fugitive dust would be generated during this time. Moreover, vehicles will travel on ice roads during these months and use of gravel roads will be minimal.

Emissions of PM_{10} and $PM_{2.5}$ generated by the process of gravel extraction consist of:

- Particulates generated by overburden and gravel extraction and stockpiling – Emission factor for overburden extraction and stockpiling was taken from Equation 1 of AP-42 Section 13.2.4. The emissions factor takes into account wind speed and material's moisture content to calculate total suspended particulate (TSP) emission factor which can be converted to $PM_{2.5}$ and PM_{10} emission factors by applying the appropriate particle size multiplier. Since the moisture of overburden and gravel is expected to be high due to the ground being snow covered most part of the year, the high end of the range of moisture contents (4.8%) that justifies the validity of the emission factor was used.
- Particulates generated by gravel crushing – PM_{10} and $PM_{2.5}$ emission factors for the gravel crushing operation were taken from AP-42 Table 11.19.2-2 (controlled tertiary crushing). It should be noted that while primary crushing will likely be sufficient for the purposes of developing gravel for roads, tertiary crushing factors were used because there are no data available for primary and secondary crushing in AP-42.

Emissions of PM_{10} and $PM_{2.5}$ generated by vehicle travel on the road connecting the wellsite and airstrip were calculated based on the method presented in Equation 1a of AP-42 Section 13.2.2. The emission factor (lb/vehicle mile traveled) was multiplied by the total miles traveled by the vehicle per hour (20 miles per hour) to obtain a maximum hourly emission rate. The total miles travelled per day per vehicle were calculated based on the number of trips per day and total roundtrip miles per trip (2.44 miles) on the gravel road.

In addition to vehicle travel on unpaved roads and gravel extraction, there are general disturbed areas created during the life of the wellsite construction. In particular, construction of the road connecting the wellsite and airstrip, construction of the wellsite and installation of the pipeline, power line and communications line, and the airstrip pad, hangar and runway will result in disturbed areas. Emissions of TSP, PM_{10} and $PM_{2.5}$ from these areas were calculated based on the emission factor available in AP-42 Section 13.2.3.3 (1.2 ton/acre/month) and the particle size multipliers from AP-42 Section 13.2.5.3. The area of disturbance was provided by CPAI. Since the disturbed areas will be watered periodically to mitigate fugitive dust emissions, a control factor of 75% was applied to the particulate emissions. This control factor is easily achievable by limiting vehicle speeds and applying enough water to ensure that the ratio of the controlled to uncontrolled surface moisture content assumed in the emission factor is 2 or above (USEPA 1992).

Developmental drilling also includes emissions from flowing back wells as part of well completion. Well flowback emissions were determined in the same manner as the GMT1 Preferred Alternative AQIA, using a simulation conducted with the ProMax 3.2 software. Emissions of GHGs (CO_2e) were calculated from emissions of CO_2, CH_4 and N_2O by applying the 100-year GWPs from IPCC's AR4.

2.1.3 Well Interventions Project Emissions Inventory

To be conservative, emissions from well interventions were estimated based on operation of the well hydraulic fracturing unit, since this unit results in higher emissions than other types of well intervention equipment such as a coil tubing unit. In addition to the boilers and engines associated with the well hydraulic fracturing unit, there are several stationary and mobile support equipment units that contribute to this emissions inventory. The well hydraulic fracturing unit consists of engines totaling 15,510 hp.

Engine emissions were calculated using the same methodology as was done for the proposed GMT1 Alternative A. Emissions of NO_x, SO_2, CO, VOC, PM_{10}, $PM_{2.5}$ and HAPs from the “small” engines in well intervention service were calculated based on emission factor data provided in AP-42 Chapter 3.3. Emissions from the “large” engines in well intervention service were calculated based on emission factor data provided in AP-42 Chapter 3.4. Emissions of GHGs were calculated based on emission factors presented in The Climate Registry General Reporting Protocol Chapter 12.

The methods used to calculate emissions from the nonroad and mobile support equipment is similar to those described in Section 2.1.3.

2.1.4 Routine Operations Project Emissions Inventory

Routine operations emissions inventory consists of mobile equipment associated with transporting workers to and from the site on the seasonal ice road and via aircraft, fugitive particulate emissions resulting from disturbed areas and vehicle travel on ice roads and the unpaved road between the storage pad and the wellsite, fugitive VOC emissions from the pipeline components, emissions related to aircraft travel, a solid waste incinerator, a diesel standby generator, and a field gas fired main production heater.

Emissions of NO_x and CO from the field gas fired production heater were calculated based on emission factors presented in AP-42 Table 1.4-1. Emissions of VOC, PM_{10} and $PM_{2.5}$ were based on emission factors in AP-42 Table 1.4-2. Emissions of SO_2 were based on a mass balance approach and a maximum fuel sulfur content of 40 ppmv in the field gas. Emissions of HAPs were based on emission factors presented in AP-42 Table 1.4-3 and 1.4-4. Emissions of GHGs were calculated based on emission factors presented in The Climate Registry General Reporting Protocol Chapter 12, Table 12.1 (CO_2) and 12.7 (CH_4 and N_2O).

For the incinerator, emissions from the combustion of solid waste as well as emissions from the two field gas fired burners were calculated. The burner emissions of NO_x and CO were based on emission factors presented in AP-42 Table 1.4-1. Emission factors for VOC, SO_2, PM_{10} and $PM_{2.5}$ are from AP-42 Table 1.4-2, and HAPs are from AP-42 Table 1.4-3 and Table 1.4-4. For the emissions associated with the combustion of solid waste in the incinerator, emissions of CO, NO_x, filterable PM, SO_2, and HAPs were calculated based on emission factors from 40 CFR Part 60, Subpart CCCC Table 8 and conversion factors from AP-42 Table 2.1-10. It was assumed that all filterable PM is equal to filterable PM_{10} which is equal to filterable $PM_{2.5}$. Condensable particulate matter (CPM) data is very limited, so the CPM emission factor was determined based on the draft permit limits from Energy Answers Arecibo, LLC (ARECIBO PUERTO RICO RENEWABLE ENERGY PROJECT). Emissions of GHGs for the incinerator were calculated based on emission factors presented in The Mandatory Greenhouse Gas Reporting Rule (40 CFR Part 98) Subpart C, Table C-1 (CO_2) and C-2 (CH_4 and N_2O). CO_2e were calculated from emissions of CO_2, CH_4 and N_2O by applying the 100-year GWPs from IPCC’s AR4.

Emissions of NO_x, CO, and filterable PM from the standby generators were calculated based on USEPA Tier 2 Nonroad Exhaust Emission Standards (40 CFR 89.112). TOC and condensable particulate emissions were calculated based on emission factors presented in AP-42 Table 3.3-1 and Table 3.4-2, respectively. Emissions of SO_2 were estimated based on a liquid fuel sulfur content of 15 ppmw. Emissions of HAPs were based on emission factors presented in AP-42 Table 3.3-2. Emissions of GHGs for the generator were calculated based on emission factors presented in The Mandatory Greenhouse Gas Reporting Rule (40 CFR Part 98) Subpart C, Table C-1 (CO_2) and C-2 (CH_4 and N_2O). CO_2e were calculated from emissions of CO_2, CH_4 and N_2O by applying the 100-year GWPs from IPCC’s AR4.

Emissions related to air traffic were estimated based on data provided by the Federal Aviation Administration (FAA) Emissions and Dispersion Modeling System (EDMS). The EDMS emissions during routine operations were calculated using information for the following aircraft: A Boeing 737 to move passengers and cargo to Deadhorse, Boeing DC-6 to move cargo to GMT1, Lockheed C-130 to move large cargo to GMT1, de Havilland DHC-6-200 Twin Otter and a Casa 212-300 to move passengers and cargo into GMT1, and a Bell 407 helicopter to move gravel crews and for conducting special studies during the summer. With the exception of the Boeing 737, **Table 2-3** details the use of each aircraft during Routine Operations. Boeing 737 usage was tied to the number of Casa/Otter flights through the number of passengers moved since all passengers using the Casa/Otter would have come to the North Slope using the Boeing 737. The Boeing 737 servicing the North Slope holds 136 passengers, the Casa, 26 and the Otter, 19. Aircraft emissions include ground taxiing, support equipment (diesel truck service and diesel generator), take off, and flight up to 1,000 feet altitude. The emissions are presented for October 2015 through June 2018. Emissions of GHGs include CO_2 only as appropriate emission factors for N_2O and CH_4 were not found.

Emissions of NO_x, CO, VOC, SO_2, PM_{10}, $PM_{2.5}$, CO_2, CH_4, N_2O and HAPs from onroad equipment associated with routine operations were estimated based on EPA's MOVES2010b motor vehicle emissions estimation program. The latest county-specific MOVES2010b input data available from ADEC was used. The MOVES generated emission factors (g/mi) were multiplied by the average speed of vehicles (20 miles per hour) to obtain hourly emissions (lb/hr). The annual operating hours per unit for the vehicles were calculated based on the assumption that the vehicle travels between two routes. One route is along the 26.2 mile seasonal ice road (roundtrip from the Alpine CPF to the GMT1 storage site at the airstrip) for the seven month winter period when the ice road is available (November-May). The second route occurs all year long, and is along the 1,960 meter gravel road (2.44 miles round trip) between the GMT1 bulk storage site and the GMT1 wellsite. Both routes assume that each mechanics truck spends four (4) hours idling at the destination for unloading time per trip. The pickup and crew cab trucks are assumed to have only one (1) hour idle time.

Fugitive emissions of VOC occur as a result of leaks in pipeline components such as valves, flanges, connectors, pump seals and others. These emissions were calculated using the same methodology as for the GMT1 Preferred Alternative AQIA. Emission factors to quantify emissions from equipment leaks were taken from Table 2-4 of "Protocol for Equipment Leak Emission Estimates", EPA-453/R-95-017, and a representative component counts for similar service were from "Methane Emissions for the Natural Gas Industry: Volume 8: Equipment Leaks", GRI-94/0257.25 (EPA-600/R-96-080). Mole fractions (and subsequently weight fractions) of various constituents were developed using flash gas and flash oil analyses via a ProMax 3.2 simulation.

2.1.5 Infill Drilling Project Emissions Inventory

Similar to developmental drilling, infill drilling emissions consist of emissions associated with the main Doyon 19 drill rig and several mobile and stationary units in a supporting role. The Doyon 19 emission units consist of three (3) heaters, two (2) boilers, and three (3) engines as deployed in drilling operations for this project. Of the engines, 2 are cement pumps which rarely operate and the remaining engine is a primary power generation engine which operates in spinning reserve incase highline power becomes temporarily unavailable. The stationary support equipment consists of six (6) boilers and fifteen (15) engines. Mobile support equipment consists of eight (8) vacuum trucks, four (4) heavy duty diesel trucks and eight (8) light pickup trucks. For detailed discussion of the emission estimation methodology, see Section 2.1.2.

2.2 GMT1 Project Modeled Emissions Inventory Summary

The near-field ambient air quality impact analysis was conducted to quantify maximum pollutant impacts within and nearby the GMT1 Project Roadless Alternative as a result of related construction and operational emissions. Impacts from criteria pollutant emissions of PM_{10}, $PM_{2.5}$, NO_x, SO_2, and CO, and emissions of air toxics (benzene, toluene, ethyl benzene, xylene, n-hexane, and formaldehyde) were evaluated as part of the study.

Table 2-3 Aircraft Usage During a Typical Year during Routine Operations (Combined Take-off and Landings Per Month at GMT1)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Operations (Otter/Casa)	4	4	4	4	20	20	20	20	20	20	20	20
Construction (Otter/Casa)	0	0	0	0	0	0	0	0	0	0	0	0
Drilling (Otter/Casa)	0	0	0	0	0	0	0	0	0	0	0	0
Operations Cargo (DC-6)	3	3	3	3	3	3	3	3	3	3	3	3
Construction Cargo (DC-6)	0	0	0	0	0	0	0	0	0	0	0	0
Drilling Cargo (DC-6)	0	0	0	0	0	0	0	0	0	0	0	0
Large Cargo (C-130)	0	0	0	0	0	0	0	0	0	0	0	0
Construction (Helicopter)	0	0	0	0	0	0	0	0	0	0	0	0
Special Studies (Helicopter)	0	0	0	0	517	517	259	259	0	0	0	0

Several factors were considered when developing modeling scenarios to demonstrate compliance with the ambient air quality standards. These factors include the GMT1 Project Roadless Alternative's construction and operation schedule (and any overlapping therein); the location of GMT1 Project Roadless Alternative-related emissions and their proximity to ambient air or sensitive receptors; and the relative magnitude and type of emissions for each activity.

With consideration of the above factors, the following scenarios were selected for the near-field analysis:

1) Access Road and Pad Construction;
2) Mining the Clover Material Source;
3) Infill Drilling; and
4) Well Intervention.

These scenarios are expected to cover the range of GMT1 Project Roadless Alternative-related, worst-case emission scenarios for the various pollutants (e.g., maximum PM_{10} and $PM_{2.5}$ emissions from construction; maximum 1-hour NO_2 emissions for drilling and blasting, and maximum air toxics from well intervention). These scenarios also consider GMT1 Project Roadless Alternative-related sources that are outside of the GMT1 site and may be within a closer proximity to the town of Nuiqsut, e.g., the blasting associated with the Clover Material Source. The cross-section of various activities analyzed provides a thorough and comprehensive assessment of emissions and their impacts on nearby ambient air and sensitive receptors.

2.2.1 Blasting Construction Modeled Emissions Inventory

Information regarding the modeled emissions inventory for blasting construction is in **Table 2-4**. Short term and annual emission rates for modeled criteria pollutants are in **Table 2-5**. Stack parameters for the blasting construction activities can be found in **Chapter 3**.

Table 2-4 Blasting Construction Modeled Emissions Inventory Information

Model ID	Description	Comments
TAILPIPE	Onroad construction equipment traveling on access road	Emissions were pulled from the onroad construction project emissions inventory and fractioned according to blasting usage information provided by CPAI. Emissions from the project emissions inventory were scaled to represent emissions from one round trip travel per day on a 0.31 mile (0.5 kilometer) portion of the access road. Hourly and annual emission rates represent the maximum emissions for the entire construction period.
TAILPIPE	Nonroad construction equipment	Emissions were pulled directly from the nonroad construction project emissions inventory and fractioned according to blasting usage information provided by CPAI. Hourly and annual emission rates represent the maximum emissions for the entire construction period.
BLAST_ST, BLAST_AN	Emissions directly related to the blasting source	Emissions were pulled explicitly from the project emissions inventory.
DISTURB	Disturbed area fugitive emissions	Material mining will be complete by May and when the ground thaws. At that point, the area will be filled with water. Therefore, the disturbed area will not be a source of dust emissions.

Table 2-5 Blasting Construction Modeled Emission Rates

		NO_x		PM_{10}		$PM_{2.5}$		SO_2			CO
		1-hour	Annual	24-hr	Annual	24-hr	Annual	1-hour	24-hour	Annual	1-hr / 8-hr
Model ID	**Source Description**	(g/sec)	(g/sec)	(g/sec)	(g/sec)	(g/sec)	(g/sec)	(g/sec)	(g/sec)	(g/sec)	(g/sec)
TAILPIPE	Onroad construction equipment	4.27E-04	1.67E-04	2.27E-05	8.85E-06	2.20E-05	8.59E-06	1.12E-06	1.12E-06	4.52E-07	2.37E-04
TAILPIPE	Nonroad construction equipment	2.98E+00	1.06E+00	2.56E-01	9.36E-02	2.49E-01	9.09E-02	5.97E-03	5.97E-03	2.14E-03	2.12E+00
DISTURB	Disturbed area fugitive emissions	N/A	N/A	0.00E+00	0.00E+00	0.00E+00	0.00E+00	N/A	N/A	N/A	N/A
BLAST_ST	Blasting source	5.35E+01		2.26E-01		1.30E-02		6.30E+00	2.62E-01		2.11E+02
BLAST_AN	Blasting source		4.38E-01		4.43E-02		2.56E-03			5.15E-02	

2.2.2 Well Interventions Modeled Emissions Inventory

Information regarding the modeled emissions inventory for well interventions is in **Table 2-6**. Short term and annual emission rates for modeled criteria pollutants are in **Table 2-7**. Stack parameters for well intervention activities can be found in **Chapter 3**.

Table 2-6 Well Interventions Modeled Emissions Inventory Information

Model ID	Description	Comments
RD_TAIL_1	Onroad construction equip. traveling on access road, GMT1 side	Emissions were pulled from the onroad drilling project emissions inventory. Emissions from the project emissions inventory were scaled to represent emissions from one round trip travel per day on the 0.31 mile (0.5 kilometer) portion of the access road.
RD_FUG_1	Fugitive dust emissions from access road travel, GMT1 side	Emissions were pulled from the fugitive dust project emissions inventory. Emissions from the project emissions inventory were scaled to represent emissions from one round trip travel per day on the 0.31 mile (0.5 kilometer) portion of the access road.
RD_TAIL_2	Onroad construction equip. traveling on access road, Airstrip side	These emissions are expected to be the same as those on the GMT1 side, and were set equal to RD_TAIL_1.
RD_FUG_2	Fugitive dust emissions from access road travel, Airstrip side	These emissions are expected to be the same as those on the GMT1 side, and were set equal to RD_FUG_1.
NONMOB	Stationary drilling support equip.	Emissions were pulled explicitly from the project emissions inventory.
PAD_DIST	Disturbed area fugitive emissions from wellsite	Emissions were pulled explicitly from the project emissions inventory. Though Well Interventions activities will be one month in duration, fugitive emissions will last four months.
ARPD_DIST	Disturbed area fugitive emissions from airstrip pad	
HANG_DIST	Disturbed area fugitive emissions from airstrip hangar	
RUN_DIS1	Disturbed area fugitive emissions from airstrip runway	
AIRSTRP1/2/3	Aircraft emissions	Emissions were pulled explicitly from the project emissions inventory for the operational scenario. These emissions only represent aircraft-related emissions at the GMT1 site, not emissions at the destination site.
WELLINT1/2	Well Intervention heaters and engines	Emissions from the coil tubing unit, rather than the well fracturing unit, were modeled. The coil tubing unit is most likely to be used, so it more accurately represents activity emissions.
PROD_HTR	Gas fired production heater	Emissions were pulled explicitly from the project emissions inventory.
INCIN	Incinerator at the storage pad	Emissions were pulled explicitly from the project emissions inventory.
AIR_EGEN	Generator at the storage pad	Emissions were based on 1,000 hours per year of operation.
WEL_EGEN	Generator at the wellsite	Emissions were based on 1,000 hours per year of operation.

Table 2-7 Well Interventions Modeled Emission Rates

Model ID	Source Description	NO_x		PM_{10}		$PM_{2.5}$		SO_2			CO
		1-hour	Annual	24-hr	Annual	24-hr	Annual	1-hour	24-hour	Annual	1-hr / 8-hr
		(g/sec)	(g/sec)	(g/sec)	(g/sec)	(g/sec)	(g/sec)	(g/sec)	(g/sec)	(g/sec)	(g/sec)
RD_TAIL_1	Onroad construction equipment, GMT1 side	2.11E-03	1.54E-04	8.60E-05	2.96E-05	8.34E-05	2.88E-05	9.28E-06	9.28E-06	5.32E-07	9.78E-04
RD_FUG_1	Fugitive dust emissions, GMT1 side	N/A	N/A	1.35E-01	4.83E-02	1.35E-02	4.92E-03	N/A	N/A	N/A	N/A
RD_TAIL_2	Onroad construction equipment, Airstrip side	2.11E-03	1.54E-04	8.60E-05	2.96E-05	8.34E-05	2.88E-05	9.28E-06	9.28E-06	5.32E-07	9.78E-04
RD_FUG_2	Fugitive dust emissions, Airstrip side	N/A	N/A	1.35E-01	4.83E-02	1.35E-02	4.92E-03	N/A	N/A	N/A	N/A
NONMOB	Stationary support equipment	1.16E+00	9.69E-02	7.36E-02	6.13E-03	7.30E-02	6.08E-03	1.59E-03	1.59E-03	1.32E-04	6.17E-01
PAD_DIST	Disturbed area fugitives, wellsite	N/A	N/A	6.19E-01	2.04E-01	9.29E-02	3.06E-02	N/A	N/A	N/A	N/A
ARPD_DIST	Disturbed area fugitives, airstrip pad	N/A	N/A	9.20E-01	3.02E-01	1.38E-01	4.54E-02	N/A	N/A	N/A	N/A
HANG_DIST	Disturbed area fugitives, hangar	N/A	N/A	8.68E-01	2.85E-01	1.30E-01	4.28E-02	N/A	N/A	N/A	N/A
RUN_DIS1	Disturbed area fugitives, runway	N/A	N/A	1.14E+00	3.74E-01	1.71E-01	5.61E-02	N/A	N/A	N/A	N/A
AIRSTRP1	Aircraft, split in thirds	1.71E-03	1.71E-03	1.56E-03	1.56E-03	1.56E-03	1.56E-03	7.12E-04	7.12E-04	7.12E-04	1.04E-01
AIRSTRP2	Aircraft, split in thirds	1.71E-03	1.71E-03	1.56E-03	1.56E-03	1.56E-03	1.56E-03	7.12E-04	7.12E-04	7.12E-04	1.04E-01
AIRSTRP3	Aircraft, split in thirds	1.71E-03	1.71E-03	1.56E-03	1.56E-03	1.56E-03	1.56E-03	7.12E-04	7.12E-04	7.12E-04	1.04E-01
WELLINT1	Heaters and engines	1.20E+00	9.90E-02	3.01E-02	2.48E-03	3.01E-02	2.48E-03	1.46E-03	1.46E-03	1.20E-04	2.76E-01
WELLINT2	Heaters and engines	1.20E+00	9.90E-02	3.01E-02	2.48E-03	3.01E-02	2.48E-03	1.46E-03	1.46E-03	1.20E-04	2.76E-01
PROD_HTR	Production heater	3.58E-01	3.58E-01	2.72E-02	2.72E-02	2.72E-02	2.72E-02	1.77E-02	1.77E-02	1.77E-02	3.01E-01
INCIN	Incinerator	7.49E-02	7.49E-02	9.90E-02	9.90E-02	9.90E-02	9.90E-02	8.59E-04	8.59E-04	8.59E-04	4.31E-02
AIR_EGEN	Generator, airstrip	2.03E-01	2.03E-01	7.38E-03	7.38E-03	7.38E-03	7.38E-03	1.99E-04	1.99E-04	1.99E-04	1.11E-01
WEL_EGEN	Generator, wellsite	2.03E-01	2.03E-01	7.38E-03	7.38E-03	7.38E-03	7.38E-03	1.99E-04	1.99E-04	1.99E-04	1.11E-01

2.2.3 Infill Drilling Modeled Emissions Inventory

Information regarding the modeled emissions inventory for infill drilling is in **Table 2-8**. Short term and annual emission rates for modeled criteria pollutants are in **Table 2-9**. Stack parameters for infilling drilling activities can be found in **Chapter 3**.

Table 2-8 Infill Drilling Modeled Emissions Inventory Information

Model ID	Description	Comments
RD_TAIL_1	Onroad construction equipment, GMT1 side	Emissions were pulled from the onroad drilling project emissions inventory. Emissions from the project emissions inventory were scaled to represent emissions from one round trip travel per day on the 0.31 mile (0.5 kilometer) portion of the access road.
RD_FUG_1	Fugitive dust emissions, GMT1 Side	Emissions were pulled from the fugitive dust project emissions inventory. Emissions from the project emissions inventory were scaled to represent emissions from one round trip travel per day on the 0.31mile (0.5 kilometer) portion of the access road.
RD_TAIL_2	Onroad construction equipment, Airstrip Side	These emissions are expected to be the same as those on the GMT1 side, and were set equal to RD_TAIL_1.
RD_FUG_2	Fugitive dust emissions, Airstrip Side	These emissions are expected to be the same as those on the GMT1 side, and were set equal to RD_FUG_1.
NONMOB	Stationary support equipment	Emissions were pulled explicitly from the project emissions inventory.
PAD_DIST	Disturbed area, wellsite	Emissions were pulled explicitly from the project emissions inventory. Fugitive emissions will last four months.
ARPD_DIST	Disturbed area, airstrip pad	
HANG_DIST	Disturbed area, hangar	
RUN_DIS1	Disturbed area, runway	
D19_PWR	Primary Power	Emissions were pulled explicitly from the project emissions inventory.
D19_BOIL1/2	Boiler 1 and 2	Emissions were pulled explicitly from the project emissions inventory.
D19_CEM1/2	Cement Pump 1 and 2	The cement pumps are considered intermittent emission units, so short term NO_2 emissions were annualized according to USEPA guidance for intermittent emission units. All other emissions were pulled explicitly from the project emissions inventory.
D19_HTR1, 2/AB	Air Heater 1 and 2	Emissions were pulled explicitly from the project emissions inventory.
PROD_HTR	Production heater	Emissions were pulled explicitly from the project emissions inventory.
INCIN	Incinerator at the airstrip	Emissions were pulled explicitly from the project emissions inventory.
AIR_EGEN	Back-up generator, airstrip	Emissions represent 1,000 hours per year of operation.
WEL_EGEN	Back-up generator, wellsite	Emissions represent 1,000 hours per year of operation.
CAMP_ENG	Rig camp engine	This engine will not be used during infill drilling activities because power will be available onsite.
AIRSTRP1/2/3	Aircraft emissions	Emissions were pulled explicitly from the project emissions inventory for the construction scenario.

Table 2-9 Infill Drilling Modeled Emission Rates

Model ID	Source Description	NO_x		PM_{10}		$PM_{2.5}$		SO_2			CO
		1-hour (g/sec)	Annual (g/sec)	24-hr (g/sec)	Annual (g/sec)	24-hr (g/sec)	Annual (g/sec)	1-hour (g/sec)	24-hour (g/sec)	Annual (g/sec)	1-hr / 8-hr (g/sec)
RD_TAIL_1	Onroad construction equipment, GMT1 side	2.11E-03	1.84E-03	8.60E-05	3.56E-04	8.34E-05	3.45E-04	9.28E-06	9.28E-06	6.39E-06	9.78E-04
RD_FUG_1	Fugitive dust emissions, GMT1 Side	N/A	N/A	1.35E-01	5.79E-01	1.35E-02	5.91E-02	N/A	N/A	N/A	N/A
RD_TAIL_2	Onroad construction equipment, Airstrip Side	2.11E-03	1.84E-03	8.60E-05	3.56E-04	8.34E-05	3.45E-04	9.28E-06	9.28E-06	6.39E-06	9.78E-04
RD_FUG_2	Fugitive dust emissions, Airstrip Side	N/A	N/A	1.35E-01	5.79E-01	1.35E-02	5.91E-02	N/A	N/A	N/A	N/A
NONMOB	Support equipment	1.16E+00	1.16E+00	7.36E-02	7.36E-02	7.30E-02	7.30E-02	1.59E-03	1.59E-03	1.59E-03	6.17E-01
PAD_DIST	Disturbed area, wellsite	N/A	N/A	6.19E-01	2.04E-01	9.29E-02	3.06E-02	N/A	N/A	N/A	N/A
ARPD_DIST	Disturbed area, air pad	N/A	N/A	9.20E-01	3.02E-01	1.38E-01	4.54E-02	N/A	N/A	N/A	N/A
HANG_DIST	Disturbed area, hangar	N/A	N/A	8.68E-01	2.85E-01	1.30E-01	4.28E-02	N/A	N/A	N/A	N/A
RUN_DIS1	Disturbed area, runway	N/A	N/A	1.14E+00	3.74E-01	1.71E-01	5.61E-02	N/A	N/A	N/A	N/A
D19_PWR	Primary Power	3.65E-01	3.65E-01	1.51E-02	1.51E-02	1.51E-02	1.51E-02	5.39E-04	5.39E-04	5.39E-04	1.07E-01
D19_BOIL1	Boiler 1	8.74E-02	8.74E-02	1.04E-02	1.04E-02	9.31E-03	9.31E-03	8.74E-04	8.74E-04	8.74E-04	2.19E-02
D19_BOIL2	Boiler 2	8.74E-02	8.74E-02	1.04E-02	1.04E-02	9.31E-03	9.31E-03	8.74E-04	8.74E-04	8.74E-04	2.19E-02
D19_CEM1	Cement Pump 1	2.29E-02	2.29E-02	2.41E-02	1.38E-03	2.41E-02	1.38E-03	1.87E-05	8.21E-05	1.87E-05	5.02E-01
D19_CEM1	Cement Pump 2	2.29E-02	2.29E-02	2.41E-02	1.38E-03	2.41E-02	1.38E-03	1.87E-05	8.21E-05	1.87E-05	5.02E-01
D19_HTR1	Air Heater 1	7.79E-02	7.79E-02	9.27E-03	9.27E-03	8.29E-03	8.29E-03	7.79E-04	7.79E-04	7.79E-04	1.95E-02
D19_HTR2A	Air Heater 2, split in half	1.94E-02	1.94E-02	2.31E-03	2.31E-03	2.07E-03	2.07E-03	1.94E-04	1.94E-04	1.94E-04	4.85E-03
D19_HTR2B	Air Heater 2, split in half	1.94E-02	1.94E-02	2.31E-03	2.31E-03	2.07E-03	2.07E-03	1.94E-04	1.94E-04	1.94E-04	4.85E-03
PROD_HTR	Production heater	3.58E-01	3.58E-01	2.72E-02	2.72E-02	2.72E-02	2.72E-02	1.77E-02	1.77E-02	1.77E-02	3.01E-01
INCIN	Incinerator, at airstrip	7.49E-02	7.49E-02	9.90E-02	9.90E-02	9.90E-02	9.90E-02	8.59E-04	8.59E-04	8.59E-04	4.31E-02
AIR_EGEN	Generator, at airstrip	2.03E-01	2.03E-01	7.38E-03	7.38E-03	7.38E-03	7.38E-03	1.99E-04	1.99E-04	1.99E-04	1.11E-01
WEL_EGEN	Generator, at wellsite	2.03E-01	2.03E-01	7.38E-03	7.38E-03	7.38E-03	7.38E-03	1.99E-04	1.99E-04	1.99E-04	1.11E-01
AIRSTRP1	Aircraft, split in thirds	3.43E-03	3.43E-03	2.16E-03	2.16E-03	2.16E-03	2.16E-03	1.11E-03	1.11E-03	1.11E-03	1.31E-01
AIRSTRP2	Aircraft, split in thirds	3.43E-03	3.43E-03	2.16E-03	2.16E-03	2.16E-03	2.16E-03	1.11E-03	1.11E-03	1.11E-03	1.31E-01
AIRSTRP3	Aircraft, split in thirds	3.43E-03	3.43E-03	2.16E-03	2.16E-03	2.16E-03	2.16E-03	1.11E-03	1.11E-03	1.11E-03	1.31E-01

2.2.4 Wellsite Construction Modeled Emissions Inventory

Information regarding the modeled emissions inventory for the wellsite construction is in **Table 2-10**. Short term and annual emission rates for modeled criteria pollutants are in **Table 2-11**. Stack parameters for wellsite construction activities can be found in **Chapter 3**.

Table 2-10 Wellsite Construction Modeled Emissions Inventory Information

Model ID	Description	Comments
RD_TAIL_1	Onroad construction equipment traveling on access road, GMT1 Side	Emissions were pulled from the onroad construction project emissions inventory and fractioned according to wellsite construction usage information provided by CPAI. Emissions from the project emissions inventory were scaled to represent emissions from one round trip travel per day on a 0.31 mile (0.5 kilometer) portion of the access road. Hourly and annual emission rates represent the maximum emissions for the entire construction period.
RD_FUG_1	Access road fugitive dust emissions, GMT1 Side	Wellsite and road construction will occur during the winter months (October-May). Therefore, travel on the access road will not be a source of fugitive dust emissions.
RD_TAIL_2	Onroad construction equipment, Airstrip Side	These emissions are expected to be the same as those on the GMT1 side, and were set equal to RD_TAIL_1.
RD_FUG_2	Fugitive dust emissions, Airstrip Side	These emissions are expected to be the same as those on the GMT1 side, and were set equal to RD_FUG_1.
PAD_CONST	Nonroad construction equipment	Emissions were pulled directly from the nonroad construction project emissions inventory and fractioned according to wellsite construction usage information provided by CPAI. Hourly and annual emission rates represent the maximum emissions for the entire construction period.
AIRSTRP1/2/3	Aircraft emissions	Emissions were pulled explicitly from the project emissions inventory for the construction scenario.
PAD_DIST	Disturbed area fugitive emissions, wellsite	Emissions were pulled explicitly from the project emissions inventory. Fugitive emissions will only occur from June to September.
ARPD_DIST	Disturbed area fugitive emissions, airstrip pad	
HANG_DIST	Disturbed area fugitive emissions, hangar	
RUN_DIS1	Disturbed area fugitive emissions, runway	

Table 2-11 Wellsite Construction Modeled Emission Rates

Model ID	Source Description	NO_x		PM_{10}		$PM_{2.5}$		SO_2		CO	
		1-hour (g/sec)	Annual (g/sec)	24-hr (g/sec)	Annual (g/sec)	24-hr (g/sec)	Annual (g/sec)	1-hour (g/sec)	24-hour (g/sec)	Annual (g/sec)	1-hr / 8-hr (g/sec)
RD_TAIL_1	Onroad construction equipment, GMT1 side	2.11E-03	1.84E-03	8.60E-05	3.56E-04	8.34E-05	3.45E-04	9.28E-06	9.28E-06	6.39E-06	9.78E-04
RD_FUG_1	Fugitive dust emissions, GMT1 Side	N/A	N/A	1.35E-01	5.79E-01	1.35E-02	5.91E-02	N/A	N/A	N/A	N/A
RD_TAIL_2	Onroad construction equipment, Airstrip Side	2.11E-03	1.84E-03	8.60E-05	3.56E-04	8.34E-05	3.45E-04	9.28E-06	9.28E-06	6.39E-06	9.78E-04
RD_FUG_2	Fugitive dust emissions, Airstrip Side	N/A	N/A	1.35E-01	5.79E-01	1.35E-02	5.91E-02	N/A	N/A	N/A	N/A
PAD_CONST	Nonroad construction equipment	3.03E+00	1.12	2.83E-01	1.06E-01	2.75E-01	1.03E-01	6.16E-03	6.16E-03	2.27E-03	2.27E+00
PAD_DIST	Disturbed area, wellsite	N/A	N/A	6.19E-01	2.04E-01	9.29E-02	3.06E-02	N/A	N/A	N/A	N/A
ARPD_DIST	Disturbed area, air pad	N/A	N/A	9.20E-01	3.02E-01	1.38E-01	4.54E-02	N/A	N/A	N/A	N/A
HANG_DIST	Disturbed area, hangar	N/A	N/A	8.68E-01	2.85E-01	1.30E-01	4.28E-02	N/A	N/A	N/A	N/A
RUN_DIS1	Disturbed area, runway	N/A	N/A	1.14E+00	3.74E-01	1.71E-01	5.61E-02	N/A	N/A	N/A	N/A
AIRSTRP1	Aircraft, split in thirds	3.43E-03	3.43E-03	2.16E-03	2.16E-03	2.16E-03	2.16E-03	1.11E-03	1.11E-03	1.11E-03	1.31E-01
AIRSTRP2	Aircraft, split in thirds	3.43E-03	3.43E-03	2.16E-03	2.16E-03	2.16E-03	2.16E-03	1.11E-03	1.11E-03	1.11E-03	1.31E-01
AIRSTRP3	Aircraft, split in thirds	3.43E-03	3.43E-03	2.16E-03	2.16E-03	2.16E-03	2.16E-03	1.11E-03	1.11E-03	1.11E-03	1.31E-01

2.2.5 Air Toxics Modeled Emissions Inventory

Information regarding the modeled emissions inventory for infill drilling, which produces the worst-case air toxics emissions is in **Table 2-12**. Short term and annual emission rates for modeled air toxic pollutants are in **Table 2-13**. Stack parameters for infilling drilling activities can be found in **Chapter 3**.

Table 2-12 Air Toxics Modeled Emissions Inventory Information

Model ID	Description	Comments
RD_TAIL_1	Onroad construction equipment, GMT1 side	Emissions were pulled from the onroad drilling project emissions inventory. Emissions from the project emissions inventory were scaled to represent emissions from one round trip travel per day on a 0.31 mile (0.5 kilometer) portion of the access road.
RD_FUG_1	Fugitive dust emissions, GMT1 Side	Emissions were pulled from the fugitive dust project emissions inventory. Emissions from the project emissions inventory were scaled to represent emissions from one round trip travel per day on a 0.31 mile (0.5 kilometer) portion of the access road.
RD_TAIL_2	Onroad construction equipment, Airstrip Side	These emissions are expected to be the same as those on the GMT1 side, and were set equal to RD_TAIL_1.
RD_FUG_2	Fugitive dust emissions, Airstrip Side	These emissions are expected to be the same as those on the GMT1 side, and were set equal to RD_FUG_1.
NONMOB	Support equipment	Emissions were pulled explicitly from the project emissions inventory.
PAD_DIST	Disturbed area, wellsite	Emissions were pulled explicitly from the project emissions inventory. Fugitive emissions will last four months.
ARPD_DIST	Disturbed area, airstrip pad	
HANG_DIST	Disturbed area, hangar	
RUN_DIS1	Disturbed area, runway	
D19_PWR	Primary Power	Emissions were pulled explicitly from the project emissions inventory.
D19_BOIL1/2	Boiler 1 and 2	Emissions were pulled explicitly from the project emissions inventory.
D19_CEM1/2	Cement Pump 1 and 2	The cement pumps are considered intermittent emission units, so short term NO_2 emissions were annualized according to USEPA guidance for intermittent emission units. All other emissions were pulled explicitly from the project emissions inventory.
D19_HTR1, 2/AB	Air Heater 1 and 2	Emissions were pulled explicitly from the project emissions inventory.
PROD_HTR	Production heater	Emissions were pulled explicitly from the project emissions inventory.
INCIN	Incinerator at the airstrip	Emissions were pulled explicitly from the project emissions inventory.
AIR_EGEN	Generator, airstrip	Emissions represent 1,000 hours per year of operation.
WEL_EGEN	Generator, wellsite	Emissions represent 1,000 hours per year of operation.
CAMP_ENG	Rig Camp Engine	This engine will not be used during infill drilling activities because power will be available onsite.
AIRSTRP1/2/3	Aircraft emissions	Emissions were pulled explicitly from the project emissions inventory for the construction scenario.
WELL	Well flowback	Emissions were pulled explicitly from the project emissions inventory.

Table 2-13 Air Toxics Modeled Emission Rates

Model ID	Source Description	Benzene 1-hour (g/sec)	Benzene Annual (g/sec)	Ethylbenzene 1-hour (g/sec)	Ethylbenzene Annual (g/sec)	Formaldehyde 1-hour (g/sec)	Formaldehyde Annual (g/sec)	n-Hexane 1-hour (g/sec)	n-Hexane Annual (g/sec)	Toluene 1-hour (g/sec)	Toluene Annual (g/sec)	Xylene 1-hour (g/sec)	Xylene Annual (g/sec)
RD_TAIL_1	Onroad construction equipment, GMT1 side	1.58E-06	1.48E-06	5.92E-07	5.36E-07	1.87E-05	1.67E-05	4.63E-07	4.13E-07	1.61E-06	1.30E-06	1.79E-06	1.39E-06
RD_FUG_1	Fugitive dust, GMT1 side	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
RD_TAIL_2	Onroad construction equipment, airstrip side	1.58E-06	1.48E-06	5.92E-07	5.36E-07	1.87E-05	1.67E-05	4.63E-07	4.13E-07	1.61E-06	1.30E-06	1.79E-06	1.39E-06
RD_FUG_2	Fugitive dust, airstrip side	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
NONMOB	Support equipment	5.47E-04	5.47E-04	1.46E-07	1.46E-07	2.59E-04	2.59E-04	0.00E+00	0.00E+00	2.21E-04	2.21E-04	1.42E-04	1.42E-04
PAD_DIST	Disturbed area, wellsite	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
ARPD_DIST	Disturbed area, air pad	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
HANG_DIST	Disturbed area, hangar	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
RUN_DIS1	Disturbed area, runway	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
D19_PWR	Primary Power	6.42E-04	6.42E-04	0.00E+00	0.00E+00	6.53E-05	6.53E-05	0.00E+00	0.00E+00	2.33E-04	2.33E-04	1.60E-04	1.60E-04
D19_BOIL1	Boiler 1	9.36E-07	9.36E-07	2.78E-07	2.78E-07	1.44E-04	1.44E-04	0.00E+00	0.00E+00	2.71E-05	2.71E-05	4.77E-07	4.77E-07
D19_BOIL2	Boiler 2	9.36E-07	9.36E-07	2.78E-07	2.78E-07	1.44E-04	1.44E-04	0.00E+00	0.00E+00	2.71E-05	2.71E-05	4.77E-07	4.77E-07
D19_CEM1	Cement Pump 1	1.99E-04	1.13E-05	0.00E+00	0.00E+00	2.51E-04	1.43E-05	0.00E+00	0.00E+00	8.71E-05	4.97E-06	6.07E-05	3.46E-06
D19_CEM1	Cement Pump 2	1.99E-04	1.13E-05	0.00E+00	0.00E+00	2.51E-04	1.43E-05	0.00E+00	0.00E+00	8.71E-05	4.97E-06	6.07E-05	3.46E-06
D19_HTR1	Air Heater 1	8.33E-07	8.33E-07	2.48E-07	2.48E-07	1.28E-04	1.28E-04	0.00E+00	0.00E+00	2.41E-05	2.41E-05	4.24E-07	4.24E-07
D19_HTR2A	Air Heater 2, split in half	2.08E-07	2.08E-07	6.17E-08	6.17E-08	3.20E-05	3.20E-05	0.00E+00	0.00E+00	6.02E-06	6.02E-06	1.06E-07	1.06E-07
D19_HTR2B	Air Heater 2, split in half	2.08E-07	2.08E-07	6.17E-08	6.17E-08	3.20E-05	3.20E-05	0.00E+00	0.00E+00	6.02E-06	6.02E-06	1.06E-07	1.06E-07
PROD_HTR	Production heater	7.52E-06	7.52E-06	0.00E+00	0.00E+00	2.69E-04	2.69E-04	6.45E-03	6.45E-03	1.22E-05	1.22E-05	0.00E+00	0.00E+00
INCIN	Incinerator, at airstrip	1.02E-06	1.02E-06	1.73E-04	1.73E-04	3.63E-05	3.63E-05	8.71E-04	8.71E-04	1.64E-06	1.64E-06	1.73E-04	1.73E-04
AIR_EGEN	Generator, at airstrip	9.18E-04	9.18E-04	0.00E+00	0.00E+00	9.33E-05	9.33E-05	0.00E+00	0.00E+00	3.32E-04	3.32E-04	2.28E-04	2.28E-04
WEL_EGEN	Generator, at wellsite	9.18E-04	9.18E-04	0.00E+00	0.00E+00	9.33E-05	9.33E-05	0.00E+00	0.00E+00	3.32E-04	3.32E-04	2.28E-04	2.28E-04
AIRSTRP1	Aircraft, split in thirds	6.31E-04	6.31E-04	5.33E-05	5.33E-05	4.98E-03	4.98E-03	0.00E+00	0.00E+00	1.75E-04	1.75E-04	1.55E-04	1.55E-04
AIRSTRP2	Aircraft, split in thirds	6.31E-04	6.31E-04	5.33E-05	5.33E-05	4.98E-03	4.98E-03	0.00E+00	0.00E+00	1.75E-04	1.75E-04	1.55E-04	1.55E-04
AIRSTRP3	Aircraft, split in thirds	6.31E-04	6.31E-04	5.33E-05	5.33E-05	4.98E-03	4.98E-03	0.00E+00	0.00E+00	1.75E-04	1.75E-04	1.55E-04	1.55E-04
WELL	Well flowback	1.92E-03	1.16E-04	6.06E-04	3.57E-05	0.00E+00	0.00E+00	7.51E-02	4.50E-03	2.18E-03	1.30E-04	7.34E-04	4.31E-05
CAMP_ENG	Rig camp engine	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

2.3 Emissions from Increased Power Demand Resulting from GMT1

Power for the Alpine development and connected wellsites is provided centrally from gas-fired turbine-powered electrical generators located at the Alpine Central Production Facility (CPF). The currently permitted Alpine CPF primary power generation capability in megawatt electrical (MWe) based on ISO[1] conditions is shown in **Table 2-14**.

Table 2-14 Currently Permitted Alpine CPF Power Generation Capability

Turbine Description	Rating/Size
Nuovo Pignone PG5371 Generator Turbine (Gas Fired)	26.3 MWe (ISO)
Nuovo Pignone PGT10+Generator Turbine (Gas Fired)	11.3 MWe (ISO)
Solar Taurus 60S Generator Turbine (Dual Fired)	5.5 MWe (ISO)
Solar Taurus 60S Generator Turbine (Gas Fired)	5.5 MWe (ISO)
Total =	48.6 MWe (ISO)

Regardless of alternative, the GMT1 wellsite itself is anticipated to increase power demand from between 1 and 2 MWe depending on season. This power demand comes primarily from required lighting, heat trace on piping and heating modules. Because of the following load demands, the GMT1 Roadless Alternative is expected to require an additional 2.5 MWe above that required for Alternative A:

- additional heat trace,
- additional heated module space,
- permanent camps and office space,
- waste treatment facility,
- mud and bulk plant,
- grind and injection facility, and
- aircraft support facility and runway lighting.

Historical power consumption within the Alpine development started in the late 1990's at between 15 and 20 MWe depending on season. Power demand peaked in 2012 to approximately 30 MWe winter demand and 20 MWe summer demand. The current permitted electrical capability of Alpine is 37.6 MWe (ISO), plus an additional 11 MWe (ISO) backup power generation from the solar turbines. It is clear that the planned 2 MWe peak demand (winter) and 1 MWe (summer) by GMT1 Alternative A will not increase Alpine CPF power demand beyond its currently permitted levels, and are well within the typical 3-5 MWe summer to winter variation. Moreover, demand from GMT1 Alternative A is small in comparison to demands from other much larger sources at the CPF like the crude oil shipping pumps which require a 5 MWe load, and the drill rigs (Doyon 19, Doyon 141, etc.) which each add another 3 to 4 MWe, highly variable load. In short, the additional power required by GMT1 Alternative A will hardly be noticeable since it is smaller than the typical seasonal variation seen as a result of power demand from other, larger, sources.

[1] ISO refers to turbine rating at inlet conditions specified by the International Standards Organization of ambient Temperature = 15 deg C, Relative Humidity = 60 % and Ambient Pressure at Sea Level.

The same cannot be said for the GMT1 Roadless Alternative because of how decisions about GMT1 affect the GMT2 development and how the two together impact power demand. If the GMT1 Roadless Alternative is selected as the preferred alternative, this will cause the GMT2 project to be developed as a roadless project as well. Together, the two projects could cause as much as a 10 MWe increase in power demand. This additional demand beyond the existing load demand would put the Alpine power generation system too close to 100% capacity to allow for a sufficient safety margin. For this reason, the two projects together would require the installation of an additional power generation turbine at Alpine and an increase in emissions. **Table 2-15** presents the increase assuming the increased power demand is met by installing a 15 MWe (ISO) Solar Titan 130 turbine. This increase in emission is large enough to require obtaining a minor source air quality construction permit from the State of Alaska prior to construction. To obtain this permit, CPAI would need to demonstrate through dispersion modeling that the emissions increase would not cause or contribute to a violation of the NAAQS/AAAQS.

Table 2-15 Potential Emissions from a 15 MWe Power Generation Turbine Installed at the Alpine CPF

Pollutant	Emissions (ton/year)
$PM_{10}/PM_{2.5}$	3.8
NO_x	70
CO	85
SO_2	3.1
VOC	1.2
CO_2e	85,000

Regardless of alternative, it has been assumed that drilling will be conducted with an electrified drill rig and associated man camp using electrical power produced at the Alpine CPF. While it seems as though this approach would cause an increase in demand from the Alpine electrical grid, it will not because historical power demand includes the use of an electrified drilling activities.

As required by the Alpine construction and operating permits, all drilling at Alpine CD1, CD2, CD3 and CD4 must be conducted using electrified rigs and camps. Initially, all of Alpine was drilled with a single drill rig (Doyon 19), but more recently, operations have included a second rig at times (Doyon 141). Therefore, the historical Alpine power demand includes supporting two electrified drilling operations (i.e. drill rig and associated camp). Since the number of electrified drilling operations being supported by the Alpine electrical system will not increase as a result of the GMT1 project, there will be no emissions increase associated with power generation supporting the electrified GMT1 drill rig and rig camp.

3.0 Key Near-field Dispersion Modeling Assumptions

3.1 Modeling Methodology

The near field ambient air quality impact analysis was conducted to quantify maximum pollutant impacts within the GMT1 Project area due to project related construction and operational emissions. Concentrations of the following air contaminants were predicted as part of this study:

- Criteria pollutant emissions of:
  - Particulate matter less than 10 micrometers aerodynamic diameter (PM_{10}),
  - Particulate matter less than 2.5 micrometers aerodynamic diameter ($PM_{2.5}$),
  - Nitrogen Dioxide (NO_2),
  - Sulfur Dioxide (SO_2), and
  - Carbon Monoxide (CO);
- Air toxics emissions of:
  - benzene,
  - toluene,
  - ethyl benzene,
  - xylene,
  - n-hexane, and
  - formaldehyde

The USEPA's Guideline (USEPA 2005) model, AERMOD (Version 12345), was used to assess near field impacts. Regulatory model settings were utilized, with the exception of the non-regulatory Ozone Limiting Method (OLM) option, which was used for modeling nitrogen dioxide (NO_2) concentration estimates. Modeling analyses for NO_2 concentration estimates also utilized hourly ozone concentration data collected at the Nuiqsut monitoring station from 2008 through 2012.

GMT1 Project impacts to ambient ozone and secondary $PM_{2.5}$ were not predicted using dispersion modeling for this air quality impact analysis; rather a qualitative assessment of the potential contribution to regional ozone and secondary $PM_{2.5}$ formation has been conducted.

3.2 Meteorological Input Data and Processing

Meteorological data collected at the Nuiqsut ambient air quality and meteorological monitoring station has been used for the near field dispersion modeling. Monitoring at Nuiqsut station began in 1998 and is ongoing. The onsite data include 10 meter level measurements of wind speed, standard deviation of horizontal wind speed, wind direction, standard deviation of wind direction (sigma theta),solar radiation, vertical wind speed, standard deviation of vertical wind speed, temperature (10-meter and 2-meter), and temperature difference (10-2 meters).

The Nuiqsut monitoring station is approximately 11.5 miles (18.5 kilometers) to the east-southeast of the GMT1 Project area. The monitoring site has a geophysical and topographical setting similar to the GMT1 Project area and is considered representative of the meteorological conditions in the GMT1 Project impact area. The most recent 5 years of data (2008 – 2012) were used for the near field analysis. The meteorological processing and data filling procedure was fully discussed in the GMT1 Alternative A AQIA (AECOM 2013). The location of the Nuiqsut site is shown in **Figure 3-1**. A wind rose for the Nuiqsut location is presented in **Figure 3-2**.

Figure 3-1 Nuiqsut Meteorological Tower and ASOS Station in Relation to Project Area

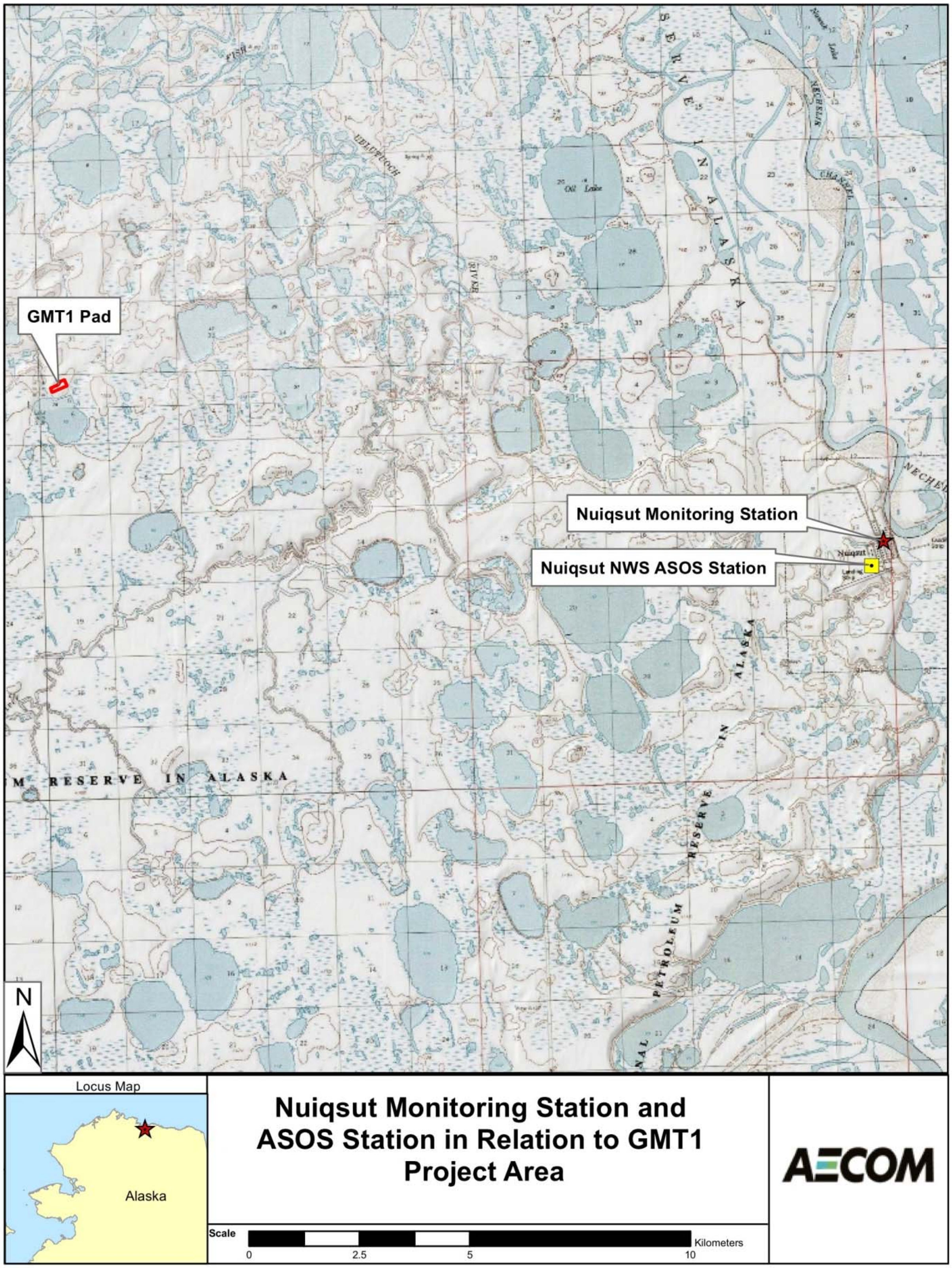
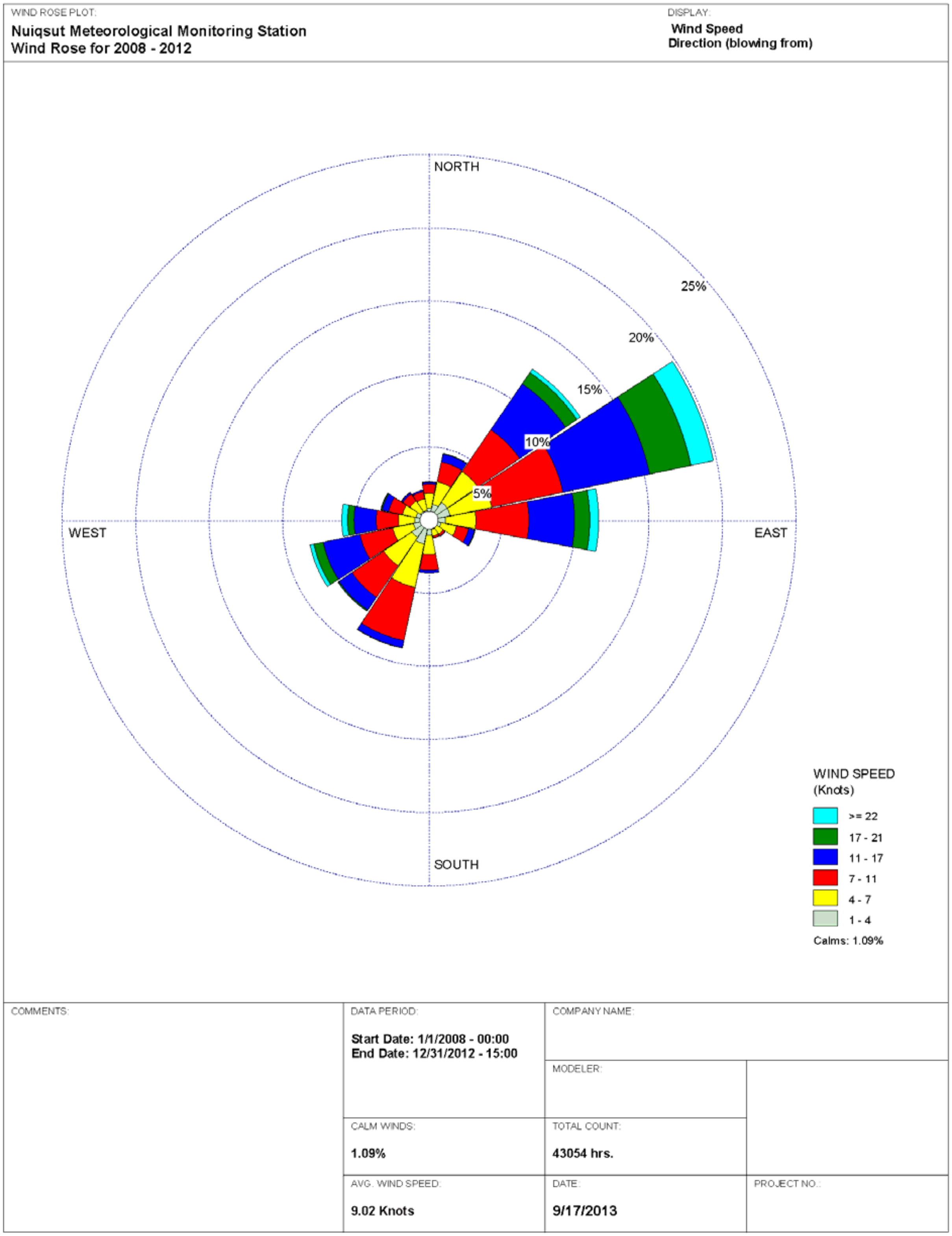


Figure 3-2 Nuiqsut Meteorological Data Wind Rose



The Nuiqsut meteorological measurements were processed into datasets (surface data and profile data) compatible with the AERMOD dispersion model using the AERMET (Version 12345) meteorological processor. Since temperature difference and solar radiation data are included in the onsite measurements, AERMET was applied following the Bulk Richardson method switch settings.

3.3 Upper Air Data

The nearest NWS upper air data station to the GMT1 Project area is located at Barrow, Alaska, which is located approximately 150 miles (240 kilometers) northwest of the GMT1 Project area. Concurrent upper air data from this station were obtained from the National Oceanic and Atmospheric Administration Earth System Research Laboratory (NOAA/ESRL) Radiosonde Database and provided as input to AERMET.

3.4 Surface Characteristics

A summary of the surface characteristics used as input to AERMET is provided in **Table 3-1**. These values were applied seasonally over one sector surrounding the monitoring site. Values used for processing the Nuiqsut meteorological data were previously approved by Alaska Department of Environmental Conservation (ADEC) in their review of the BP Exploration (Alaska), Inc. (BPXA) WRDx Gas Partial Processing Project Modeling Protocol (ADEC 2007). As recommended by ADEC, these values were applied on a seasonal basis with summer defined as June through September and winter defined as October through May. These values are representative of locations classified as Coastal Wet Tundra. These conditions are specific to the North Slope coastal plain at low elevations near the coast, which are classified as wet sedge tundra and for tundra dominated by thaw lakes, ice-wedge polygons, frost boils, water tracks, and bogs.

Table 3-1 ADEC Approved Surface Characteristics for the North Slope Coastal Plain

Surface Parameter	Winter Value (October through May)	Summer Value (June through September)
Albedo	0.8	0.18
Bowen Ratio	1.5	0.80
Surface Roughness Length (meters)	0.004	0.02

3.5 Background Data

Background pollutant concentrations are used as an indicator of existing regional conditions, and are assumed to include impacts from emissions from existing stationary emission sources from mobile, urban, biogenic, other non-industrial emission sources, and from transport into the region. These background concentrations were added to the model predicted GMT1 Project impacts to estimate cumulative ambient air quality impacts. **Table 3-2** presents the background values used for this study. These values were obtained from data collected at the Nuiqsut ambient air quality monitoring station for calendar years 2010 through 2012. An analysis of the data, as well as the development of the values presented in **Table 3-2** can be found in Appendix A.

Table 3-2 Background Ambient Air Quality Concentrations Collected at the Nuiqsut Ambient Air Quality Monitoring Station (2010-2012)

Pollutant	Averaging Period	Measured Background Concentration	
		(ppb)	(μg/m^3)
CO	1-hour	130	1,489
	8-hour	110	1,259
NO_2	1-hour	20	38
	Annual	2	2.9
PM_{10}	24-hour	-	48
$PM_{2.5}$	24-hour	-	7.1
	Annual	-	2.2
SO_2	1-hour	3	7.7
	3-hour	7	18
	24-hour	3	6.8
	Annual	0	0.3

3.5.1 Development of Seasonally-Varying Hourly NO_2 Background Values for Refined NO_2 Modeling

Seasonally varying 1-hour NO_2 background values were used as a refinement in the modeling of the Access Road and Pad Construction scenario. Hourly NO_2 values monitored at the Nuiqsut Air Quality Monitoring Station for calendar years 2010, 2011, and 2012 were analyzed to determine a seasonally varying background value for each hour of the day. The values were determined as follows:

1. Assign seasons to each month of data, where:
   - Season 1 = January, February, and December
   - Season 2 = March – May
   - Season 3 = June – August
   - Season 4 = September – November
2. Count the number of valid observations for each hour of the day, for each season.
3. Determine the 98th percentile value for each hour of the day, by season, based on the number of valid observations.
4. Determine the 3-year average (2010-2012) 98th percentile value for each hour of the day, by season.

Table 3-3 provides a count of valid hourly NO_2 observations by hour of day and season. **Table 3-4** provides the 98th percentile values calculated for each hour of the day, by season as well as the 3-year average 98th percentile values that were input to AERMOD.

Table 3-3 Count of Valid Hourly NO_2 Observations by Hour of Day and Season

2010	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Season 1	79	78	53	79	79	79	77	77	78	78	77	79	79	78	77	77	76	75	76	77	78	78	78	79
Season 2	92	92	61	92	92	92	92	91	91	91	90	90	89	91	89	89	89	92	92	92	92	92	91	91
Season 3	91	91	61	91	91	90	90	90	88	89	88	87	88	90	90	90	91	91	91	91	91	91	90	91
Season 4	78	77	53	78	78	77	77	77	76	77	76	77	77	77	78	78	77	77	77	77	76	76	76	77
2011	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**
Season 1	90	90	90	64	65	90	90	90	90	90	89	89	90	90	89	90	89	88	90	90	90	90	90	90
Season 2	91	91	91	92	74	92	92	92	92	90	89	90	90	90	89	87	89	88	88	89	89	91	90	91
Season 3	90	90	90	90	77	90	90	90	87	87	87	87	90	87	85	84	86	87	89	88	90	90	91	91
Season 4	91	91	91	78	78	90	90	91	91	91	88	88	88	89	87	89	88	87	88	89	91	91	91	91
2012	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**
Season 1	74	74	69	59	74	73	73	71	73	70	70	71	69	70	68	69	69	73	74	73	73	73	75	76
Season 2	89	89	89	72	89	89	89	89	89	87	87	89	89	88	88	86	87	89	88	88	89	88	88	89
Season 3	92	92	91	78	92	91	92	92	92	92	92	92	92	92	91	91	92	92	92	91	91	92	92	92
Season 4	84	84	84	72	84	84	84	84	83	82	82	83	82	82	81	81	81	83	84	84	84	84	84	84

Table 3-4 98th Percentile Hourly NO_2 Values by Hour of Day and Season ($\mu g/m^3$)

2010	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Season 1	20.7	28.2	15.0	15.0	13.2	13.2	22.6	13.2	18.8	15.0	13.2	13.2	22.6	20.7	16.9	24.4	18.8	18.8	16.9	20.7	24.4	15.0	16.9	22.6
Season 2	20.7	18.8	15.0	15.0	15.0	11.3	11.3	9.4	5.6	11.3	7.5	9.4	7.5	7.5	7.5	9.4	9.4	11.3	9.4	20.7	22.6	15.0	18.8	18.8
Season 3	13.2	15.0	15.0	9.4	9.4	9.4	9.4	11.3	9.4	11.3	7.5	5.6	5.6	7.5	5.6	5.6	5.6	7.5	9.4	11.3	9.4	13.2	11.3	13.2
Season 4	7.5	7.5	9.4	9.4	7.5	5.6	7.5	9.4	7.5	5.6	7.5	7.5	5.6	7.5	7.5	9.4	7.5	9.4	15.0	15.0	9.4	13.2	9.4	7.5
2011	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Season 1	16.9	19.0	15.0	20.7	11.3	15.0	20.7	20.7	18.8	20.7	20.7	27.3	20.7	18.8	20.5	22.6	20.9	20.1	35.9	45.1	22.6	25.0	26.3	20.1
Season 2	19.6	22.2	15.0	17.7	16.4	16.0	16.0	16.9	13.2	11.3	16.9	13.7	9.4	7.5	5.6	6.2	7.5	9.2	11.3	11.3	13.2	15.0	19.2	18.8
Season 3	15.8	14.1	15.2	11.8	11.1	12.0	10.7	9.4	9.0	8.1	7.5	7.9	8.1	6.6	6.8	7.3	10.0	11.3	11.1	11.3	14.9	18.8	14.5	19.0
Season 4	9.8	10.3	6.8	5.1	4.7	7.0	11.8	20.5	9.2	5.6	5.3	12.0	8.3	10.5	12.0	12.8	10.9	14.5	13.0	18.1	9.8	9.0	8.8	8.8
2012	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Season 1	25.8	24.3	23.7	16.9	18.6	21.1	21.2	16.0	18.2	27.5	18.1	21.6	27.3	18.2	20.1	25.0	17.7	16.2	26.3	17.9	24.3	20.5	17.5	15.4
Season 2	13.5	16.2	21.1	25.6	23.3	19.6	14.5	12.2	9.8	5.3	7.0	6.0	4.9	7.5	8.7	6.0	6.4	10.0	9.0	12.0	10.5	13.7	17.7	15.8
Season 3	17.3	15.0	16.9	8.3	7.9	8.5	6.8	10.0	9.2	7.0	8.3	7.5	8.3	9.4	9.0	7.7	8.1	7.3	7.0	6.6	6.8	10.2	15.8	14.9
Season 4	6.2	6.4	5.8	5.3	4.9	4.5	4.7	10.2	10.3	7.7	7.3	8.3	10.0	7.1	8.3	7.0	12.6	12.6	12.4	11.8	9.4	16.0	6.4	6.4
3-Yr Avg.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Season 1	21.1	23.8	17.9	17.6	14.4	16.4	21.5	16.6	18.6	21.1	17.3	20.7	23.5	19.2	19.2	24.0	19.1	18.4	26.4	27.9	23.8	20.2	20.2	19.4
Season 2	17.9	19.1	17.1	19.4	18.2	15.6	13.9	12.9	9.5	9.3	10.5	9.7	7.3	7.5	7.3	7.2	7.8	10.2	9.9	14.7	15.4	14.6	18.6	17.8
Season 3	15.4	14.7	15.7	9.8	9.5	10.0	9.0	10.2	9.2	8.8	7.8	7.0	7.3	7.8	7.1	6.9	7.9	8.7	9.2	9.7	10.3	14.0	13.9	15.7
Season 4	7.8	8.1	7.3	6.6	5.7	5.7	8.0	13.4	9.0	6.3	6.7	9.3	8.0	8.4	9.3	9.7	10.3	12.2	13.5	15.0	9.5	12.7	8.2	7.6

3.5.2 Development of Hourly Varying Ozone Values for Refined NO_2 Modeling

As mentioned in Section 3.1, simulating the NO_x to NO_2 chemical transformation in modeled plumes has been conducted using the OLM methodology with the AERMOD model. To implement this technique, hourly ambient ozone concentrations required as input to the NO_2 modeling were developed from hourly data collected at the Nuiqsut monitoring station for calendar years 2008 through 2012 concurrent with the Nuiqsut meteorological data that was used for the modeling. Since the data is concurrent, the measured hourly ozone value was simply input to the model for the corresponding day and hour being modeled. If an hourly ozone measurement was missing, the value used to represent a particular hour was the 95^{th} percentile of all values measured across all five years during the month containing the missing hour. For a month with 30 days, the value selected to represent an hour during that month would be the 95^{th} percentile value from 3,600 values (180^{th} highest value). Substituting the 95^{th} percentile value ensures that the substituted value is conservatively representative of the actual measurement, resulting in conservative predicted NO_2 concentrations. **Table 3-5** summarizes various metrics characterizing monthly ozone concentrations and the 95 percentile values used for filling the hourly ozone input file.

Table 3-5 Summary of O_3 Mixing Ratios (ppbv) Measured at Nuiqsut 2008 through 2012

Month	Average	Maximum	95^{th} Percentile
January	31.8	43.9	38.5
February	31.7	59.8	40.2
March	25.5	53.2	45.8
April	17.0	53.7	39.3
May	21.2	59.7	35.1
June	21.2	48.7	29.9
July	16.2	50.7	24.6
August	16.4	36.0	23.9
September	20.9	34.8	30.6
October	27.6	39.4	35.2
November	27.9	52.8	37.0
December	30.4	41.6	36.8

3.6 Selection of Source In-Stack Ratios for Refined NO_2 Modeling

As mentioned in Section 3.1, simulating the NO_x to NO_2 chemical transformation in modeled plumes has been conducted using the OLM methodology within the AERMOD model. Implementing this technique required estimates of source in-stack NO_2 to NO_x ratios. For this analysis, with the exception of explosives detonation, estimates of in-stack ratios were developed for each source group based on a review of available literature. That review and the ratios developed is presented in Appendix A of the GMT1 Alternative A AQIA and is summarized as follows:

- Small Diesel-Fired Heaters/Boilers: 0.05
- Large Natural Gas-Fired Heaters/Boilers:.................... 0.3
- Diesel-Fired Internal Combustion Engines Associated with Power Generation:.................... 0.2
- Diesel-Fired Nonroad Engines Associated with Construction Equipment:.................... 0.2
- Onroad Mobile Sources:.................... 0.15
- Explosives Detonation: 0.50

For explosives detonation, no literature could be found to support a source-specific in-stack ratio; therefore, the USEPA-approved screening value of 0.5 was used.

3.7 Facility Simulation Used for Criteria Pollutant Modeling

As discussed in Chapter 2, four scenarios were developed from comprehensive GMT1 Project emissions inventory for the Roadless Alternative that either represented those scenarios that were expected to produce the worst-case ambient air quality impacts or scenarios that are relevant to comprehensively characterizing GMT1 project impacts. A description of how these scenarios were characterized in the modeling is included in this section.

The proposed GMT1 Project site layout during Pad and Access Road Construction is provided in **Figure 3-3**. Modeled emission rates are presented in Chapter 2. Modeled source parameters are provided in **Table 3-6**. As mentioned in Section 3.5, 1-hour NO_2 modeling included use of a seasonal background value in AERMOD. Note that this refinement was not applied to modeling of annual NO_2 for consistency with the GMT1 Alternative A AQIA. Hourly varying emissions were also used to more appropriately account for the short duration of some activities over the modeled 5-year period. Specifically, it was assumed that pad construction activities occurred for 12 months, infill drilling activities for 14 months, and permanent operations for 34 months.

For 24-hour $PM_{2.5}$ and PM_{10}, emissions of fugitive dust associated with windblown and vehicular disturbance of dirt at both the wellsite and airstrip were assumed to only occur from June to September of each year. Freezing conditions in the region prevent fugitive dust emissions for the remainder of the year. Note that this refinement was not applied to modeling of annual $PM_{2.5}$ for consistency with the GMT1 Alternative A AQIA.

The proposed GMT1 Project Clover Material Source site layout during construction is provided in **Figure 3-4**. Modeled emission rates are presented in Chapter 2. Modeled source parameters are provided in **Table 3-7**. Modeling for the following pollutants/averaging periods included use of hourly varying emissions to more appropriately account for the short duration of some activities over the modeled 5-year period:

- 1-hour NO_2;
- 24-hour $PM_{2.5}$; and
- 24-hour PM_{10}.

It was assumed that blasting activity of the Clover material source occurred for 12 months, infill drilling activities for 14 months, and permanent operations for 34 months.

The proposed GMT1 Project site layout during Infill Drilling is provided in **Figure 3-5**. Modeled emission rates are presented in Chapter 2. Modeled source parameters are provided in **Table 3-8**. 1-hour NO_2 modeling included use of hourly varying emissions to more appropriately account for the short duration of some activities over the modeled 5-year period. It was assumed that infill drilling activity occurred for 14 months and permanent operations occurred for 46 months.

For 24-hour $PM_{2.5}$ and PM_{10}, emissions of fugitive dust associated with windblown and vehicular disturbance of dirt at both the wellsite and airstrip were assumed to only occur from June to September of each year. Freezing conditions in the region prevent fugitive dust emissions for the remainder of the year. Note that this refinement was not applied to modeling of annual $PM_{2.5}$ for consistency with the GMT1 Alternative A AQIA.

The proposed GMT1 Project site layout during Well Intervention is provided in **Figure 3-6**. Modeled emission rates are presented in Chapter 2. Modeled source parameters are provided in **Table 3-9**. 1-hour NO_2 modeling included use of hourly varying emissions to more appropriately account for the short duration of some activities over the modeled 5-year period. It was assumed that well intervention activities occurred for 1 month and permanent operations occurred for 11 months of each of the 5 years.

The layout for the proposed airstrip associated with the GMT1 wellsite is provided in **Figure 3-7**. Note that sources located at the airstrip were included in the modeling for each of the following three scenarios:

- Access Road and Pad Construction,
- Infill Drilling, and
- Well Intervention.

Modeled emission rates for the airstrip sources are presented in Chapter 2. Modeled parameters are provided in **Table 3-10**.

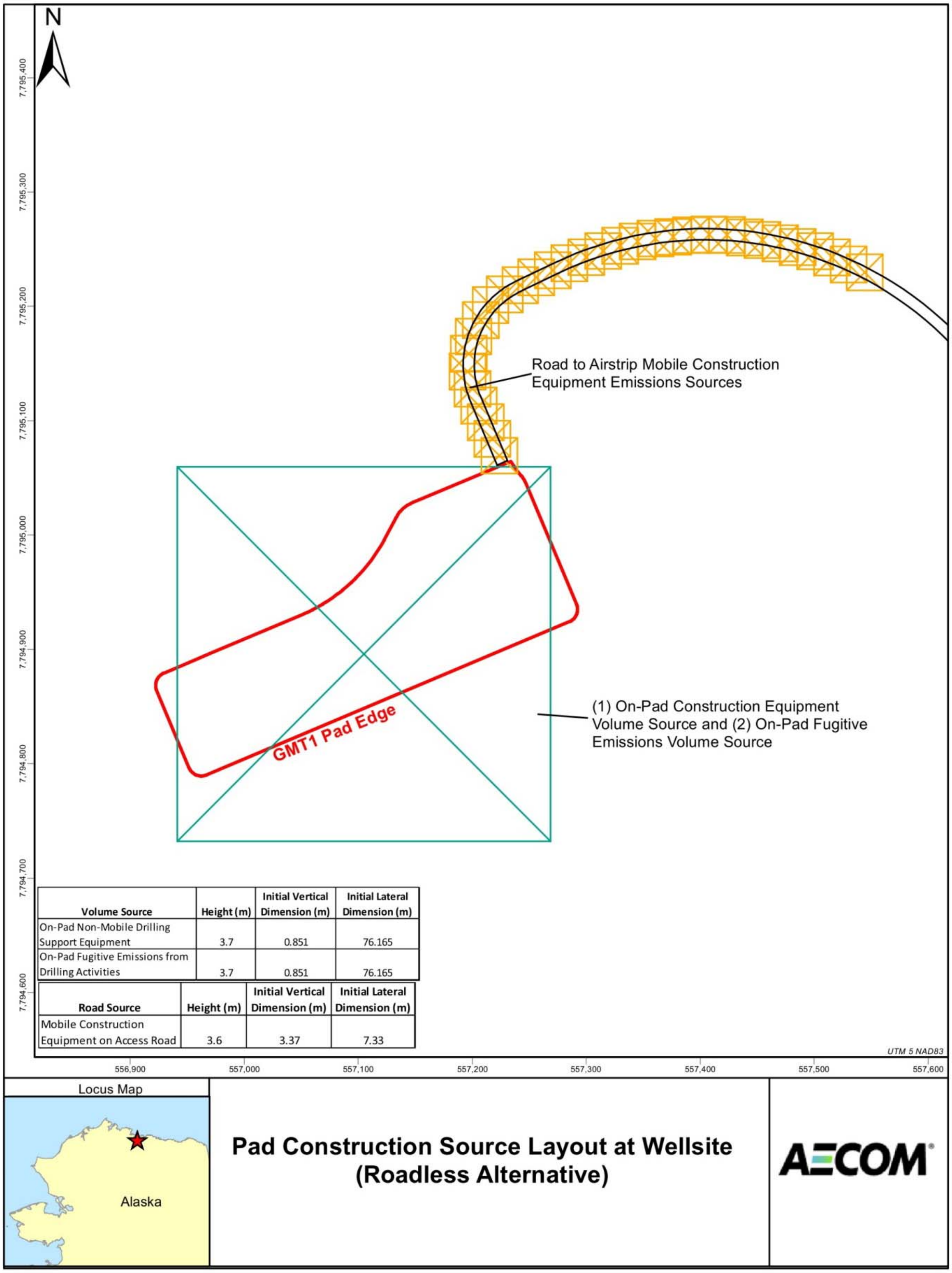
Point sources were used for modeling emissions from the drill rig, rig camp, well intervention source, stationary line heater, emergency generators, and the incinerator. The most recent PRIME version of the Building Profile Input Program (BPIP-PRIME version 04274) was used to determine appropriate direction-specific building dimension downwash parameters for each affected source.

3.8 Air Toxics Modeling

Near field air toxics were also predicted with AERMOD for both a short-term (acute) exposure assessment and for calculation of long-term risk in the GMT1 Project area. Air toxics will be emitted predominantly during well venting associated during the early stages of developmental drilling; therefore, air toxics emissions during this stage of the project were considered a worst-case representation for all years. A maximum emissions case was developed for each air toxic. The modeling methodology for the short-term and long-term air toxics impact assessments is nearly identical to the methodology outlined in Section 3.1. Emissions from well venting combined with those sources involved in drilling (i.e., drill rig, portable support equipment inventory, mobile sources inventory and production heater) were combined and the total was modeled as a single volume source similar to that modeled for the on-pad non-mobile drilling support equipment emissions for the Infill Drilling Scenario. The volume source was centered on the wellsite and modeled with the following parameters:

- Release Height – 3.66 meters (typical height of a 1-story structure)
- Length of Side – 327.51 meters (Approximate length of area where most wellsite activity will take place)
- Initial Lateral Dimension – 76.17 meters (AERMOD User's Guide, Table 3-1)
- Initial Vertical Dimension – 0.851 meter (AERMOD User's Guide, Table 3-1)
- AERMOD was executed with a unitized (1 gram/sec) emission rate. The resulting concentration was then multiplied by the pollutant emissions to determine the AERMOD concentrations for each individual pollutant.

Figure 3-3 Modeled Layout – Access Road and Pad Construction



Volume Source	Height (m)	Initial Vertical Dimension (m)	Initial Lateral Dimension (m)
On-Pad Non-Mobile Drilling Support Equipment	3.7	0.851	76.165
On-Pad Fugitive Emissions from Drilling Activities	3.7	0.851	76.165

Road Source	Height (m)	Initial Vertical Dimension (m)	Initial Lateral Dimension (m)
Mobile Construction Equipment on Access Road	3.6	3.37	7.33

Table 3-6 Modeled Source Parameters - Access Road and Pad Construction

Model ID	Source Description	Source Type	Source Parameters						
			Release Height (m)	Plume Height (m)	Plume Width (m)	Initial Lat. Dimen. (m)	Initial Vert. Dimen. (m)	Vehicle Height[2] (m)	NO_2/NO_X Ratios
RD_TAIL1	Construction equipment - on road to airstrip, tailpipe emissions	Line Source [1] (32 volumes)	3.63	7.25	15.75	7.33	3.37	4.27	0.15

Model ID	Source Description	Source Type	Release Height[3] (m)		Length of Side[4] (m)	Initial Lat. Dimen.[5] (m)	Initial Vert. Dimen.[5] (m)		NO_2/NO_X Ratios
PAD_CONST	Construction equipment - on pad, tailpipe emissions	Volume	3.66		327.51	76.165	0.851		0.20
PAD_DIST	Pad Disturbed Area during construction, fugitive particulates	Volume	3.66		327.51	76.165	0.851		na

[1] Source Parameters Based on Haul Road Workgroup Guidance (USEPA 2012a):

- Top of Plume Height – 1.7 x Vehicle Height.
- Volume Source Release Height – 0.5 x Top of Plume height.
- Width of Plume – Road Width + 6m for two lane roadways. Road width assumed to be 32 feet, based on sheet 22 in "GMT1 Permit Package 7-12-13.pdf" provided by CPAI.
- Initial Sigma Vertical Dimension – Top of Plume / 2.15 (AERMOD User's Guide, Table 3-1, USEPA 2004).
- Initial Sigma Lateral Dimension – Width of Plume / 2.15 (AERMOD User's Guide, Table 3-1, USEPA 2004).

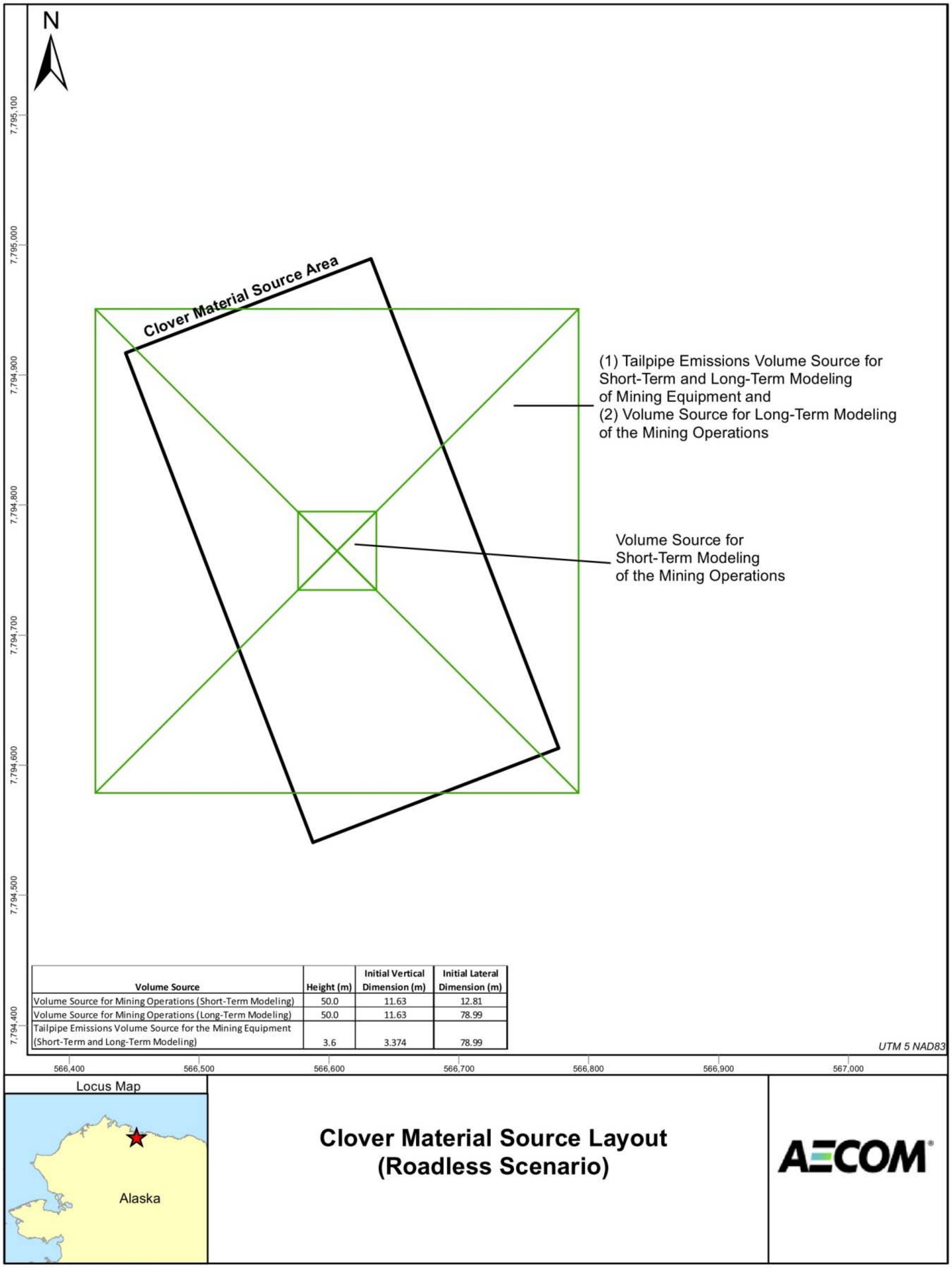
[2] Typical truck height.

[3] Typical height of a 1-story structure which is a size consistent with the equipment size and other pad structures responsible for the turbulence scale affecting the plume.

[4] Approximate length of area where most wellsite activity will take place.

[5] AERMOD User's Guide, Table 3-1 (USEPA 2004).

Figure 3-4 Modeled Layout – Clover Material Source



Volume Source	Height (m)	Initial Vertical Dimension (m)	Initial Lateral Dimension (m)
Volume Source for Mining Operations (Short-Term Modeling)	50.0	11.63	12.81
Volume Source for Mining Operations (Long-Term Modeling)	50.0	11.63	78.99
Tailpipe Emissions Volume Source for the Mining Equipment (Short-Term and Long-Term Modeling)	3.6	3.374	78.99

Table 3-7 Modeled Source Parameters – Clover Material Source

Model ID	Source Description	Source Type	Source Parameters						
			Release Height (m)	Plume Height (m)	Plume Width (m)	Initial Lat. Dimen.[5] (m)	Initial Vert. Dimen.[5] (m)	Vehicle Height[2] (m)	NO_2/NO_X Ratios
TAILPIPE	Blasting Activity at Clover Material Source, tailpipe emissions	Volume[1]	3.63	7.25	372.07	86.53	3.374	4.27	0.15

Model ID	Source Description	Source Type	Source Parameters						
			Release Height[3] (m)		Length of Side[4] (m)	Initial Lat. Dimen.[5] (m)	Initial Vert. Dimen.[5] (m)		NO_2/NO_X Ratios
BLAST_ST	Blasting Activity at Clover Material Source, short-term averaging periods	Volume	50.00		60.35	14.03	11.63		0.50
BLAST_AN	Blasting Activity at Clover Material Source, long-term averaging periods	Volume	50.00		372.07	86.53	11.63		0.50

[1] Source Parameters Based on Haul Road Workgroup Guidance (USEPA 2012a):

- Top of Plume Height – 1.7 x Vehicle Height.
- Volume Source Release Height – 0.5 x Top of Plume height.
- Width of Plume – Road Width + 6m for two lane roadways. Road width assumed to be 32 feet, based on sheet 22 in "GMT1 Permit Package 7-12-13.pdf" provided by CPAI.
- Initial Sigma Vertical Dimension – Top of Plume / 2.15 (AERMOD User's Guide, Table 3-1, USEPA 2004).
- Initial Sigma Lateral Dimension – Width of Plume / 2.15 (AERMOD User's Guide, Table 3-1, USEPA 2004).

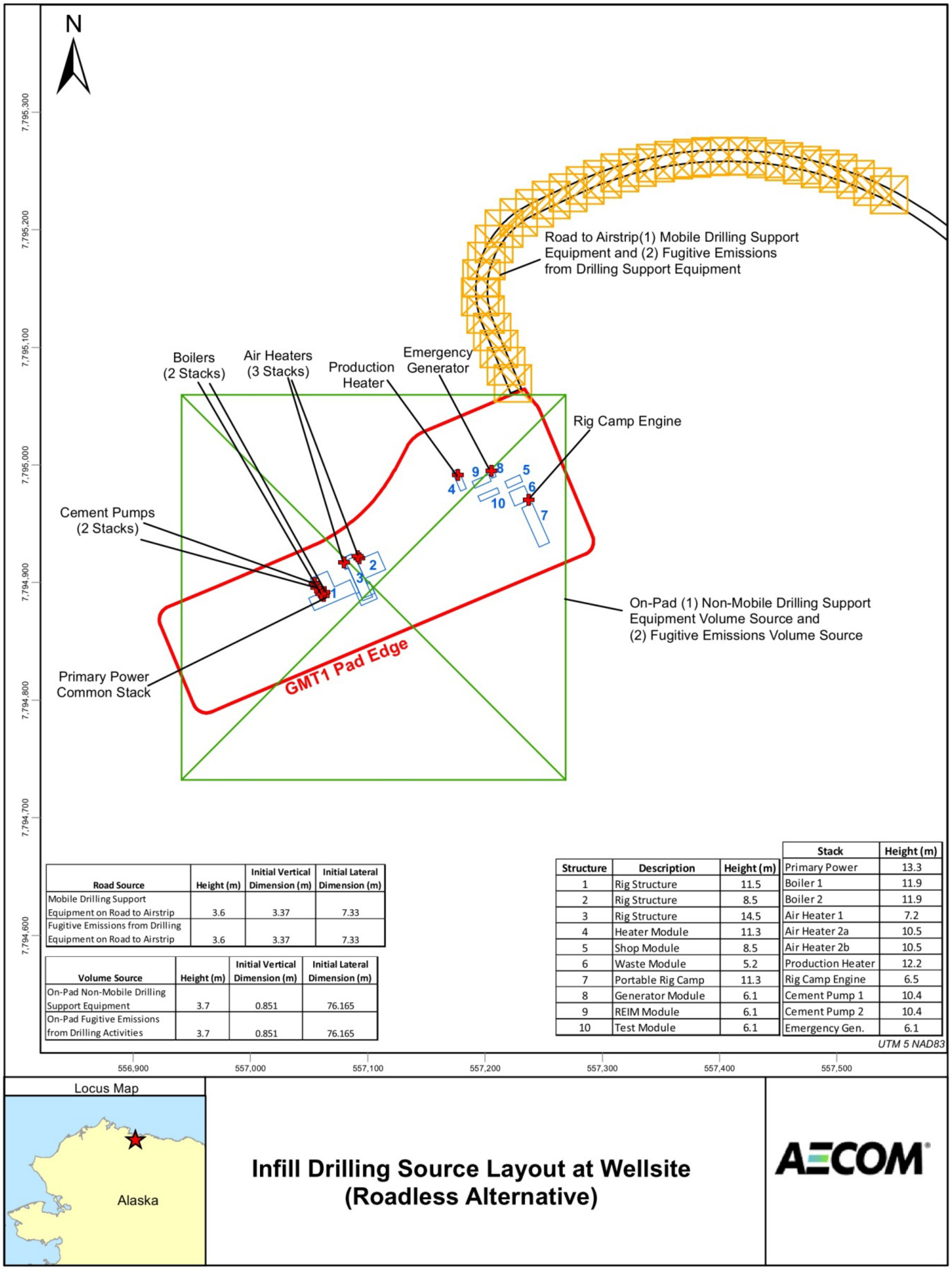
[2] Typical truck height.

[3] Height selected based on the nature of the blasting activity.

[4] Approximate length of area where blasting activity will take place.

[5] AERMOD User's Guide, Table 3-1 (USEPA 2004).

Figure 3-5 Modeled Layout – Infill Drilling



Road Source	Height (m)	Initial Vertical Dimension (m)	Initial Lateral Dimension (m)
Mobile Drilling Support Equipment on Road to Airstrip	3.6	3.37	7.33
Fugitive Emissions from Drilling Equipment on Road to Airstrip	3.6	3.37	7.33

Volume Source	Height (m)	Initial Vertical Dimension (m)	Initial Lateral Dimension (m)
On-Pad Non-Mobile Drilling Support Equipment	3.7	0.851	76.165
On-Pad Fugitive Emissions from Drilling Activities	3.7	0.851	76.165

Structure	Description	Height (m)
1	Rig Structure	11.5
2	Rig Structure	8.5
3	Rig Structure	14.5
4	Heater Module	11.3
5	Shop Module	8.5
6	Waste Module	5.2
7	Portable Rig Camp	11.3
8	Generator Module	6.1
9	REIM Module	6.1
10	Test Module	6.1

Stack	Height (m)
Primary Power	13.3
Boiler 1	11.9
Boiler 2	11.9
Air Heater 1	7.2
Air Heater 2a	10.5
Air Heater 2b	10.5
Production Heater	12.2
Rig Camp Engine	6.5
Cement Pump 1	10.4
Cement Pump 2	10.4
Emergency Gen.	6.1

Table 3-8 Modeled Source Parameters – Infill Drilling

Model ID	Source Description	Source Type	Stack Parameters				
			Stack Height (m)	Stack Temp. (deg K)	Stack Velocity (m/sec)	Stack Diameter (m)	NO_2/NO_X Ratios
D19_PWR	Primary Power Common Stack[1]	Point	13.3	614	10.5	0.400	0.20
D19_BOIL1	Boiler 1 - Superior[2]	Point	11.9	450	11.7	0.279	0.05
D19_BOIL2	Boiler 2 - Superior[2]	Point	11.9	450	11.7	0.279	0.05
D19_CEM1	Cement Pump 1[2]	Point	10.4	750	43.5	0.130	0.20
D19_CEM2	Cement Pump 2[2]	Point	10.4	750	43.5	0.130	0.20
D19_HTR1	Air Heater 1 - Dick's[2]	Point	7.2	533	10.8	0.300	0.05
D19_HTR2A	Air Heater 2 - Dick's, split into 2 stacks[2]	Point	10.5	533	3.2	0.300	0.05
D19_HTR2B	Air Heater 2 - Dick's, split into 2 stacks[2]	Point	10.5	533	3.2	0.300	0.05
PROD_HTR	Gas fired production heater[2]	Point	12.2	529	5.7	0.940	0.30
WEL_EGEN	Back-up Generator[2]	Point	6.1	795	15.1	0.460	0.20

[1] Stack parameters based on vendor data.

[2] Stack parameters based on DOYON 19 drill rig and CD5 Minor Permit Application (SECOR 2005).

Table 3-8 Modeled Source Parameters – Infill Drilling (Cont.)

			Source Parameters						
			Release Height	Plume Height	Plume Width	Initial Lat. Dimen.	Initial Vert. Dimen.	Vehicle Height[2]	
Model ID	Source Description	Source Type	(m)	(m)	(m)	(m)	(m)	(m)	NO_2/NO_X Ratios
RD_TAIL1	Mobile Drilling Support Equip on Road to Airstrip, tailpipe emissions	Line Source [1] (32 volumes)	3.63	7.25	15.75	7.33	3.37	4.27	0.15
RD_FUG1	Mobile Drilling Support Equip on Road to Airstrip, fugitive particulates	Line Source [1] (32 volumes)	3.63	7.25	15.75	7.33	3.37	4.27	na

			Source Parameters						
			Release Height[3]		Length of Side[4]	Initial Lat. Dimen.[5]	Initial Vert. Dimen.[5]		
Model ID	Source Description	Source Type	(m)		(m)	(m)	(m)		NO_2/NO_X Ratios
NONMOB	Non-Mobile Drilling Support Equip on Pad	Volume	3.66		327.51	76.165	0.851		0.20
PAD_DIST	Pad Disturbed Area, fugitive particulates	Volume	3.66		327.51	76.165	0.851		na

[1] Source Parameters Based on Haul Road Workgroup Guidance (USEPA 2012a):

- Top of Plume Height – 1.7 x Vehicle Height.
- Volume Source Release Height – 0.5 x Top of Plume height.
- Width of Plume – Road Width + 6m for two lane roadways. Road width assumed to be 32 feet, based on sheet 22 in "GMT1 Permit Package 7-12-13.pdf" provided by CPAI.
- Initial Sigma Vertical Dimension – Top of Plume / 2.15 (AERMOD User's Guide, Table 3-1, USEPA 2004).
- Initial Sigma Lateral Dimension – Width of Plume / 2.15 (AERMOD User's Guide, Table 3-1, USEPA 2004).

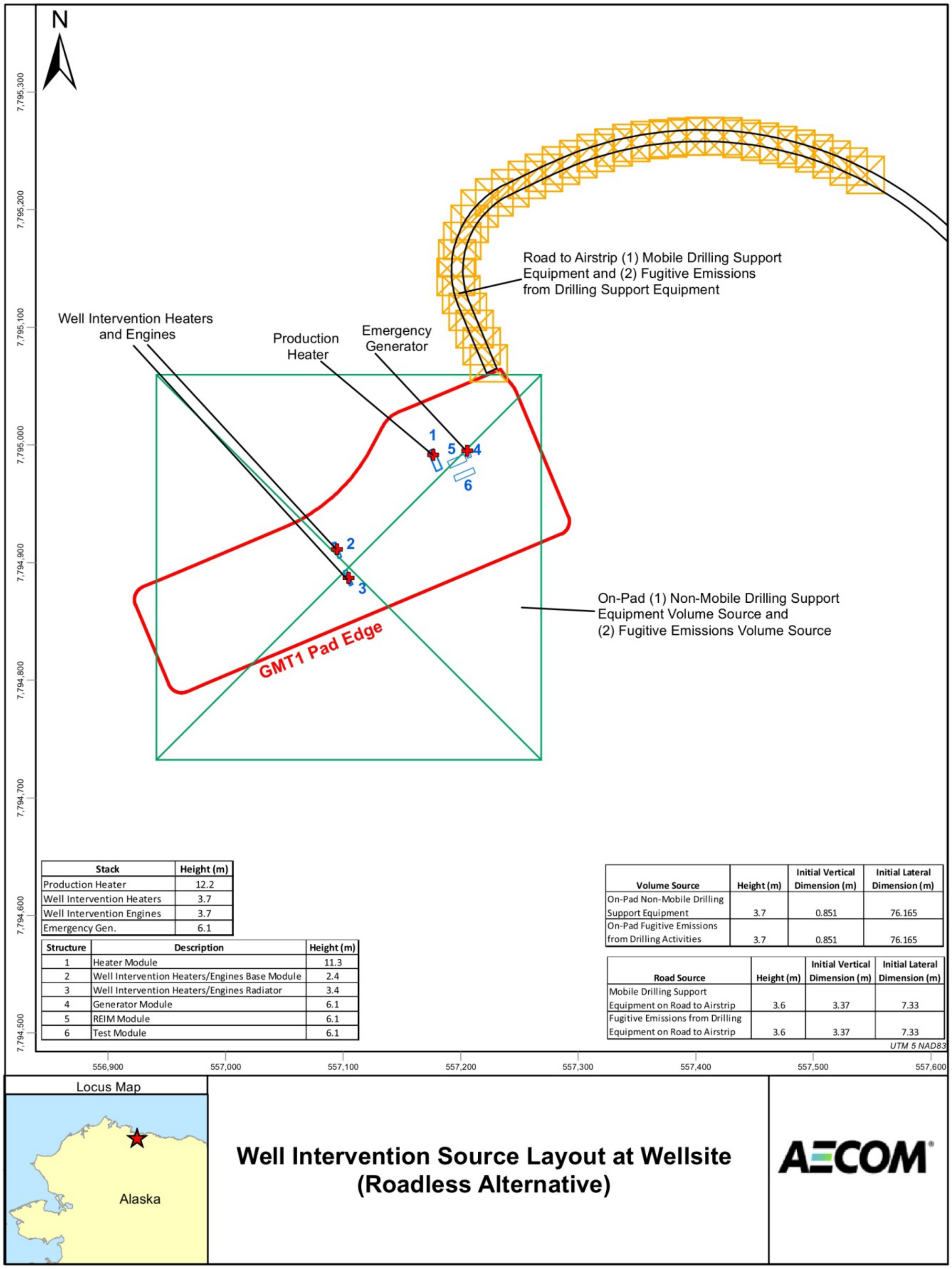
[2] Typical truck height.

[3] Typical height of a 1-story structure which is a size consistent with the equipment size and other pad structures responsible for the turbulence scale affecting the plume.

[4] Approximate length of area where most wellsite activity will take place.

[5] AERMOD User's Guide, Table 3-1 (USEPA 2004).

Figure 3-6 Modeled Layout – Well Intervention



Stack	Height (m)
Production Heater	12.2
Well Intervention Heaters	3.7
Well Intervention Engines	3.7
Emergency Gen.	6.1

Structure	Description	Height (m)
1	Heater Module	11.3
2	Well Intervention Heaters/Engines Base Module	2.4
3	Well Intervention Heaters/Engines Radiator	3.4
4	Generator Module	6.1
5	REIM Module	6.1
6	Test Module	6.1

Volume Source	Height (m)	Initial Vertical Dimension (m)	Initial Lateral Dimension (m)
On-Pad Non-Mobile Drilling Support Equipment	3.7	0.851	76.165
On-Pad Fugitive Emissions from Drilling Activities	3.7	0.851	76.165

Road Source	Height (m)	Initial Vertical Dimension (m)	Initial Lateral Dimension (m)
Mobile Drilling Support Equipment on Road to Airstrip	3.6	3.37	7.33
Fugitive Emissions from Drilling Equipment on Road to Airstrip	3.6	3.37	7.33

Table 3-9 Modeled Source Parameters – Well Intervention

Model ID	Source Description	Source Type	Stack Parameters				
			Stack Height (m)	Stack Temp. (deg K)	Stack Velocity (m/sec)	Stack Diameter (m)	NO_2/NO_X Ratios
PROD_HTR	Gas fired production heater[1]	Point	12.2	529	5.74	0.940	0.30
WELLINT1	Well Intervention Heaters and Engines were combined, with emissions then divided between two sources[2]. Fuel consumption by this source is dominated by engines; therefore, the instack ratio is consistent with that.	Point	3.70	644	41.60	0.356	0.20
WELLINT2		Point	3.70	644	41.60	0.356	0.20
WEL_EGEN	Back-up Generator[1]	Point	6.1	795	15.1	0.460	0.20

[1] Stack parameters based on CD5 Minor Permit Application (SECOR 2005).

[2] Stack parameters based on professional judgment following a comparison to similar equipment operating on the North Slope.

Table 3-9 Modeled Source Parameters – Well Intervention (Cont.)

Model ID	Source Description	Source Type	Source Parameters: Release Height (m)	Plume Height (m)	Plume Width (m)	Initial Lat. Dimen. (m)	Initial Vert. Dimen. (m)	Vehicle Height[2] (m)	NO_2/NO_X Ratios
RD_TAIL1	Mobile Drilling Support Equip on Access Road, tailpipe emissions	Line Source [1] (32 volumes)	3.63	7.25	15.75	7.33	3.37	4.27	0.15
RD_FUG1	Mobile Drilling Support Equip on Access Road, fugitive particulates	Line Source [1] (32 volumes)	3.63	7.25	15.75	7.33	3.37	4.27	na

Model ID	Source Description	Source Type	Source Parameters: Release Height[3] (m)		Length of Side[4] (m)	Initial Lat. Dimen.[5] (m)	Initial Vert. Dimen.[5] (m)		NO_2/NO_X Ratios
NONMOB	Non-Mobile Drilling Support Equip on Pad	Volume	3.66		327.51	76.165	0.851		0.20
PAD_DIST	Pad Disturbed Area, fugitive particulates	Volume	3.66		327.51	76.165	0.851		na

[1] Source Parameters Based on Haul Road Workgroup Guidance (USEPA 2012a):

- Top of Plume Height – 1.7 x Vehicle Height.
- Volume Source Release Height – 0.5 x Top of Plume height.
- Width of Plume – Road Width + 6m for two lane roadways. Road width assumed to be 32 feet, based on sheet 22 in "GMT1 Permit Package 7-12-13.pdf" provided by CPAI.
- Initial Sigma Vertical Dimension – Top of Plume / 2.15 (AERMOD User's Guide, Table 3-1, USEPA 2004).
- Initial Sigma Lateral Dimension – Width of Plume / 2.15 (AERMOD User's Guide, Table 3-1, USEPA 2004).

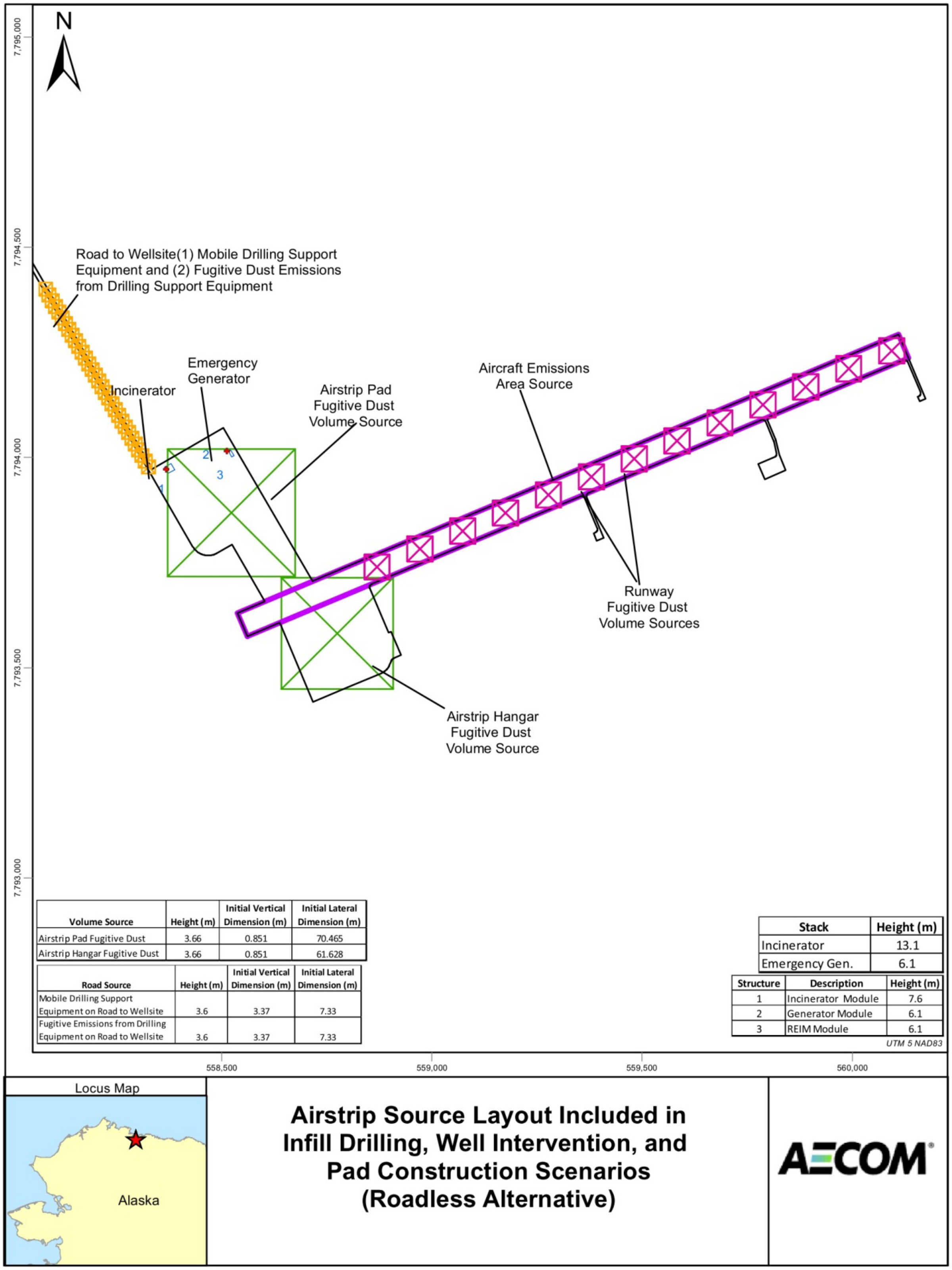
[2] Typical truck height.

[3] Typical height of a 1-story structure which is a size consistent with the equipment size and other pad structures responsible for the turbulence scale affecting the plume.

[4] Approximate length of area where most wellsite activity will take place.

[5] AERMOD User's Guide, Table 3-1 (USEPA 2004).

Figure 3-7 Modeled Layout – Airstrip, Included in Access Road and Pad Construction, Infill Drilling, and Well Intervention Modeling Scenarios



Volume Source	Height (m)	Initial Vertical Dimension (m)	Initial Lateral Dimension (m)
Airstrip Pad Fugitive Dust	3.66	0.851	70.465
Airstrip Hangar Fugitive Dust	3.66	0.851	61.628

Road Source	Height (m)	Initial Vertical Dimension (m)	Initial Lateral Dimension (m)
Mobile Drilling Support Equipment on Road to Wellsite	3.6	3.37	7.33
Fugitive Emissions from Drilling Equipment on Road to Wellsite	3.6	3.37	7.33

Stack	Height (m)
Incinerator	13.1
Emergency Gen.	6.1

Structure	Description	Height (m)
1	Incinerator Module	7.6
2	Generator Module	6.1
3	REIM Module	6.1

Table 3-10 Modeled Source Parameters – Airstrip, Included in Access Road and Pad Construction, Infill Drilling, and Well Intervention Modeling Scenarios

Model ID	Source Description	Source Type	Stack Parameters				
			Stack Height (m)	Stack Temp (deg K)	Stack Vel (m/sec)	Stack Diam (m)	NO_2/NO_X Ratios
AIR_EGEN	Emergency back-up Generator[1]	Point	6.1	795	15.1	0.460	0.20
INCIN	Incinerator[1]	Point	13.1	1172	16.9	0.300	0.50

[1] Stack parameters based on DOYON 19 drill rig and CD5 Minor Permit Application (SECOR 2005).

Model ID	Source Description	Source Type	Source Parameters						
			Release Height (m)	Plume Height (m)	Plume Width (m)	Initial Lat. Dimen. (m)	Initial Vert. Dimen. (m)	Vehicle Height[3] (m)	NO_2/NO_X Ratios
RD_TAIL2	Mobile Drilling Support Equip on Access Road, tailpipe emissions	Line Source [2] (32 volumes)	3.63	7.25	15.75	7.33	3.37	4.27	0.15
RD_FUG2	Mobile Drilling Support Equip on Access Road, fugitive particulates	Line Source [2] (32 volumes)	3.63	7.25	15.75	7.33	3.37	4.27	na

[2] Source Parameters Based on Haul Road Workgroup Guidance (USEPA 2012a):

- Top of Plume Height – 1.7 x Vehicle Height.
- Volume Source Release Height – 0.5 x Top of Plume height.
- Width of Plume – Road Width + 6m for two lane roadways. Road width assumed to be 32 feet, based on sheet 22 in "GMT1 Permit Package 7-12-13.pdf" provided by CPAI.
- Initial Sigma Vertical Dimension – Top of Plume / 2.15 (AERMOD User's Guide, Table 3-1, USEPA 2004).
- Initial Sigma Lateral Dimension – Width of Plume / 2.15 (AERMOD User's Guide, Table 3-1, USEPA 2004).

[3] Typical truck height.

Table 3-10 Modeled Source Parameters – Airstrip, Included in Access Road and Pad Construction, Infill Drilling, and Well Intervention Modeling Scenarios (Cont.)

Model ID	Source Description	Source Type	Source Parameters			
			Release Height[1]	Length of Side[2]	Initial Lat. Dimen.[3]	Initial Vert. Dimen.[3]
			(m)	(m)	(m)	(m)
ARPD_DIS	Airstrip Disturbed Area, fugitive	Volume	3.66	303	70.465	0.851
HANG_DIS	Hangar Disturbed Area, fugitive	Volume	3.66	265	61.628	0.851
RUN_DIS1	Runway Disturbed Area, fugitive	Volume	2.0	60	13.953	0.465

1 Typical height of a 1-story structure.

2 Approximate length of area where most wellsite activity will take place.

3 AERMOD User's Guide, Table 3-1 (USEPA 2004).

Model ID	Source Description	Source Type	Source Parameters				
			Release Height[4]	# of vertices	Initial Vert. Dimen.[5]	Area	NO_2/NO_X Ratios
			(m)	(m)	(m)	(m^2)	
AIRSTRP1	Aircraft Emissions Layer 1	Area	50.8	4	77.5	103,407	0.50
AIRSTRP2	Aircraft Emissions Layer 1	Area	152.4	4	77.5	103,407	0.50
AIRSTRP3	Aircraft Emissions Layer 3	Area	254.0	4	77.5	103,407	0.50

4 Aircraft emissions up to the mixing height were modeled. The emissions were split into 3 equal area sources, releasing at 3 different levels, up to the mixing height (1000 ft). Each of the 3 layers spanned 333 feet (101.6 m).

5 AERMOD User's Guide, Table 3-1 (USEPA 2004).

3.9 Receptors

Discrete modeling receptor sets were used for each modeling scenario. The receptor grids consisted of receptors placed at 25-meter intervals along the ambient boundary which was defined at the perimeter of the wellsite gravel pad and airstrip, and the extent of the Clover Material Source, with remaining receptors placed at:

- 25-meter resolution extending from the ambient boundary outward at least 100 meters;
- 100-meter resolution extending from the 25 meter density receptors outward to 1 kilometers in each cardinal direction, and
- 250-meter resolution extending from the 100 meter density receptors outward to 2 kilometers in each cardinal direction.

Flat terrain receptors were used for all near field modeling analyses based on a review of the terrain in the GMT1 Project area. An illustration of the receptor grid for each of the modeled scenarios is provided in **Figure 3-8** through **Figure 3-9Error! Reference source not found.**.

Dispersion modeling for all scenarios was also conducted for a single receptor representing the Nuiqsut Community. The receptor was located at 70.217° N, 150.995° W (NAD 83) and assigned an elevation of 15.24 meters (50 feet), based on the approximate location of the community on Google Earth aerial photography.

3.10 Offsite Sources

As mentioned above, background pollutant concentrations are assumed to include impacts from emissions from existing emission sources in the region. Background concentrations calculated for this project were based on monitoring data collected through 2012. Thus, any significant offsite sources would be reflected in the background concentrations. There are no other reasonably foreseeable development sources that would be large enough to create a significant concentration gradient in the impact area. Therefore, no offsite source inventory was included in the near field dispersion modeling analysis.

Figure 3-8 Receptor Grid – Scenarios for Activities on or Near the GMT1 Project Wellsite

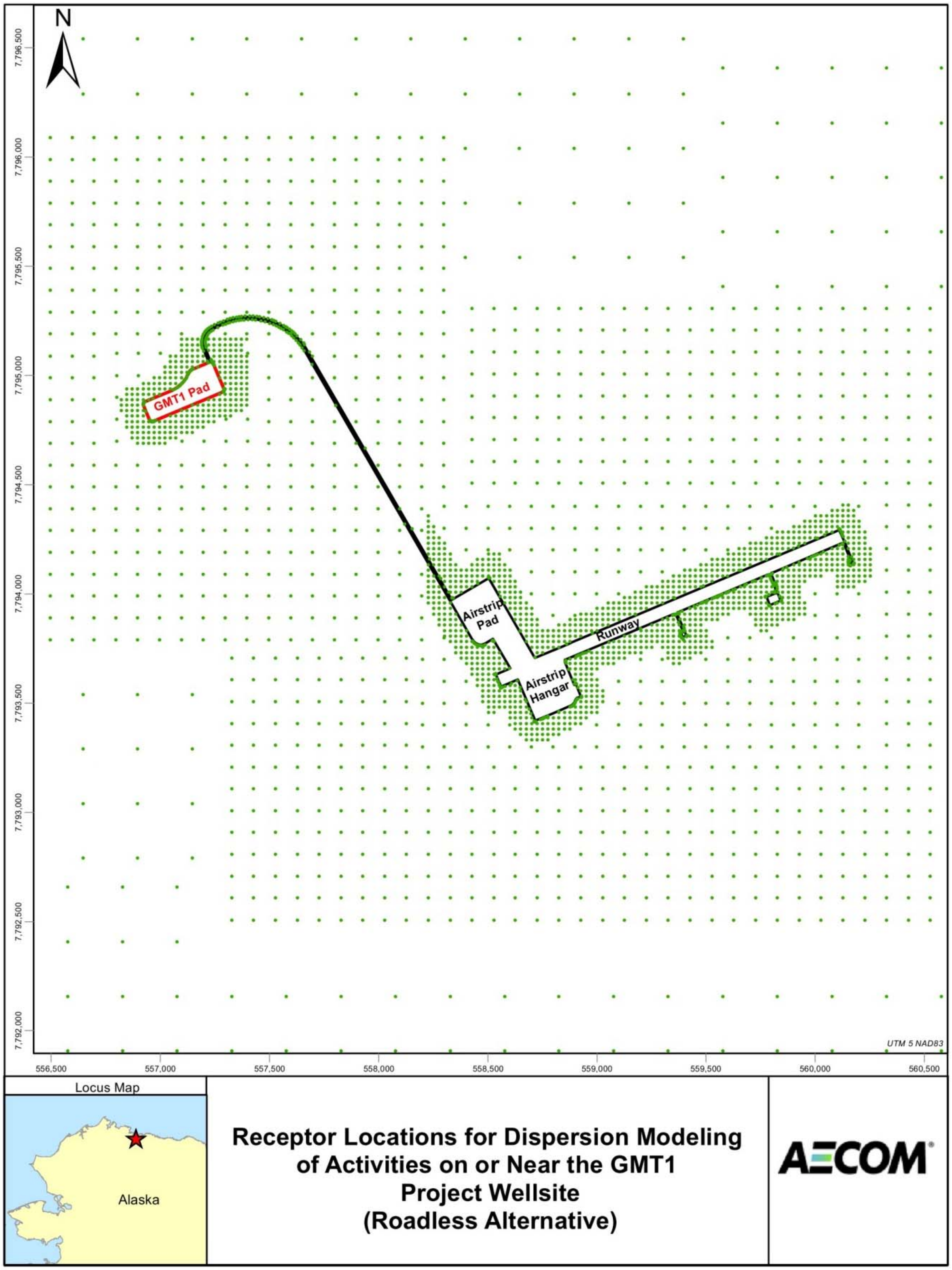
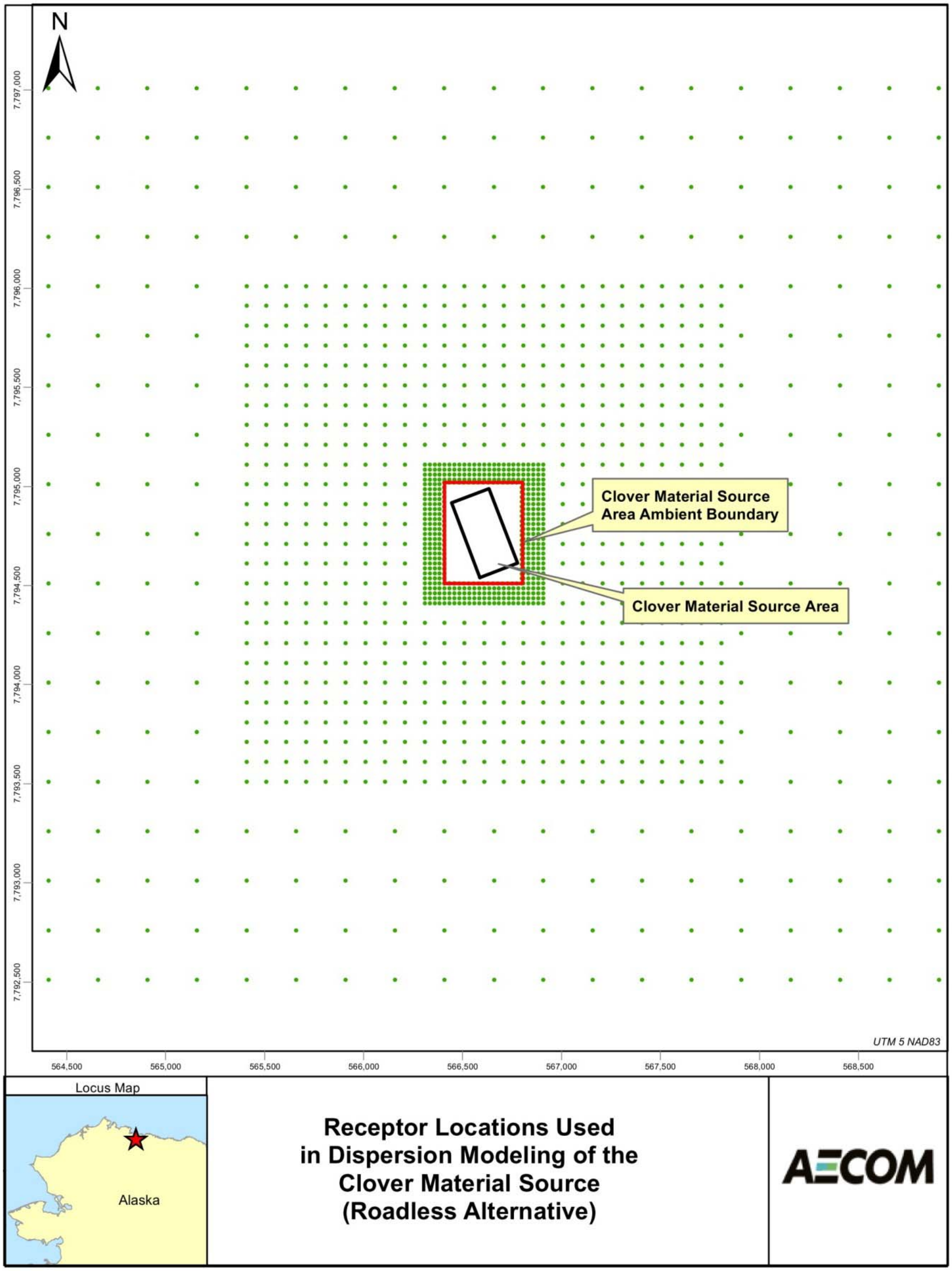


Figure 3-9 Receptor Grid – Clover Material Source



4.0 Key Far-Field Dispersion Modeling Assumptions

4.1 Modeling Methodology

The purpose of the far field analysis was to quantify potential far-field air quality impacts to both ambient air concentrations and Air Quality Related Values (AQRVs) from air pollutant emissions of NO_x, SO_2, PM_{10}, and $PM_{2.5}$ that result from the drilling and operation of the GMT1 Project as detailed in Chapter 2. Nearby Reasonably Foreseeable Development (RFD) sources, not yet built and therefore, not included in the background ambient air quality data, were also explicitly modeled to quantify potential cumulative air quality and AQRV impacts. Ambient air quality impacts of NO_2, SO_2, PM_{10}, and $PM_{2.5}$ and AQRVs were analyzed at the U.S. Fish and Wildlife Service (USFWS)-identified Class II receptors of concern within 185 miles (300 kilometers) of the GMT1 Project. Cumulative air quality impacts of NO_2, SO_2, PM_{10}, and $PM_{2.5}$ were also analyzed at the community of Nuiqsut.

The analyses was performed using the version of the CALPUFF modeling system approved by USEPA at the time this analysis was undertaken (Version 5.8). That version of CALPUFF was subsequently modified by the USFWS to account for Polar Stereographic coordinate system (BLM 2012). The meteorological data for the analysis were processed with the latest version of Mesoscale Model Interface Program (MMIF), currently version 2.3p1, (ENVIRON 2012) to develop a meteorological wind field. All CALPUFF model options conform to the 2009 USEPA guidance (USEPA 2009) as applicable and all CALPOST model options and inputs will utilize FLAG 2010 guidance and inputs (FLAG 2010).

The community of Nuiqsut and Class II areas of concern located within 185 miles (300 kilometer) of the GMT1 Project are listed in **Table 4-1** and shown on **Figure 4-1**. **Table 4-1** also lists the agency responsible for managing the area, and the PSD classification.

Using the Project and RFD sources, the CALPUFF-predicted impacts will be compared with ambient air quality standards and post-processed to compute: 1) air quality impacts 2) AQRV impacts due to light extinction change for comparison to visibility impact thresholds; and 3) AQRV impacts due to deposition rates for comparison to sulfur (S) and nitrogen (N) deposition thresholds.

4.2 GMT1 Project Roadless Alternative Simulation

The scenario modeled in CALPUFF to assess far-field GMT1 Project impacts was the Infill Drilling scenario described in Chapter 2 and Chapter 3. This scenario’s emission inventory consists of a drill rig, a production heater, back-up power generation, incinerator, drill rig portable support equipment, aircraft and attendant fugitive and tailpipe emissions from mobile equipment. This scenario is expected to provide the worst-case emissions with fuel combustion sources that will provide worst-case air quality and AQRV impacts. For conservatism with respect to the visibility, it was assumed that all filterable particulate matter, including that from non-combustion sources, was treated as elemental carbon and all condensable particulate matter was treated as secondary organic aerosols. The particulate speciation was based on data from AP-42 for representative engines and the MOVES model for mobile sources.

The GMT1 Project sources for the Infill Drilling scenario, were simulated as they were for the near-field analysis. Therefore, they were modeled with the emissions described in **Table 2-9** and the stack parameters shown in **Table 3-8**. Each of the RFD sources, were modeled as a single volume source with the parameters described in **Table 4-2.** Based on the coarse grid cell resolution of WRF/CALPUFF, it is expected that collocating all sources into a single low-level source will provide robust and conservative source impacts.

Figure 4-1 CALPUFF Domain and Modeled Receptor Locations

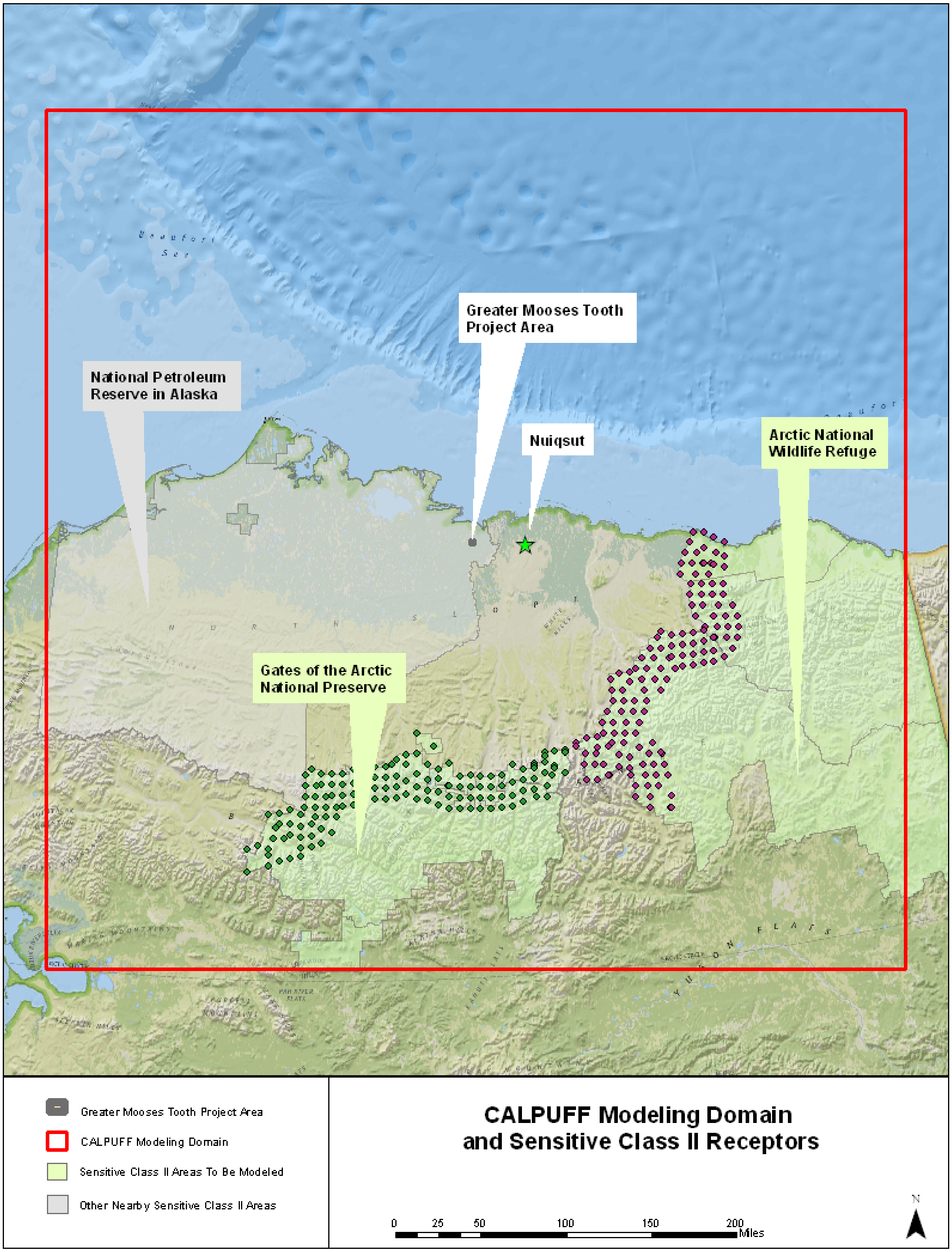


Table 4-1 Class II Areas of Concern

Area of Concern	Managing Agency	PSD Classification
Gates of the Arctic	National Park Service	II
Alaska National Wildlife Refuge	Fish and Wildlife Service	II
Nuiqsut	Alaska Department of Environmental Conservation	II

Table 4-2 RFD Far-field Source Parameters

Release Height (m)	Sigma-Y (m)	Sigma-Z (m)
10	2.33	2.33

4.3 Receptors

The CALPUFF model receptors for the areas listed in **Table 4-1** are shown in **Figure 4-1**. The Class II receptors were obtained from the 2012 NPRA Integrated Activity Plan (IAP)/EIS (BLM 2012) CALPUFF modeling. A single receptor was also placed in the community of Nuiqsut to represent cumulative impacts at that location. The receptors located within the Class II areas of concern have sufficient buffer for potential recirculation effects.

4.4 Meteorological Input Data and Processing

Three years (2007, 2008 and 2009) of the Weather Research and Forecasting (WRF) meteorological model output produced by the Bureau of Ocean and Energy Management (BOEM) (Zhang et al. 2013) was used as the meteorological dataset for input into the CALPUFF modeling.

The WRF data was extracted for the air quality modeling domain and processed into CALPUFF-ready format using the MMIF meteorological preprocessor. MMIF version 2.3 was updated version 2.3p1 by the USFS to include look-up tables for the Moderate Resolution Imaging Spectroradiometer (MODIS) land use categories that were used in the WRF analysis. During MMIF processing, two corrupt hours of WRF data were identified (October 23, 2007 hour 24 and March 5, 2009 hour 17) and after discussion with USEPA Region 10 and the USFS, removed from the MMIF processing. As a result, CALPUFF was run with the years 2007 and 2009 split into two separate periods. The location of the extracted CALPUFF domain is shown in **Figure 4-1**.

The WRF model output was processed with MMIF with the following options selected:

- Output for CALPUFF version 5.8;
- The WRF vertical layers will be interpolated to the FLM/USEPA-recommended vertical layers using the TOP option;
- The Pasquill- Gifford stability classes will be calculated with the Golder option; and
- Planetary boundary layer heights were recalculated.

CALPUFF was run in the same polar stereographic projection and 10-kilometer spatial resolution as the WRF data. The number and depth of vertical layers is consistent with USEPA specifications (USEPA 2009).

4.5 Ozone and Ammonia Data

Representative ozone and ammonia data is required for use in the chemical transformation of primary pollutant emissions. Ozone is used by CALPUFF to oxidize NO_x and SO_2 emissions within the modeling domain to nitric acid and sulfuric acid, respectively. The predicted nitric acid and sulfuric acid are then partitioned in CALPUFF between the gaseous and particulate nitrate and sulfate phases based on the available ammonia, ambient temperature and relative humidity.

Hourly ozone data from the Nuiqsut station collected from 2008 through 2012 was processed into monthly averages for input into the CALPUFF model and was described in Section 3.5.2 and is provided in **Table 3-5**. A value of 1.0 ppb for each month of the year was used as a conservative model input for ammonia. Based on a literature review for representative ammonia values in the area, provided in Appendix C of the GMT1 Alternative A AQIA, a 1.0 ppb value is highly conservative.

4.6 Air Quality

The CALPOST processor was used to obtain the appropriate averaging period for each criteria pollutant. Years 2007 and 2009 were each modeled in two separate periods separated by the erroneous WRF file, therefore, the two ‘period’ averages was obtained to conservatively represent the annual average. All air quality impacts presented in Chapter 5 are the maximum impacts from each of the 3 years (or 5 total periods due to 2007 and 2009 each having 2 periods per year).

For both the PM_{10} and $PM_{2.5}$ air quality impacts, the elemental carbon, secondary organic aerosol, secondary nitrates and secondary sulfates were combined to create a total Particulate Matter (PM) species that included both primary and secondary particulates.

4.7 Visibility

CALPUFF predicted 24-hour concentrations of nitrate, sulfate, PM_{10}, $PM_{2.5}$ and elemental carbon at each of the analyzed Class II receptors were processed using CALPOST following the procedures described in the FLAG 2010 document to estimate potential change in light extinction. This method uses seasonal natural background visibility conditions and monthly relative humidity factors provided in the FLAG 2010 report. Since natural background and relative humidity factors are only provided for Class I PSD areas in FLAG, the values from the closest Class I area, Denali National Park, were used for both Class II areas.

4.8 Deposition

The POSTUTIL and CALPOST processor were used to determine annual deposition of total Sulfur and total Nitrogen from CALPUFF modeled deposition results at each Class II area of concern. The results are expressed in kilograms per hectare per year (kg/ha/yr).

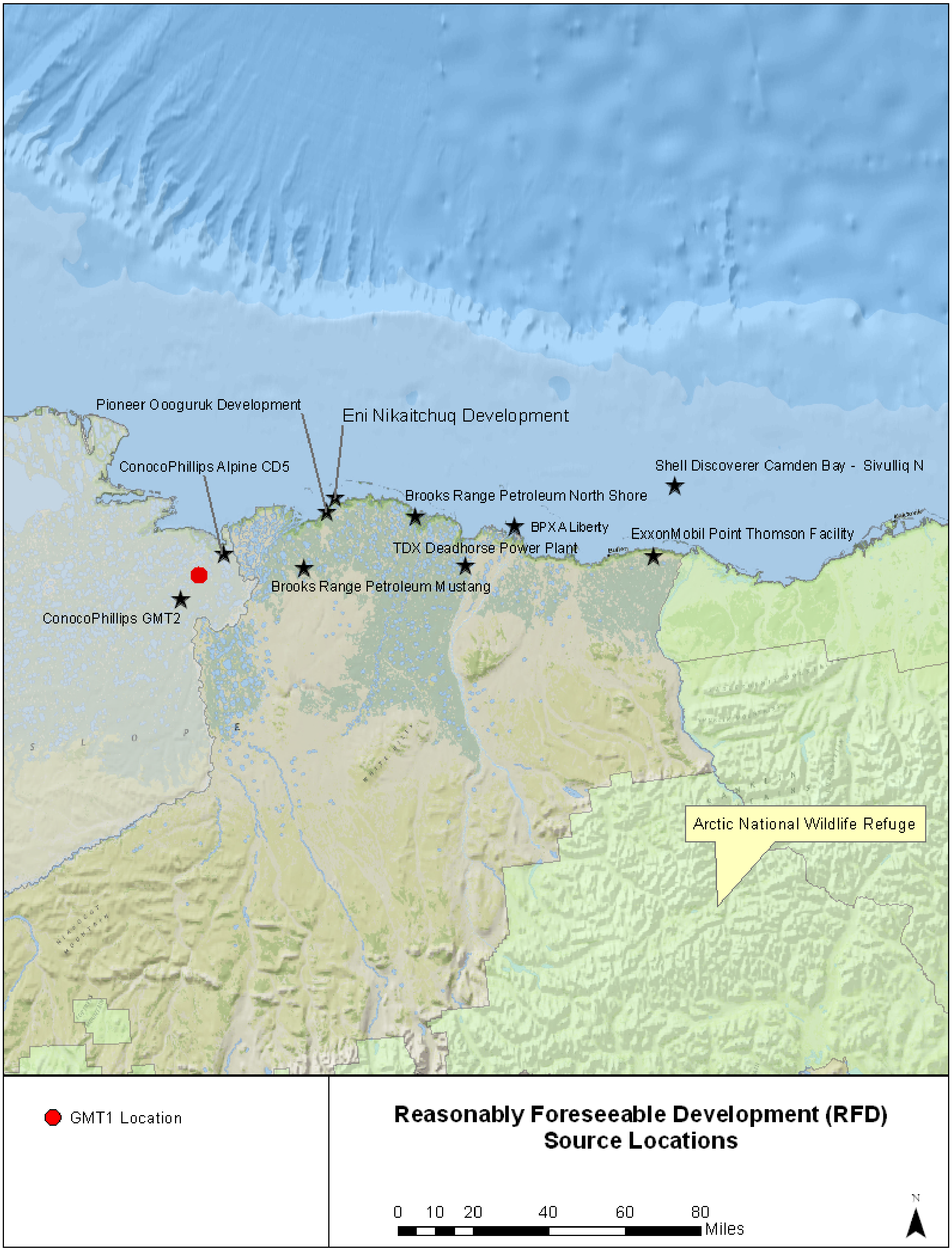
4.9 Reasonably Foreseeable Development Sources

As discussed in detail in Chapter 2, publicly available project information was reviewed to identify potential RFD sources. These sources were modeled using the same meteorology as the GMT1 Project sources. The predicted impacts from the GMT1 Project and RFD sources were combined so that a cumulative impact could be assessed. The RFD sources and their emissions are provided in **Table 4-3** below. The RFD sources were modeled with the source parameters provided in **Table 4-2**. Elevations for the RFD sources were obtained from the elevation of the WRF/CALPUFF grid cell in which they were located. The locations of the RFD sources are provided in **Figure 4-2**.

Table 4-3 Reasonably Foreseeable Development Emissions

Facility	SO_2 (g/s)	NO_x (g/s)	PM_{10} (g/s)	$PM_{2.5}$ (g/s)
Shell Discoverer Camden Bay	0.25	86.9	5.2	5.04
Eni Nikaitchuq Development	1.59	6.47	0.93	0.93
TDX Deadhorse Power Plant	0.49	11.03	0.43	0.43
Pioneer Oooguruk Development	2.12	6.96	1.01	1.04
Brooks Range Petroleum North Shore	0.24	2.55	0.07	0.07
ConocoPhillips Alpine CD5	0.65	2.69	0.12	0.12
ExxonMobil Point Thomson Facility	0.88	4.61	0.58	0.58
ConocoPhillips GMT2	0.26	5.30	0.19	0.19
Brooks Range Petroleum Mustang	0.11	1.03	0.10	0.10
BPXA Liberty	2.51	10.25	0.54	0.51

Figure 4-2 Reasonably Foreseeable Development Source Locations



5.0 Ambient Air Quality Impact Analysis Results

The results of the ambient air quality dispersion modeling analyses for the Roadless Alternative of the GMT1 Project are presented in this Chapter. Both near-field and far-field analyses are discussed below. The analyses were conducted according to the technical approaches, source emission rates, and stack parameters presented in Chapters 2, 3, and 4.

5.1 Near-field Dispersion Model Impacts

5.1.1 Criteria Pollutant Cumulative Impact Analysis

The results of the GMT1 Project Roadless Alternative criteria pollutant cumulative impact analysis for scenarios with activities occurring on or near the wellsite are compared to the NAAQS/AAAQS in **Table 5-1** through **Table 5-3**. The Infill Drilling, Access Road and Pad Construction, and Well Intervention scenarios show compliance with the NAAQS/AAAQS for all pollutants/averaging periods with the exception of particulate emissions.

For the 3 scenarios, the high 24-hour PM_{10} impacts shown in the tables can be attributed to fugitive dust associated with windblown and vehicular/aircraft disturbance of dirt on the pad, hangar, and runway located at the airstrip. These emission sources are also culpable for the high 24-hour $PM_{2.5}$ impacts for the Access Road and Pad Construction scenario as well as high annual $PM_{2.5}$ impacts for the Infill Drilling scenario. It should be noted that the seasonal refinement to the fugitive dust sources described in Section 3.7 was not applied to modeling of annual $PM_{2.5}$ so that results of the Roadless Alternative could be easily compared to the results presented for GMT1 Alternative A. If the seasonal refinement were applied, it is expected that the annual $PM_{2.5}$ impacts for the Infill Drilling scenario would demonstrate compliance with the NAAQS/AAAQS.

Table 5-4 provides model predicted criteria pollutant impacts for activities associated with the Clover Material Source. This table shows these activities demonstrate compliance with the NAAQS/AAAQS for all criteria pollutants and averaging periods with the exception of 24-hour $PM_{2.5}$. Tailpipe emissions from construction equipment are culpable for the high 24-hour $PM_{2.5}$ impacts.

For the three scenarios with activities on or near the GMT1 wellsite as well as the Clover Material Source activity, dispersion modeling was also conducted using a single receptor representing the community of Nuiqsut. **Table 5-5** provides the results, indicating compliance with the NAAQS/AAAQS for all scenarios, for all criteria pollutants and averaging periods.

5.1.2 Criteria Pollutant PSD Class II Increment Impact Analysis

The results of the GMT1 Project Roadless Alternative criteria pollutant increment analysis for the Infill Drilling scenario are compared to the PSD Class II Increments in **Table 5-6**. The Infill Drilling scenario was selected because all other scenarios represent temporary activities not typically assessed as part of an increment analysis.

Table 5-1 GMT1 Project Cumulative Impacts Compared to Established Ambient Criteria for Infill Drilling – Roadless Alternative

Pollutant	Averaging Period	Rank [1]	Maximum Model Predicted Concentration (µg/m^3)	Ambient Background (µg/m^3)	Total (µg/m^3)	NAAQS/ AAAQS (µg/m^3)	% of NAAQS/ AAAQS
CO	1-hour	H2H	861	1,488	2,349	40,000	6%
	8-hour	H2H	420	1,259	1,680	10,000	17%
SO_2	1-hour	99th	3.87	7.7	12	196	6%
	3-hour	H2H	3.84	18	21	1,300	2%
	24-hour	H2H	3.23	6.8	10	365	3%
	Annual	MAX	0.469	0.34	0.81	80	1%
NO_2	1-hour	98th	118	38	155	188	83%
	Annual	MAX	39.6	2.9	42	100	42%
PM_{10}	24-hour	H6H	104	48	152	150	**102%**
$PM_{2.5}$	24-hour	H8H	27.5	7.1	35	35	99%
	Annual	MAX	10.9	2.2	13	12	**109%**

[1] H1H: Highest value across all five modeled years.

H2H: Highest Second Highest value across all five modeled years.

H6H: Highest Sixth Highest value across all five modeled years.

H8H: Highest Eighth Highest value (98th percentile) averaged across all five modeled years.

98th: Average across all five modeled years of the 98th percentile of 1-hour daily maximum predicted concentrations.

99th: Average across all five modeled years of the 99th percentile of 1-hour daily maximum predicted concentrations.

MAX: Maximum period impact from among all individual modeled years.

Table 5-2 GMT1 Project Cumulative Impacts Compared to Established Ambient Criteria for Well Intervention – Roadless Alternative

Pollutant	Averaging Period	Rank [1]	Maximum Model Predicted Concentration (μg/m³)	Ambient Background (μg/m³)	Total (μg/m³)	NAAQS/ AAAQS (μg/m³)	% of NAAQS/ AAAQS
CO	1-hour	H2H	495	1,488	1,983	40,000	5%
	8-hour	H2H	328	1,259	1,587	10,000	16%
SO_2	1-hour	99th	3.87	7.7	12	196	6%
	3-hour	H2H	3.84	18	21	1,300	2%
	24-hour	H2H	3.23	6.8	10	365	3%
	Annual	MAX	0.421	0.3	0.76	80	1%
NO_2	1-hour	98^{th}	128	38	165	188	88%
	Annual	MAX	9.88	2.9	13	100	13%
PM_{10}	24-hour	H6H	104	48	152	150	**102%**
$PM_{2.5}$	24-hour	H8H	27.4	7.1	35	35	99%
	Annual	MAX	4.83	2.2	7.0	12	59%

[1] H1H: Highest value across all five modeled years.

H2H: Highest Second Highest value across all five modeled years.

H6H: Highest Sixth Highest value across all five modeled years.

H8H: Highest Eighth Highest value (98^{th} percentile) averaged across all five modeled years.

98th: Average across all five modeled years of the 98^{th} percentile of 1-hour daily maximum predicted concentrations.

99th: Average across all five modeled years of the 99^{th} percentile of 1-hour daily maximum predicted concentrations.

MAX: Maximum period impact from among all individual modeled years.

Table 5-3 GMT1 Cumulative Impacts Compared to Established Ambient Criteria for Pad and Access Road Construction – Roadless Alternative

Pollutant	Averaging Period	Rank [1]	Maximum Model Predicted Concentration (μg/m^3)	Ambient Background (μg/m^3)	Total (μg/m^3)	NAAQS/ AAAQS (μg/m^3)	% of NAAQS/ AAAQS
CO	1-hour	H2H	1,820	1,488	3,308	40,000	8%
	8-hour	H2H	1,206	1,259	2,465	10,000	25%
SO_2	1-hour	99th	3.99	7.7	12	196	6%
	3-hour	H2H	4.10	18	22	1,300	2%
	24-hour	H2H	2.13	6.8	8.9	365	2%
	Annual	MAX	0.113	0.3	0.45	80	1%
NO_2	1-hour	98th	166	AERMOD [2]	166	188	88%
	Annual	MAX	28.5	2.9	31	100	31%
PM_{10}	24-hour	H6H	104	48	152	150	**102%**
$PM_{2.5}$	24-hour	H8H	36.8	7.1	44	35	**125%**
	Annual	MAX	6.09	2.2	8.3	12	69%

[1] H1H: Highest value across all five modeled years.

H2H: Highest Second Highest value across all five modeled years.

H6H: Highest Sixth Highest value across all five modeled years.

H8H: Highest Eighth Highest value (98th percentile) averaged across all five modeled years.

98th: Average across all five modeled years of the 98th percentile of 1-hour daily maximum predicted concentrations.

99th: Average across all five modeled years of the 99th percentile of 1-hour daily maximum predicted concentrations.

MAX: Maximum period impact from among all individual modeled years.

[2] Seasonally varying background was included as an input to the model run; therefore, a single ambient background concentration was not added in order to determine the cumulative impact.

Table 5-4 GMT1 Project Cumulative Impacts Compared to Established Ambient Criteria for Activities within the Clover Material Source – Roadless Alternative

Pollutant	Averaging Period	Rank [1]	Maximum AERMOD Predicted Concentration (µg/m^3)	Ambient Background (µg/m^3)	Total (µg/m^3)	NAAQS/ AAAQS (µg/m^3)	% of NAAQS/ AAAQS
CO	1-hour	H2H	1,884	1,488	3,373	40,000	8%
	8-hour	H2H	1,227	1,259	2,487	10,000	25%
SO_2	1-hour	99th	16.0	7.7	24	196	12%
	3-hour	H2H	28.3	18	46	1,300	4%
	24-hour	H2H	6.57	6.8	13	365	4%
	Annual	Max	0.116	0.3	0.46	80	1%
NO_2	1-hour	98th	145	38	183	188	97%
	Annual	Max	38.4	2.9	41	100	41%
PM_{10}	24-hour	H1H	52.4	48	101	150	67%
$PM_{2.5}$	24-hour	H1H	28.3	7.1	35	35	**101%**
	Annual	Max	3.97	2.2	6.2	12	51%

[1] H1H: Highest value across all five modeled years.

H2H: Highest Second Highest value across all five modeled years.

98th: Average across all five modeled years of the 98th percentile of 1-hour daily maximum predicted concentrations.

99th: Average across all five modeled years of the 99th percentile of 1-hour daily maximum predicted concentrations.

MAX: Maximum period impact from among all individual modeled years.

Table 5-5 GMT1 Project Cumulative Impacts Compared to Established Ambient Criteria at the Community of Nuiqsut

Pollutant	Averaging Period	Rank	Maximum AERMOD Predicted Concentrations (µg/m^3) Infill Drilling	Well Interv.	Pad & Access Road Constr.	Clover Material Source	Max	Ambient Background (µg/m^3)	Total (µg/m^3)	NAAQS/ AAAQS (µg/m^3)	% of NAAQS/ AAAQS
CO	1-hour	H2H	81.5	176	26.7	24.0	176	1,488	1,664	40,000	4%
	8-hour	H2H	10.4	26.2	4.34	3.54	26.2	1,259	1,286	10,000	13%
SO_2	1-hour	99th	0.0562	1.40	0.0678	0.0535	1.40	7.7	9.1	196	5%
	3-hour	H2H	0.0752	1.08	0.0429	0.0367	1.08	18	19	1,300	1%
	24-hour	H2H	0.0119	0.194	0.008	0.0069	0.194	6.8	7.0	365	2%
	Annual	MAX	0.00009	0.00110	0.00038	0.0002	0.0011	0.3	0.34	80	0%
NO_2	1-hour	98th	86.6	103	46.4	50.6	103	38	141	188	75%
	Annual	MAX	0.0256	0.113	0.056	0.014	0.113	2.9	3.0	100	3%
PM_{10}	24-hour	H6H	0.644	1.12	0.565	0.533	1.12	48	49	150	33%
$PM_{2.5}$	24-hour	H1H	0.529	0.744	0.228	0.205	0.744	7.1	7.8	35	22%
	Annual	MAX	0.0084	0.0062	0.0134	0.0075	0.0134	2.2	2.2	12	19%

[1] H1H: Highest value across all five modeled years.

H2H: Highest Second Highest value across all five modeled years.

98th: Average across all five modeled years of the 98th percentile of 1-hour daily maximum predicted concentrations.

99th: Average across all five modeled years of the 99th percentile of 1-hour daily maximum predicted concentrations.

MAX: Maximum period impact from among all individual modeled years.

Table 5-6 GMT1 Project Impacts Compared to the Class II PSD Increments for Infill Drilling – Roadless Alternative

Pollutant	Averaging Period	Rank [1]	Maximum Model Predicted Concentration (µg/m^3)	Class II PSD Increments
SO_2	3-hour	H2H	3.8	512
	24-hour	H2H	3.2	91
	Annual	MAX	0.47	20
NO_2	Annual	MAX	40	25
PM_{10}	24-hour	H2H	112	30
	Annual	MAX	101	17
$PM_{2.5}$	24-hour	H2H	73	9
	Annual	MAX	11	4

[1] H2H: Highest Second Highest value across all five modeled years.
MAX: Maximum period impact from among all individual modeled years.

5.1.3 Impacts at the Alpine CPF Resulting from Increased Power Demand

Under the Roadless Alternative, and assuming that GMT2 will be constructed as Reasonably Foreseeable Development. **Section 2.3** indicates that a new turbine will need to be installed at the Alpine CPF. Considering the emissions increases discussed in **Section 2.3**, installing this turbine will require obtaining a construction permit from the State of Alaska, which will require an ambient air quality impact analysis to be submitted with the permit application. This new turbine would be installed at the Alpine CPF.

Since this turbine is part of reasonably foreseeable development, the potential impact this new turbine may have on ambient air quality in the near-field of the Alpine CPF was analyzed. This analysis has been conducted based on a review of the permitted allowable emissions for the Alpine CPF in relation to the current ambient air quality concentration measurements at the facility's CD1 ambient monitoring station, and the potential impacts on ambient air quality if the new turbine is constructed.

The analysis presented below consisted of reviewing the most likely constraining criteria pollutant from the proposed turbine, which is anticipated to be 1-hour NO_2. Measured recent ambient NO_2 concentrations were evaluated against the existing Alpine CD1 facility potential to emit (PTE) for NO_x with the assumption that new turbine NO_x emissions would directly contribute to ambient NO_2 concentrations. This is a conservative assumption given the low ambient ozone concentrations. The period of record reviewed for the CD1 ambient monitoring station was October 1, 2012 through June 30, 2013 which is the only data available from the station. However, during this period, production and power demand was as high as it has ever been historically, and a drill rig was operating at the Alpine CPF well line (Alpine CD1). Therefore, measurements during this period should be representative of historical maximums.

A brief review of another large North Slope production facility's emissions (Central Compression Plant [CCP]) and the corresponding CCP ambient monitoring data is also presented. This facility has very similar equipment, but much higher emissions than the Alpine CPF which, in conjunction with the CCP ambient monitoring concentrations, support the conclusions that the NAAQS/AAAQS would not be exceeded if the new turbine were constructed at the Alpine CPF.

Alpine CPF Emissions and Ambient Monitoring Data Analysis

The Alpine CPF PTE for relevant criteria pollutants are presented in **Table 5-7**. NO_x emissions comprise the majority of the current facility allowable emissions.

Table 5-7 Alpine CPF Facility Potential to Emit

PTE (tons/year)			
NO_X	**CO**	**PM_{10}**	**SO_2**
2,167	324	43	151

Reproduced from Table A of ADEC's July 1, 2003 Statement of Basis for Permit No. 489TVP01.

The proposed new turbine is estimated to emit 70 tons per year (tpy) of NO_x. This represents a 3.2 percent increase in NO_x emissions for the Alpine CPF. For purposes of this analysis, it was conservatively assumed that 100 percent of the new turbine emitted NO_x will be converted to NO_2 upon release from the turbine stack. To assess the potential impact of the new turbine on ambient NO_2 concentrations, an analysis of the current NO_2 ambient concentrations was conducted for wind directions that will coincide with the new turbine's location on the Alpine CPF pad.

Figure 5-1 shows a wind rose for the CD1 monitoring station, which is located directly southwest of the Alpine CPF production sources and the likely location of the proposed new turbine. Measured ambient NO_2 concentrations were reviewed for wind directions from 33.8 degrees through 101.3 degrees (the north-northeasterly through easterly directions). These wind directions are the directions from which the majority of Alpine CPF facility emissions transport toward the monitoring station. The highest 1-hour NO_2 concentration from this sector was 73 parts per billion (ppb) and occurred when winds were blowing from 99.1 degrees (the east-southeasterly direction).

If the new turbine were constructed, the Alpine CPF NO_x PTE would be 2,237 tpy. Assuming that the maximum 1-hour NO_2 concentration of 73 ppb is attributed entirely to the Alpine CPF current allowable emissions of 2,167 tpy of NO_x, the future ambient 1-hour NO_2 could be estimated by scaling up the maximum 73 ppb concentration by the ratio of the new NO_x PTE to the current NO_x PTE. This ratio is (2,237/2,167), or 1.032. The resulting future estimated 1-hour NO_2 concentration would therefore be 75 ppb, which is below the NAAQS/AAAQS of 100 ppb, and a change almost too small to measure. Evaluation of the maximum 1-hour NO_2 concentration in this way would yield a higher value than the design concentration for the 1-hour NO_2 NAAQS/AAAQS, which is defined as the 3-year average of the 98^{th} percentile of the annual distribution of the daily maximum 1-hour concentrations. Therefore, 75 ppb is a conservative estimate.

CCP Emissions and CCP Ambient Monitoring Data Analysis

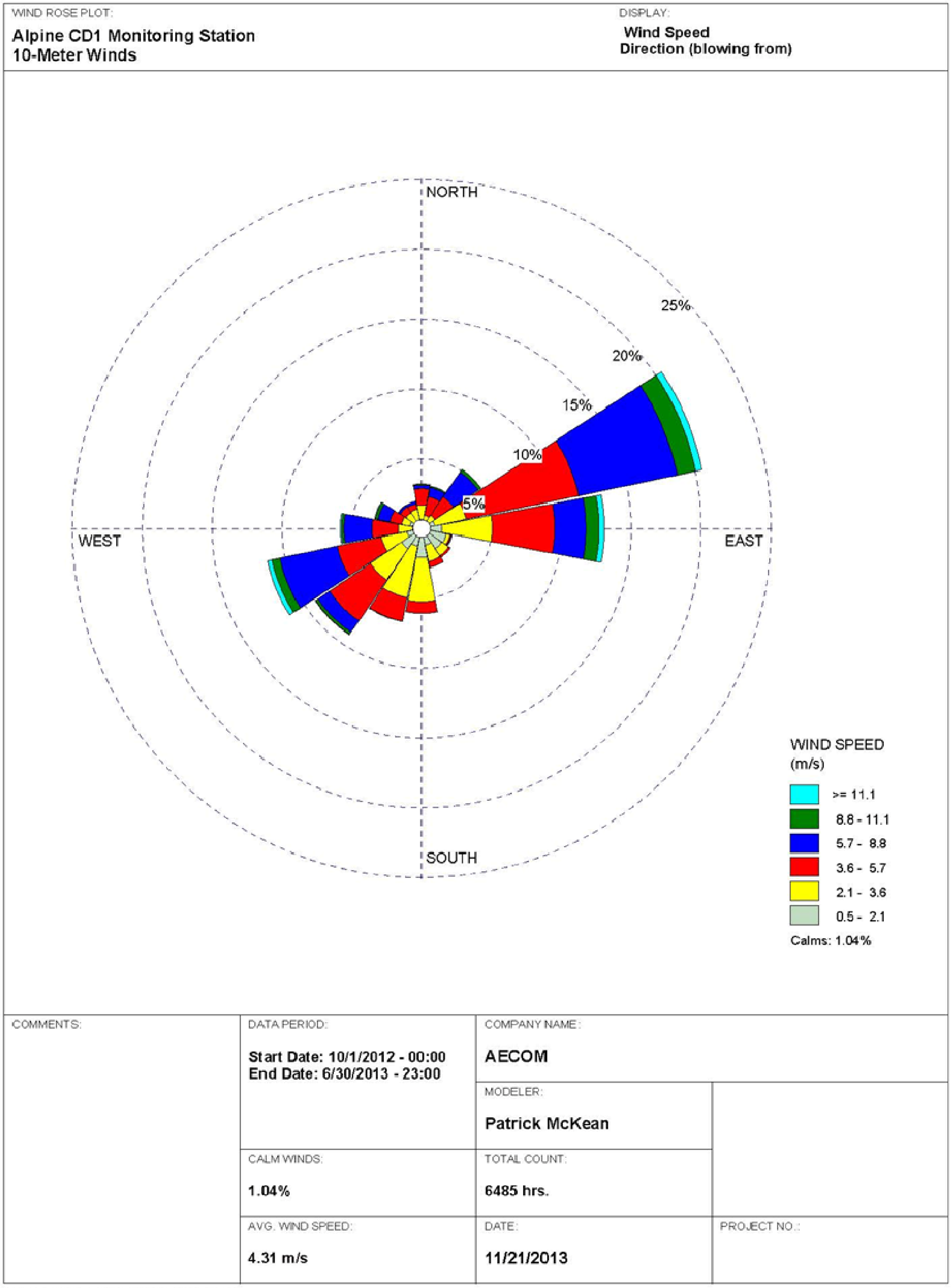
The CCP PTE for criteria pollutants are presented in Error! Reference source not found.. NO_x emissions comprise the majority of the facility's allowable emissions.

Table 5-8 CCP Facility Potential to Emit

PTE (tons/year)			
NO_x	**CO**	**PM_{10}**	**SO_2**
14,238	1,630	347	147

Reproduced from Table A of ADEC's June 18, 2003 Statement of Basis for Permit No. 166TVP01.

Figure 5-1 Windrose Based on the Alpine CD1 Monitoring Station Data



Similar to the Alpine CD1 evaluation, 1-hour NO_2 is assumed to be the most constraining pollutant at the CCP monitoring station. Review of calendar year 2008 through 2011, 1 hour highest-eight-high (H8H) NO_2 concentrations measured at the CCP monitoring station showed a maximum value of 94.5 ppb, which is below the 1-hour NO_2 NAAQS/AAAQS of 100 ppb. This monitoring station was specifically located in an area where modeling predicts the maximum H8H 1-hour NO_x should occur. During this hour, winds were 15.2 m/s and blowing from the east-northeast (75°) placing the monitoring station directly downwind of CCP; therefore, this impact is representative of maximum impacts from a facility with NO_x PTE on the order of 14,000 tons per year. Given these emissions are 6 times higher than the NO_x potential to emit after the turbine is installed at the Alpine CPF, this is a clear indication that the 1-hour NO_2 NAAQS/AAAQS would not be exceeded at the Alpine CPF.

An analysis of Alpine CPF emissions and ambient monitoring data, shows that 1-hour NO_2 impacts from the proposed turbine in combination with existing Alpine CPF permitted emissions will likely be below 75 ppb and will not exceed the NAAQS/AAAQS. Since 1-hour NO_2 is expected to be the most constraining pollutant, this conclusion is extended to the other pollutant's ambient standards. This conclusion is supported by the analysis of CCP facility emissions and measured ambient 1-hour NO_2 concentrations at the CCP monitoring station. The CCP NO_x emissions are 6 times higher than the new NO_X PTE after the turbine is installed at the Alpine CPF, and would indicate that the 1-hour NO_2 NAAQS/AAAQS would not be exceeded at the Alpine CPF.

5.1.4 Air Toxics Impact Analysis

The full list of HAPs calculated for the project activities were provided in the digital version of the project emissions inventory. The list of HAPs to be modeled (benzene, ethylbenzene, toluene, xylene, formaldehyde and n-hexane) has been developed over the years and agreed upon by the agency stakeholders involved with NEPA actions for oil and gas development projects. This list of modeled HAPs contains the substances of highest concern among the agency stakeholders for oil and gas projects, and were therefore, modeled for this project. This list of modeled toxics was also indicated in BLM's direction for this project during the project planning phase.

As described in Chapter 3, AERMOD dispersion modeling was also used to assess short-term (acute) exposure as well as long-term risk from air toxics. Short-term (1-hour) air toxics concentrations were compared to acute Reference Exposure Levels (RELs), as shown in **Table 5-9**. RELs are defined as concentrations at or below which no adverse health effects are expected. No RELs are available for ethyl benzene and n-hexane; instead, the available Immediately Dangerous to Life or Health divided by 10 (IDLH/10) values were used. These IDLH values are determined by the National Institute for Occupational Safety and Health and were obtained from USEPA's Air Toxics Database (USEPA 2011). These values are approximately comparable to mild effects levels for 1-hour exposures. **Table 5-9** provides the acute exposure assessment. Maximum modeled 1-hour concentrations were below the criteria levels for each of the air toxics evaluated.

Table 5-9 also provides the non-carcinogenic long-term exposure assessment, where annual modeled concentrations for each of the air toxics were compared directly to the Reference Concentrations for Chronic Inhalation (RfCs). An RfC is defined by USEPA as the continuous inhalation exposure concentration at which no long-term adverse health effects are expected (USEPA 2012b). Annual modeled concentrations were below the RfCs for each of the air toxics evaluated.

An air toxics impact analysis was also performed for the single receptor representing the Nuiqsut Community. **Table 5-10** shows that maximum modeled 1-hour and annual concentrations were below the criteria levels at the Nuiqsut Community receptor for each of the air toxics evaluated.

Table 5-9 Air Toxics Acute Exposure Assessment and Long-term Non-carcinogenic Exposure Assessment at the GMT1 Pad Edge – Roadless Alternative

Pollutant	REL (1-hour) (µg/m³)	Maximum Modeled 1-hour Concentration (µg/m³)	Non-carcinogenic RfC[3] (Annual) (µg/m³)	Maximum Modeled Annual Concentration (µg/m³)
Benzene	1,300 [1]	3.3	30	0.10
Ethyl benzene	350,000 [2]	0.52	1,000	0.013
Formaldehyde	55 [1]	8.1	9.8	0.43
n-Hexane	390,000 [2]	69	700	0.49
Toluene	37,000 [1]	2.6	5,000	0.040
Xylene	22,000 [1]	1.1	100	0.034

[1] USEPA Air Toxics Database, Table 2 (USEPA 2011).

[2] No REL available for these air toxics. Values shown are from (IDLH/10), USEPA Air Toxics Database, Table 2 (USEPA 2011).

[3] USEPA Air Toxics Database, Table 1 (USEPA 2012b).

Table 5-10 Air Toxics Acute Exposure Assessment and Long-term Non-carcinogenic Exposure Assessment for Nuiqsut Community Receptor – Roadless Alternative

Pollutant	REL (1-hour) (µg/m³)	Maximum Modeled 1-hour Concentration (µg/m³)	Non-carcinogenic RfC[3] (Annual) (µg/m³)	Maximum Modeled Annual Concentration (µg/m³)
Benzene	1,300 [1]	0.19	30	1.10E-04
Ethyl benzene	350,000 [2]	0.03	1,000	1.00E-05
Formaldehyde	55 [1]	0.40	9.8	3.20E-04
n-Hexane	390,000 [2]	3.89	700	3.40E-04
Toluene	37,000 [1]	0.15	5,000	5.00E-05
Xylene	22,000 [1]	0.06	100	3.00E-05

[1] USEPA Air Toxics Database, Table 2 (USEPA 2011).

[2] No REL available for these air toxics. Values shown are from (IDLH/10), USEPA Air Toxics Database, Table 2 (USEPA 2011).

[3] USEPA Air Toxics Database, Table 1 (USEPA 2012b).

Long-term cancer risk was analyzed by applying USEPA's unit risk factors (based on 70-year exposure) and an adjustment factor to the annual modeled concentrations. The adjustment factor represents the ratio of projected exposure time to 70 years. Two exposure scenarios were evaluated: a most likely exposure (MLE) scenario and one reflective of the maximally exposed individual (MEI).

The MLE exposure duration was assumed to be 30 years, which corresponds to the mean duration that a family remains at a residence **and** is exposed to project emissions. Since the life of the project is expected to be 30 years, and shorter than the mean duration a family remains at a residence in Nuiqsut, 30 years was used. This duration corresponds to an adjustment factor of 30/70 = 0.43. The duration of exposure for the MEI is also assumed to be 30 years (i.e., the Life of Project), corresponding to an adjustment factor of 30/70 = 0.43.

A second adjustment was made for time spent at home versus time spent elsewhere. Since individuals in the community of Nuiqsut will typically stay within or near the community nearly all the time, for the MLE scenario, the at-home time fraction is 100%. Therefore, the MLE adjustment factor was (0.43 x 1.0) = 0.43. The MEI scenario also assumed that the individual is at home 100 percent of the time, for a final adjustment factor of (0.43 x 1.0) = 0.43.

The long-term cancer risk assessment and adjustment factors are based on exposure of individuals where they live. Therefore, this assessment has been carried out using annual GMT1 impacts predicted within the community of Nuiqsut. After the unit risk factors and adjustment factors were applied to the annual modeled concentrations, the cancer risk for each constituent was summed to provide an estimate of the total inhalation cancer risk. **Table 5-11** shows that the total cancer risk for both the MLE and MEI scenarios are less than 1.0E-06 in the community of Nuiqsut which represents a less than one-in-one-million cancer risk.

Table 5-11 Air Toxics Long-term Cancer Risk Analysis for Nuiqsut Community Receptor – Roadless Alternative

Exposure Scenario[1]	Pollutant	Maximum Modeled Annual Concentration (μg/m^3)	Carcinogenic Unit Risk Factor[2] (1/μg/m^3)	Exposure Adjustment Factor	Cancer Risk
MLE	Benzene	1.1E-04	7.8E-06	0.43	3.7E-10
MLE	Ethyl benzene	1.0E-05	2.5E-06	0.43	1.1E-11
MLE	Formaldehyde	3.2E-04	1.3E-05	0.43	1.8E-09
				Total Inhalation Cancer Risk	**2.2E-09**
MEI	Benzene	1.1E-04	7.8E-06	0.43	3.7E-10
MEI	Ethyl benzene	1.0E-05	2.5E-06	0.43	1.1E-11
MEI	Formaldehyde	3.2E-04	1.3E-05	0.43	1.8E-09
				Total Inhalation Cancer Risk	**2.2E-09**

1 MLE = most likely exposure; MEI = maximally exposed individual.

2 USEPA Air Toxics Database, Table 1 (USEPA 2012b).

5.1.5 Ambient Ozone Cumulative Impact Analysis

Currently, there is no USEPA-recommended modeling approach for conducting an ozone ambient air quality impact analysis for this project. Therefore, to understand potential project impacts to existing ambient ozone concentrations several aspects of the ozone conditions on the Alaskan North Slope have been investigated and summarized. This includes a review of the recent emission trends of ozone precursors, a review of existing monitoring data, and a review of recent literature that details polar ozone trends and chemistry. From this analysis it is clear that regional ozone concentrations are low, well below the NAAQS/AAAQS, and not correlated to levels of anthropogenic precursor emissions. From this it is easy to conclude that the small increase in regional precursor emissions that occur as a result of the project will have negligible effect on existing background ozone concentrations; therefore, regional ozone levels will remain well below the NAAQS/AAAQS.

An analysis of recent ozone observations at locations on the Alaskan North Slope indicate that the maximum 1-hour concentration was 73 ppbv while the maximum 8-hour measurement was 50 ppbv. The hourly concentration represents 61 percent of the hourly NAAQS/AAAQS while the 8-hour concentration represents 67 percent of the 8-hour NAAQS/AAAQS (Shell 11/23/09 Supp. App.).

These ozone levels are typical of the long term trend which shows that regional ozone levels have remained low and essentially unchanged even in light of significant changes to regional precursor production leading to the conclusion that regional ozone levels are poorly correlated to regionally produced anthropogenic precursor emissions. Substantial oil production began at Prudhoe Bay in 1977 resulting in the start of a significant increase in ozone precursors from anthropogenic sources in North Slope Borough. Since that time the magnitude of these anthropogenic precursor emissions increased as oil production peaked and then decreased following trends in oil production. **Table 5-12** presents the National Emission Inventory (NEI) documented emissions of ozone precursors from all sources in the North Slope Borough from 2002 through the most recent year (2011). Prior to 2002, borough level emissions data was not available and not included in this analysis. Furthermore, starting in 2011, USEPA introduced a new nationwide emissions calculation tool for non-point oil and gas sources which drastically changed reporting for VOC emissions making it very difficult to compare the 2011 NEI values to previous years. Therefore, the 2011 VOC emission value was left off the table. This table shows that even with the changes in regional precursor load, ozone trends have remained essentially unchanged.

Table 5-12 National Emissions Inventory Reported Annual Levels of Ozone Precursors for the North Slope Borough

NEI Year	NO_x [1]		VOC [1]	
	(tons/year)	Δ% from 2002	(tons/year)	Δ% from 2002
2002	41,790	0	1,932	0
2005	41,977	0.4	1,395	-28
2008	47,604	13	1,588	14
2011	47,828	0.5	NA [2]	NA

1 The NEI database is routinely updated as errors are discovered and better data becomes available. Therefore, the data is current based on a November 11, 2013 query of the NEI database, and values may be different from those reported based on previous queries. This is particularly the case for the most recent years.

2 Starting in 2011, USEPA introduced a new nationwide emissions calculation tool for non-point oil and gas sources which drastically changed reporting for VOC emissions making it very difficult to compare the 2011 NEI values to previous years; therefore, the 2011 VOC emission value was left off the table

The National Oceanic and Atmospheric Administration's (NOAA) Earth System Research Laboratory (ESRL) Global Monitoring Division (GMD) has been recording tropospheric ozone measurements since 1973 at Barrow. These observations provide a continuous and robust dataset that are useful to assess ozone trends, averages and other useful information for the North Slope area. The Barrow data was extensively analyzed by Helmig et. al. (2007) who found that over the long term, no statistically significant trend has been observed in the Barrow data although a slight increase of 0.05 (± 0.08) ppbv per year has been observed since monitoring began. This slight increase does not correlate to regional anthropogenic production of precursors which has increased and decreased over that time frame.

This lack of connection between anthropogenic precursor emissions and regional ozone levels is also demonstrated by examining diurnal ozone trends. The lack of a diurnal trend in measured ozone concentrations is an indicator that ozone production through photochemistry involving precursor emissions and sunlight is not a significant source of regional ozone. Ground level ozone is formed through many complex chemical reactions involving precursors (NO_x, VOC, and CO) and sunlight. A correlation of measured concentrations to sunlight (i.e., a diurnal trend) would be an indicator that ozone formation is the result of the presence of precursors; however, that correlation is not observed regionally on the North Slope. Again using the long-term ozone data measured at Barrow, Helmig et al., found that the ozone levels at Barrow are generally stable on an hourly, daily and a long-term average basis. On average, only 1.8 percent (± 3.1 percent) of the hourly data exceeds the 1.5 times the annual median ozone value, the criteria in the study to denote extreme high events. This lack of diurnal variation demonstrates that local formation of ozone from regional precursors is not prevalent on the North Slope.

Though it is theoretically possible for ozone production to occur regionally as a result of precursor emissions, it simply does not dominate measured ozone levels leading to the lack of sensitivity of ozone levels to regional precursor production. In terms of local ozone production, according to Helmig et al. "…models show that a considerable amount of ozone can be photochemically formed near the surface during daytime hours over polar snow." However, an analysis of the diurnal ozone pattern at Barrow indicates a very small, ~1 ppbv, amplitude within the daily ozone cycle pointing to very little local ozone formation. It is expected that the complex snow chemistry, clean (low NO_x) maritime air, enhanced ozone deposition and halogen chemistry act as ozone sinks and negate any local production. In addition, monitored ozone data represent the net effects of atmospheric mixing and dynamics as opposed to an artificial surface layer in a photochemical model that cannot account for actual mixing and the known ozone sinks.

After an examination of long-term and short-term ozone trends and comparing those to trends in regional levels of anthropogenic precursors it is clear that regional ozone levels are not sensitive to changes in regional levels of anthropogenic precursor emissions. The evidence clearly indicates that small changes in regional precursor loading as a result of the GMT1 Project and RFD sources will have negligible effect on already low regional background ozone concentrations due to lack of sensitivity of regional ozone concentrations to regionally produced anthropogenic precursors.

5.1.6 Secondary $PM_{2.5}$ Formation

Secondary $PM_{2.5}$ formation is a complex photochemical reaction that requires a mix of precursor atmospheric pollutants in sufficient quantities for significant secondary formation to occur. The major precursor pollutants that result in the formation of secondary $PM_{2.5}$ are SO_2 and NO_x, although the GMT1 Project emits far more NO_x than SO_2, eliminating the need to consider sulfate formation.

The AERMOD dispersion model does not have the capability to account for secondary particulate formation when predicting particulate impacts. Therefore, secondary particulate formation is discussed qualitatively rather than quantitatively. Since the CALPUFF model can account for secondary particulate formation, this approach was not necessary in the far-field modeling analysis.

An analysis conducted by USEPA Region 10 for a similar source shows that contributions to impacts from secondary $PM_{2.5}$ formation will be small. When discussing secondary particulate formation from diesel fuel fired combustion sources, USEPA Region 10 in the Supplemental Statement of Basis Permit Noble Discoverer Drillship – Beaufort and Chukchi Sea Exploration Drilling Program (USEPA Region 10 2011), indicated that secondary formation of $PM_{2.5}$ will generally be low near the emission release point, where modeled concentrations are highest, because there has not been enough time for the secondary chemical reactions to occur. Instead, secondary $PM_{2.5}$ impacts will generally occur farther from the emission source. Applying this to the GMT1 project combustion sources, it is therefore unlikely that maximum primary $PM_{2.5}$ impacts and maximum secondary $PM_{2.5}$ impacts from GMT1 Project combustion sources will occur at the same time (paired in time) or location (paired in space), providing assurance that emissions from secondary formation of $PM_{2.5}$ will not threaten compliance with the NAAQS/AAAQS in the near-field.

Based on a review of existing monitoring data across the Alaskan North Slope, USEPA Region 10 determined that available $PM_{2.5}$ monitoring data from the onshore communities along the Beaufort and Chukchi Seas, and in potential transport areas where monitoring is performed, show low levels of $PM_{2.5}$, generally in the range of 2 $\mu g/m^3$ (USEPA Region 10 2011). USEPA Region 10 went on to say that the higher $PM_{2.5}$ values recorded on monitors in the North Slope generally occur on days where windblown dust or fires are believed to be contributing factors. Based on this information, USEPA Region 10 asserted that, there is no indication that secondary formation of $PM_{2.5}$ from existing sources in the North Slope is currently causing or contributing to a violation of the $PM_{2.5}$ NAAQS in the onshore communities.

To contrast this assessment of $PM_{2.5}$ concentrations in North Slope communities, USEPA Region 10 had the following to say about the large precursor loading from Prudhoe Bay stationary sources (USEPA Region 10 2011):

> “As a point of comparison, however, actual emissions of NO_x from point sources in the North Slope oil and gas fields near Deadhorse are approximately 65,000 tpy, yet the total (not just the secondary) $PM_{2.5}$ concentrations in Deadhorse are quite low. Given the amount of NO_x emissions to be authorized under these permits in comparison to NO_x emissions in the North Slope area in general, it is unlikely that NO_x emissions from the Discoverer and the Associated Fleet would be expected to cause or contribute to a violation of the $PM_{2.5}$ NAAQS given the generally low levels of $PM_{2.5}$ recorded at monitoring stations in the area.”

Given that GMT1 project NO_x emissions are on the order of 100 TPY during a typical production year and much less than those from the Shell Discoverer and the Associated Fleet which were permitted at 336 tpy, the statements made by USEPA Region10 with respect to the Discoverer are equally applicable to the GMT1 Project.

In summary, evidence compiled by USEPA Region 10 suggests that secondary $PM_{2.5}$ formed from precursor emissions on the Alaskan North Slope is low even in light of large precursor emissions. Therefore, precursor emissions from the relatively small GMT1 Project will not result in significant secondarily formed $PM_{2.5}$. Furthermore, excluding windblown fugitive dust contributions, the model predicted $PM_{2.5}$ impacts indicates that a significant margin of safety exists before the $PM_{2.5}$ NAAQS/AAAQS would be threatened even with the conservatism that has been built into the analysis which includes assuming that maximum direct and secondary $PM_{2.5}$ impacts occur at the same location and time. Based on this assessment, it is clear that the $PM_{2.5}$ NAAQS/AAAQS will be protected when accounting for secondary precursors and that it is not appropriate or necessary to use a photochemical model to further evaluate secondary $PM_{2.5}$ formation in this near-field AERMOD modeling exercise.

5.1.7 Lead

The primary source of lead emissions from combustion sources results from lead additives contained in some fuels and subsequently emitted during combustion. Since lead is not an additive to any source fuels, lead will only be present at trace element levels as a result of engine lubricant constituents or as a result of engine wear and will be negligible. Currently, the only liquid fuel type containing a lead additive is leaded aviation gasoline used in piston-engine aircraft which are not part of the source inventory.

Therefore, lead emissions from all GMT1 project emission units will be negligible, and source emissions will not cause or contribute to an exceedance of the lead NAAQS.

5.1.8 Near-field Conclusions

The criteria pollutant impact analysis for the Roadless Alternative demonstrates compliance with all criteria pollutant NAAQS/AAAQS for all averaging periods with the following exceptions:

- 24-hour $PM_{2.5}$ impacts exceed the NAAQS/AAAQS for the three scenarios with activities on or near the drilling pad (Infill Drilling, Well Intervention, and Access Road and Pad Construction). 24-hour PM_{10} impacts also exceed the NAAQS/AAAQS for the Access Road and Pad Construction scenario. Fugitive dust sources located at the airstrip are responsible for the high impacts.
- 24-hour PM_{10} impacts exceed the NAAQS/AAAQS for the Clover Material Source. Tailpipe emissions from construction equipment are responsible for the high impacts.

5.2 Far-field Dispersion Model Impacts

Using the modeling inputs, options and assumptions discussed in Chapters 2 and 4, the far-field modeling was executed and results are presented in the following sections. The results for both project-alone and cumulative impacts for air quality and AQRVs are provided in separate sections.

5.2.1 Project Impacts

The impacts from the GMT1 project are provided below and compared to the NAAQS/AAAQS, visibility and sulfur and nitrogen deposition at each of the Class II areas analyzed.

5.2.1.1 Air Quality

As shown in **Table 5-13** and **Table 5-14** below, the maximum GMT1 Project air quality impacts, combined with representative background air quality data, at the analyzed Class II areas are well below the applicable ambient air quality standards.

5.2.1.2 Visibility

As shown in **Table 5-15** through **Table 5-18** below, all GMT1 Project visibility impacts are well below both the 0.5 and 1.0 ddv threshold at the Class II areas analyzed.

5.2.1.3 Deposition

As shown in **Table 5-19** below, all GMT1 Project deposition impacts are well below the DAT at the Class II areas analyzed.

5.2.2 Cumulative Impacts

Cumulative impacts were assessed by combining both GMT1 Project and RFD impacts for an assessment of total air quality impacts at the Class II areas analyzed.

5.2.2.1 Air Quality

As shown in **Table 5-20** through **Table 5-22** below, the maximum cumulative air quality impacts, combined with representative background air quality data, at both Class II areas analyzed and Nuiqsut are below the applicable ambient air quality standards.

5.2.2.2 Visibility

As shown in **Table 5-23** through **Table 5-26** below, the cumulative visibility impacts exceed both the 0.5 and 1.0 ddv threshold at both Class II areas analyzed.

5.2.2.3 Deposition

As shown in **Table 5-27** below, the cumulative deposition impacts exceed the DAT at the Alaska National Wildlife Refuge for nitrogen, but are below the DAT for the Alaska National Wildlife Refuge for sulfur and for both pollutants and Gates of the Arctic.

5.3 Far-Field Analysis Conclusions

The far-field, project-only impacts are negligible with all impacts below their applicable standards and thresholds at all Class II areas analyzed.

The cumulative impacts are below the ambient air quality standards at all areas, but exceed the visibility thresholds (0.5 and 1.0 ddv) at both Gates of Arctic and the Arctic National Wildlife Refuge. Nitrogen deposition at the Alaska National Wildlife Refuge is above the DAT, but the remaining deposition impacts are below the DATs. It is likely that the cumulative impacts are controlled by the nearby offshore and onshore sources and their proximity to the Alaska National Wildlife Refuge as shown in **Figure 4-2**. It is expected that if additional model runs with refined source data were conducted, the impacts would be reduced.

Table 5-13 GMT1 Air Quality Impacts at Alaska National Wildlife Refuge – Project Only Roadless Alternative

Pollutant	Averaging Period	Maximum Predicted Impact (μg/m^3)	Ambient Background (μg/m^3)	Total Impact (μg/m^3)	NAAQS/ AAAQS (μg/m^3)	% of NAAQS/ AAAQS
NO_2	1-hour [1]	5.6E-02	38	38.1	188	20%
	Period [1, 2]	5.9E-04	2.9	2.90	100	3%
SO_2	1-hour [1]	4.5E-04	7.7	7.70	196	4%
	3-hour [1]	3.2E-04	18	18.0	1,300	1%
	24-hour [1]	1.4E-04	6.8	6.80	365	2%
	Period [1, 2]	5.6E-06	0.3	0.30	80	0%
PM_{10}	24-hour [1]	5.2E-02	48	48.1	150	32%
$PM_{2.5}$	24-hour [1]	5.2E-02	7.1	7.15	35	20%
	Period [1, 2]	2.6E-03	2.2	2.20	12	18%

[1] The maximum impacts are reported for all averaging periods.

[2] Due to the two erroneous WRF files, both 2007 and 2009 had to be run in separate periods in CALPUFF. Therefore, the reported values may represent an annual average for only 2008, while 2007 and 2009 have periods much less than 8,760 hours and conservatively represent an annual average.

Table 5-14 GMT1 Air Quality Impacts at Gates of the Arctic – Project Only – Roadless Alternative

Pollutant	Averaging Period	Maximum Predicted Impact (μg/m^3)	Ambient Background (μg/m^3)	Total Impact (μg/m^3)	NAAQS/ AAAQS (μg/m^3)	% of NAAQS/ AAAQS (%)
NO_2	1-hour [1]	2.7E-02	38	38.0	188	20%
	Period [1, 2]	7.8E-05	2.9	2.90	100	3%
SO_2	1-hour [1]	3.3E-04	7.7	7.70	196	4%
	3-hour [1]	3.0E-04	18	18.0	1,300	1%
	24-hour [1]	1.2E-04	6.8	6.80	365	2%
	Period [1, 2]	2.1E-06	0.3	0.30	80	0%
PM_{10}	24-hour [1]	7.0E-02	48	48.1	150	32%
$PM_{2.5}$	24-hour [1]	7.0E-02	7.1	7.17	35	20%
	Period [1, 2]	1.3E-03	2.2	2.20	12	18%

[1] The maximum impacts are reported for all averaging periods.

[2] Due to the two erroneous WRF files, both 2007 and 2009 had to be run in separate periods in CALPUFF. Therefore, the reported values may represent an annual average for only 2008, while 2007 and 2009 have periods much less than 8760 hours and conservatively represent an annual average.

Table 5-15 GMT1 Number of Days Greater Than 0.5 ddv – Project Only – Roadless Alternative

Area	Number of Days Greater Than 0.5 ddv		
	2007	2008	2009
Alaska National Wildlife Refuge	0	0	0
Gates of the Arctic	0	0	0

Table 5-16 GMT1 Number of Days Greater Than 1.0 ddv – Project Only – Roadless Alternative

Area	Number of Days Greater Than 1 ddv		
	2007	2008	2009
Alaska National Wildlife Refuge	0	0	0
Gates of the Arctic	0	0	0

Table 5-17 GMT1 Project Maximum ddv Impact – Project Only – Roadless Alternative

Area	Maximum ddv		
	2007	2008	2009
Alaska National Wildlife Refuge	0.238	0.288	0.315
Gates of the Arctic	0.154	0.220	0.431

Table 5-18 GMT1 Project 98th Percentile ddv Impact – Project Only – Roadless Alternative

Area	98^{th} Percentile ddv		
	2007	2008	2009
Alaska National Wildlife Refuge	0.127	0.114	0.170
Gates of the Arctic	0.079	0.085	0.087

Table 5-19 GMT1 Project Deposition Impacts – Project Only – Roadless Alternative

Area	Pollutant	Averaging Period	Maximum Impact (kg/ha/yr)	DAT (kg/ha/yr)	% of DAT (%)
Alaska National Wildlife Refuge	Nitrogen	Annual [1]	1.92E-04	0.005	7
Gates of the Arctic	Nitrogen	Annual [1]	1.03E-04	0.005	2
Alaska National Wildlife Refuge	Sulfur	Annual [1]	2.79E-06	0.005	0.1
Gates of the Arctic	Sulfur	Annual [1]	1.72E-06	0.005	0.03

[1] All maximum GMT deposition impacts occur in year 2008, thus represent a true annual impact.

Table 5-20 Cumulative Air Quality Impacts at Alaska National Wildlife Refuge – Roadless Alternative

Pollutant	Averaging Period	Maximum Predicted Impact ($\mu g/m^3$)	Ambient Background ($\mu g/m^3$)	Total Impact ($\mu g/m^3$)	NAAQS/ AAAQS ($\mu g/m^3$)	% of NAAQS/ AAAQS
NO_2	1-hour [1]	41	38	78.8	188	42%
	Period [1, 2]	0.14	2.9	3.04	100	3%
SO_2	1-hour [1]	0.76	7.7	8.46	196	4%
	3-hour [1]	0.54	18	18.5	1,300	1%
	24-hour [1]	0.17	6.8	6.97	365	2%
	Period [1, 2]	0.013	0.3	0.31	80	0%
PM_{10}	24-hour [1]	2.7	48	50.7	150	34%
$PM_{2.5}$	24-hour [1]	0.45	7.1	7.55	35	22%
	Period [1, 2]	0.023	2.2	2.22	12	19%

[1] The maximum impacts are reported for all averaging periods.

[2] Due to the two erroneous WRF files, both 2007 and 2009 had to be run in separate periods in CALPUFF. Therefore the reported values may represent an annual average for only 2008, while 2007 and 2009 have periods much less than 8760 hours and conservatively represent an annual average.

Table 5-21 Cumulative Air Quality Impacts at Gates of the Arctic – Roadless Alternative

Pollutant	Averaging Period	Maximum Predicted Impact ($\mu g/m^3$)	Ambient Background ($\mu g/m^3$)	Total Impact ($\mu g/m^3$)	NAAQS/ AAAQS ($\mu g/m^3$)	% of NAAQS/ AAAQS (%)
NO_2	1-hour [1]	0.44	38	38.4	188	20%
	Period [1, 2]	0.0024	2.9	2.90	100	3%
SO_2	1-hour [1]	0.046	7.7	7.75	196	4%
	3-hour [1]	0.038	18	18.0	1,300	1%
	24-hour [1]	0.017	6.8	6.82	365	2%
	Period [1, 2]	0.0010	0.3	0.30	80	0%
PM_{10}	24-hour [1]	0.33	48	48.3	150	32%
$PM_{2.5}$	24-hour [1]	0.037	7.1	7.14	35	20%
	Period [1, 2]	0.0032	2.2	2.20	12	18%

[1] The maximum impacts are reported for all averaging periods.

[2] Due to the two erroneous WRF files, both 2007 and 2009 had to be run in separate periods in CALPUFF. Therefore the reported values may represent an annual average for only 2008, while 2007 and 2009 have periods much less than 8,760 hours and conservatively represent an annual average.

Table 5-22 Cumulative Air Quality Impacts at the Community of Nuiqsut – Roadless Alternative

Pollutant	Averaging Period	Maximum Predicted Impact (µg/m^3)	Ambient Background (µg/m^3)	Total Impact (µg/m^3)	NAAQS/ AAAQS (µg/m^3)	% of NAAQS/ AAAQS
NO_2	1-hour [1]	2.7	38	40.7	188	22%
	Period [1, 2]	0.17	2.9	3.07	100	3%
SO_2	1-hour [1]	0.71	7.7	8.41	196	4%
	3-hour [1]	0.60	18	18.6	1,300	1%
	24-hour [1]	0.31	6.8	7.11	365	2%
	Period [1, 2]	0.025	0.3	0.33	80	0%
PM_{10}	24-hour [1]	4.8	48	52.8	150	35%
$PM_{2.5}$	24-hour [1]	0.15	7.1	7.25	35	21%
	Period [1, 2]	0.029	2.2	2.23	12	19%

[1] The maximum impacts are reported for all averaging periods.

[2] Due to the two erroneous WRF files, both 2007 and 2009 had to be run in separate periods in CALPUFF. Therefore, the reported values may represent an annual average for only 2008, while 2007 and 2009 have periods much less than 8,760 hours and conservatively represent an annual average.

Table 5-23 Cumulative Impacts - Number of Days Greater Than 0.5 ddv – Roadless Alternative

Area	Number of Days Greater than 0.5 ddv		
	2007	2008	2009
Alaska National Wildlife Refuge	86	108	96
Gates of the Arctic	11	12	19

Table 5-24 Cumulative Impacts - Number of Days Greater Than 1.0 ddv – Roadless Alternative

Area	Number of Days Greater than 1 ddv		
	2007	2008	2009
Alaska National Wildlife Refuge	50	59	48
Gates of the Arctic	1	1	2

Table 5-25 Cumulative Impacts - Maximum ddv Impact – Roadless Alternative

Area	Maximum ddv		
	2007	2008	2009
Alaska National Wildlife Refuge	9.016	8.628	7.791
Gates of the Arctic	1.243	1.039	1.182

Table 5-26 Cumulative Impacts - 98th Percentile ddv Impact – Roadless Alternative

Area	98th percentile ddv		
	2007	2008	2009
Alaska National Wildlife Refuge	3.623	4.267	4.504
Gates of the Arctic	0.566	0.586	0.784

Table 5-27 Cumulative Impacts - Deposition Impacts – Roadless Alternative

Area	Pollutant	Averaging Period	Maximum Impact (kg/ha/yr)	DAT (kg/ha/yr)	% of DAT (%)
Alaska National Wildlife Refuge	Nitrogen	Annual [1]	2.37E-02	0.005	474
Gates of the Arctic	Nitrogen	Period [2]	4.68E-03	0.005	94
Alaska National Wildlife Refuge	Sulfur	Annual [1]	3.91E-03	0.005	78
Gates of the Arctic	Sulfur	Period [2]	7.93E-04	0.005	16

[1] Maximum cumulative impacts occur in year 2008, thus represent a true annual impact.

[2] Maximum cumulative impacts occur in the second portion of year 2009 (7,230 hours), thus do not represent a true annual impact. The conversion from $g/m^2/s$ to kg/ha/yr assumes 8,784 hours, therefore; reported impacts are conservatively high.

6.0 References

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Appendix A

Nuiqsut Ambient Air Quality Data Analysis for ConocoPhillips Greater Mooses Tooth

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Subject: ConocoPhillips GMT1 – Representative Background Air Pollutant Concentrations for the GMT1 Project Location - REVISED

Dear Bridget,

The air pollutant concentrations used to represent non-modeled sources in the GMT1 Alternative A ambient air quality impact analysis (background concentrations) were primarily taken from an analysis USEPA Region 10 had done for onshore locations adjacent to the Beaufort Sea. As needed, that analysis was supplemented with data collected at the Nuiqsut Ambient Air Quality Monitoring Station.

Based on recommendations from several air quality MOU participants, it was decided that all background concentrations should be based on data collected at the Nuiqsut Ambient Air Quality Monitoring Station rather than mixing data sources. Therefore, data collected during 2010, 2011 and 2012 from the Nuiqsut Ambient Air Quality Monitoring Station were used to develop a revised set of background concentrations to use in the GMT1 ambient air quality impact analysis.

On December 18, 2013, an analysis of the data collected at Nuiqsut was transmitted to you. Unfortunately, the title to Table 1 was incorrect. Therefore, we have corrected the title and are sending you a revised version. Note that the table title is the only thing that has be updated.

Attachment A to this document presents the revised overview of the Nuiqsut monitoring station and the background concentrations determined. Please pass this analysis to BLM and have them contact me if they have questions.

Thanks!

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encl. Attachment A - Nuiqsut Ambient Air Quality Data Analysis for ConocoPhillips Alaska, Inc. Greater Mooses Tooth - REVISED

Attachment A

Nuiqsut Ambient Air Quality Data Analysis for ConocoPhillips Alaska, Inc. Greater Mooses Tooth - REVISED

Nuiqsut Ambient Air Quality Data Analysis for ConocoPhillips Alaska, Inc. Greater Mooses Tooth - REVISED

Summary of Data Collected at the Nuiqsut Monitoring Station

Ambient air quality data used to describe the existing air quality and used as representative background concentrations for the Greater Mooses Tooth 1 (GMT1) ambient air quality impact analysis has been obtained from the Nuiqsut Air Quality Monitoring Station, located in Nuiqsut, North Slope Borough, Alaska. Representative data from this station are summarized in **Table 1**. The Nuiqsut Monitoring Station, currently operated by SLR Consulting on behalf of ConocoPhillips Alaska, Inc., began measurements of meteorological parameters and select air pollutants in 1999. By July 2009, most criteria air pollutants defined by the Clean Air Act were measured at the Nuiqsut Monitoring Station including carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), particulate matter less than 2.5 microns in diameter ($PM_{2.5}$), particulate matter less than 10 microns in diameter (PM_{10}), and sulfur dioxide (SO_2). The ambient data from 2010 through 2012 are the most current and complete annual datasets available for the aforementioned criteria pollutants and were used for this analysis.

With the exception of measurements from local sources such as residential heating and local power generation, ambient gas-phase data from the Nuiqsut Monitoring Station are representative of the background regional air quality conditions for the proposed Greater Mooses Tooth (GMT1). **Table 2** through **Table 7** summarize ambient concentrations of the criteria pollutants. The monitoring station is located approximately 12 miles east southeast of GMT1 in the town of Nuiqsut. **Figure 1** illustrates the proximity of GMT1 to Nuiqsut and surrounding Alpine Development area. Due to its proximity to sources, the Nuiqsut Monitoring Station captures the anthropogenic emission of pollutants from the community, such as emissions from aircraft, mobile transportation, and energy generation. Because of the bimodality of wind directions and strong winds throughout the year, this location also captures regional sources affecting air quality. Therefore, data from the Nuiqsut Monitoring Station are representative of the existing emissions from the Alpine Development area, broader oil and gas development at units such as Kuparuk and Prudhoe Bay, surrounding natural emissions sources, and globally transported emissions. Because it is current, data from 2010 to 2012 capture the effects of the recent local and regional oil and gas development activities on the North Slope.

Ambient particle-phase data from Nuiqsut Monitoring Station, however, are not as representative of background conditions for GMT1. The Nuiqsut Monitoring Station and community of Nuiqsut are located near large exposed areas comprised of fine sediments along the Nigliq Channel in the Colville River Delta. Ambient monitoring here has captured periods of elevated particulate matter from windblown dust (PM_{10}) during the summer months. A previous analysis in SECOR (2002), prepared for ConocoPhillips Alaska Inc. and submitted to the State of Alaska for review, examined the meteorological conditions resulting in these elevated PM_{10} values at the Nuiqsut Monitoring Station. Based on this analysis, it is evident that the elevated PM_{10} values are due to the monitoring station's proximity to the exposed silt banks of the Nigliq Channel and anthropogenic sources, such as dirt roads, in the town of Nuiqsut. In general, the highest PM_{10} values occurred on days with strong winds from the east between 60° and 100° (from the Nigliq Channel) and from the south and west between 140° and 270° (from Nuiqsut). **Figure 2** illustrates the proximity of the Nuiqsut Monitoring Station to potential PM_{10} sources (SECOR 2002). Ambient data collected from 2010 through 2012 also demonstrate this phenomenon. For the analysis of GMT1, these local and anthropogenic PM_{10} sources are not representative of ambient conditions in the impact area because there are no similar nearby sources and particulate matter is unlikely to be transported over such distances. Therefore, background concentrations for modeled impacts should not be determined based on elevated particulate values from unique wind events at the Nuiqsut Monitoring Station.

To obtain more representative PM_{10} values for the GMT1 impact area, anomalously high values of the 24-hour average PM_{10} values were examined in **Table 5**. The second-highest 24-hour average PM_{10} value for 2011 was

117 µg/m^3, which occurred on July 7. Based on the wind speed and direction on July 7, these elevated values were a likely result of windblown dust from silt on the banks of the Nigliq Channel and are not characteristic of the GMT1 impact area. When this value is not considered for the 2011 analysis, the second-highest 24-hour average PM_{10} value was 43 µg/m^3, a more representative value for the GMT1 analysis. This conclusion is supported by calculating the true PM_{10} design value which is the fourth-highest 24-hour average over the entire 3-year period analyzed. The true design value tends to eliminate the anomalous wind events that lead to elevated PM_{10} values. Between 2010 and 2012, the fourth-highest 24-hour average was 48 µg/m^3, indicating a similar background PM_{10} value to that calculated once the July 7, 2011 value is removed.

Ambient data collected at the Nuiqsut Monitoring Station are of sufficient quality for use in these modeling exercises. The data are collected and recorded in accordance with the Quality Assurance Project Plan (QAPP) and are of Prevention of Significant Deterioration (PSD) quality. Furthermore, annual data recovery for each year and each pollutant is greater than 80% in all cases and in most cases greater than 90%; this meets general completeness requirements of 75% for comparison of ambient data to the National Ambient Air Quality Standards (NAAQS).

References

SECOR International Incorporated, 2002. Air Quality Construction Permit Application Revision for the Proposed Alpine CDN & CDS Satellite Drilling Pads Colville River Unit, Alaska, Volume I, Technical Report. March 2002.

Table 1 Representative Background Data

Pollutant Metric		Mixing Ratio (ppm)	Concentration (µg/m^3)
CO	1-hour Average	1.3	1,488
	8-hour Running Average	1.1	1,259
NO_2	1-hour Average	0.020	38
	Annual Mean	0.002	2.9
$PM_{2.5}$	24-hour Average	--	7.1
	Annual Mean	--	2.2
PM_{10}	24-hour Average	--	48
	Annual Mean	--	7.7
SO_2	1-hour Average	0.003	7.7
	3-hour Average	0.007	18
	24-hour Average	0.003	6.8
	Annual Mean	0.000	0.3

Table 2 Summary of CO Measurements from the Nuiqsut Monitoring Station 2010 through 2012

Year	Number of Valid Hourly Values	Data Recovery (%)	1st High 1-hour Average (ppm)	2nd High 1-hour Average (ppm)	1st High 8-hour Running Average (ppm)	2nd High 8-hour Running Average (ppm)
2010	8,283	95	0.5	0.5	0.4	0.4
2011	8,190	93	1.7	1.3	1.1	1.1
2012	7,907	90	0.9	0.8	0.8	0.8
Maximum	--	--	1.7	1.3	1.1	1.1

NOTE: CO 8-hour Running Averages are calculated for 8-hour periods for which there are at least 6 valid hours (75% data completeness).

Table 3 Summary of NO_2 Measurements from the Nuiqsut Monitoring Station 2010 through 2012

Year	Number of Valid Hourly Values	Data Recovery (%)	1st High 1-hour Average (ppb)	98th Percentile Daily Maximum 1-hour Average (ppb)	Annual Mean (ppb)
2010	7,952	91	28	20	1
2011	7,992	91	47	22	2
2012	7,988	91	34	18	1
3-Year Average	--	--	36	20	1
Maximum	--	--	47	22	2

NOTE: NO_2 98th Percentile Daily Maximum 1-hour Averages are calculated by determining the percentile value for maximum daily 1-hour values for which there are at least 18 valid hours (75% data completeness) in a given calendar day.

Table 4 Summary of O_3 Measurements from the Nuiqsut Monitoring Station 2010 through 2012

Year	Number of Valid Hourly Values	Data Recovery (%)	1st High 1-hour Average (ppb)	1st High Daily Maximum 8-hour Running Average (ppb)	4th High Daily Maximum 8-hour Running Average (ppb)
2010	8,352	95	46	43	41
2011	7,976	91	59	53	51
2012	7,308	83	48	46	39
3-Year Average	--	--	51	47	44

NOTE: O_3 8-hour Running Averages are calculated for 8-hour periods for which there are at least 6 valid hours (75% completeness).

Table 5 Summary of $PM_{2.5}$ Measurements from the Nuiqsut Monitoring Station 2010 through 2012

Year	Number of Valid Hourly Values	Data Recovery (%)	1st High 24-hour Average (µg/m³)	98th Percentile 24-hour Average (µg/m³)	Annual Mean (µg/m³)
2010	8,298	95	15	9	3
2011	8,300	95	14	6	1
2012	8,198	93	10	6	2
3-Year Average	--	--	13	7	2

NOTE: Actual, rather than Standard, $PM_{2.5}$ data are used when both are available. $PM_{2.5}$ 24-hour Averages are calculated for calendar days for which there are at least 18 valid hours (75% data completeness).

Table 6 Summary of PM_{10} Measurements from the Nuiqsut Monitoring Station 2010 through 2012

Year	Number of Valid Hourly Values	Data Recovery (%)	1st High 24-hour Average (µg/m³)	2nd High 24-hour Average (µg/m³)	Annual Mean (µg/m³)
2010	8,527	97	167	48	8
2011	7,777	89	225	43*	4
2012	8,270	94	39	37	3
Maximum	--	--	225	48	8

NOTE: Standard, rather than Actual, PM_{10} data are used when both are available. PM_{10} 24-hour Averages are calculated for calendar days for which there are at least 18 valid hours (75% data completeness).

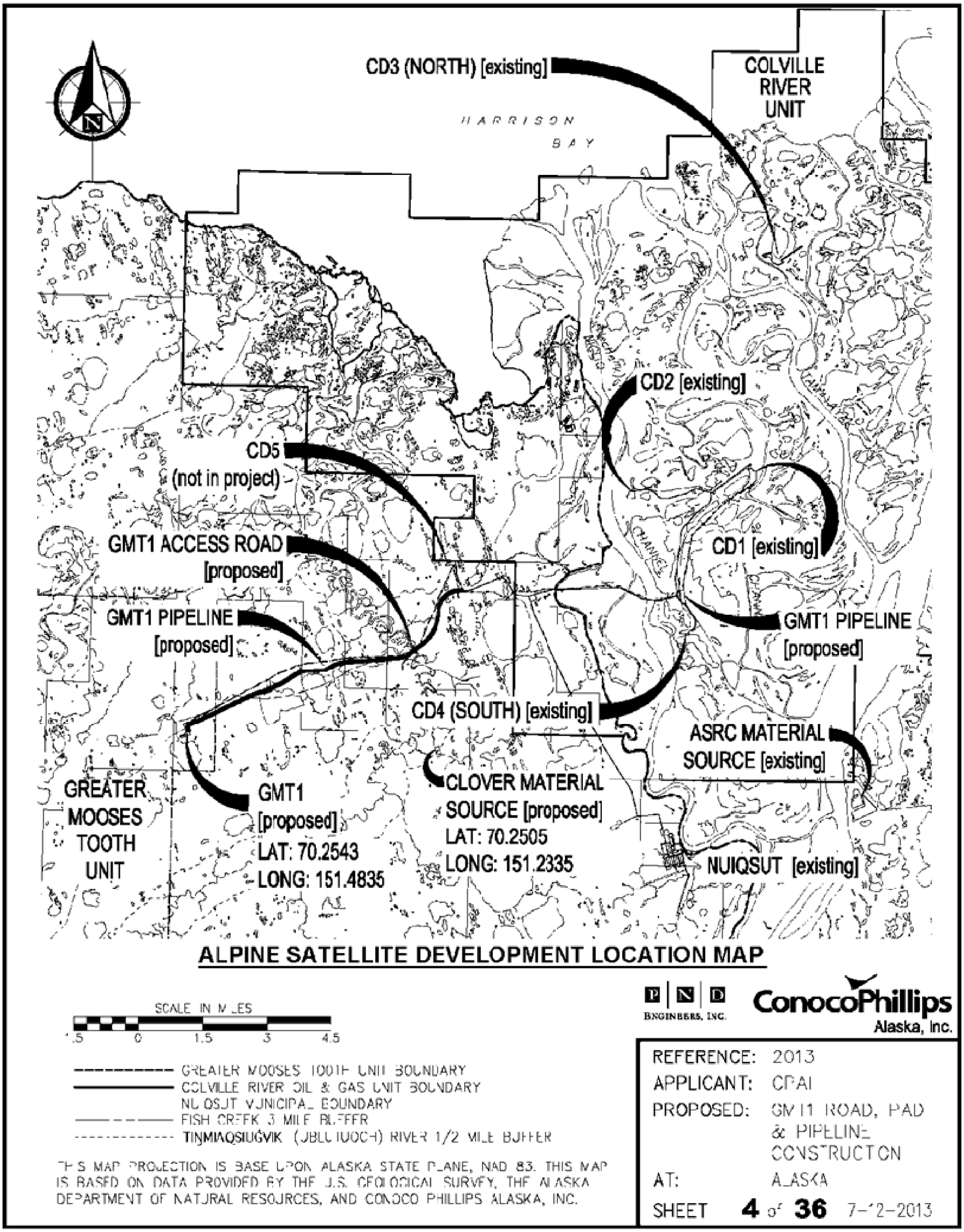
* The 2nd High 24-hour Average for 2011 is 117 µg/m³ due to a wind event on July 7, 2011. When this day is not considered, the 2nd High 24-hour Average for 2011 is 43 µg/m³.

Table 7 Summary of SO_2 Measurements from the Nuiqsut Monitoring Station 2010 through 2012

Year	Number of Valid Hourly Values	Data Recovery (%)	1st High 1-hour Average (ppb)	99th Percentile Daily Max 1-hour Average (ppb)	1st High 3-hour Average (ppb)	2nd High 3-hour Average (ppb)	1st High 24-hour Average (ppb)	2nd High 24-hour Average (ppb)	Annual Mean (ppb)
2010	8,282	95	3	2	2	1	1	1	0
2011	7,977	91	41	5	13	7	3	3	0
2012	7,944	90	4	2	2	2	1	1	0
3-Year Average	--	--	16	3	6	3	2	2	0
Maximum	--	--	41	5	13	7	3	3	0

NOTE: SO_2 99th Percentile Daily Maximum 1-hour Averages are calculated for calendar days for which there are at least 18 valid hours (75% data completeness). SO_2 3-hour Averages are calculated only when there are 3 valid hours in the period. SO_2 24-hour Averages are calculated for calendar days for which there are at least 18 valid hours (75% data completeness).

Figure 1 Regional Map of Proposed GMT1, Existing Facilities, and the Community of Nuiqsut



AECOM

Figure 2 Proximity of Nuiqsut Monitoring Station to the Community of Nuiqsut and Nigliq (Nechelik) Channel. Potential Sources of Particulate Matter are Shaded in Red.