Alaska's 2011 Air Monitoring Network Plan

Chapter 1 – Monitoring Plan

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1. ALASKA'S 2011 AMBIENT AIR QUALITY MONITORING PLAN

1.1.Introduction

In 1970 the Congress of the United States created the U.S. Environmental Protection Agency (EPA) and promulgated the Clean Air Act. Title I of the Clean Air Act (CAA) established National Ambient Air Quality Standards to protect public health. National Ambient Air Quality Standards (NAAQS) were developed for six *criteria pollutants*: particulate matter (PM), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO), ozone (O_3), and lead (Pb). Particulate matter has two associated NAAQS; fine particulate matter particles less than 2.5 micrometers in diameter ($PM_{2.5}$) and coarse particulate matter particles less than 10 micrometers in diameter (PM_{10}). Thresholds limits established under the NAAQS to protect human health are known as primary standards. The primary health standards are to protect the most sensitive of the human population, including those people with existing respiratory or other chronic health conditions, children, and the elderly. Secondary standards established under the NAAQS are set to protect the public welfare and the environment.

Since promulgation of the ordinary Clean Air Act the EPA has continued to revise the NAAQS based on the assessment of national air quality trends and on current (and ongoing) health studies. Since 2008, the EPA has strengthened the NAAQS for lead, ozone, sulfur dioxide, and nitrogen dioxide. Table 1.1.1 presents the NAAQS standards with the most recent updates.

To protect public health and assess attainment with NAAQS limits, the State of Alaska Department of Environmental Conservation (DEC) established an air quality monitoring program. The State of Alaska represents a large geographical area with a small population. Anchorage and the Matanuska-Susitna (Mat-Su) Valley have the bulk of the 698,573 people in the state, about 54%. The remainder of the population is distributed among Juneau and Fairbanks with populations of about 30-40,000 and many scattered and isolated small villages most of which are off the road system and have populations ranging from 16 people to 10,000 people. The land area of the state is approximately 1.7 million square kilometers (km) or 680,000 square miles. In accordance with the National Monitoring Strategy, DEC plans air monitoring activities using the following criteria:

1. Monitor in larger communities to cover the largest possible population exposure;

2. Monitor in designated smaller towns and villages that are representative of multiple communities in a region; and

3. Monitor in response to air quality complaints.

In addition to the NAAQS for *criteria pollutants,* Title III of the Clean Air Act regulates a list 188 hazardous air pollutants, often referred to as *HAPs* or air toxics. These air pollutants have been shown to be carcinogenetic or exhibit high toxicity in humans and the environment. Air toxics are regulated through emission limits established for stationary sources, mobile sources, and other area sources. Special monitoring projects may be developed to evaluate source specific locations. Currently, DEC has no air toxics monitoring planned for 2010-2011.

Table 1.1 – NAAQS for Criteria Pollutants

	Primary Standards		Secondary Standards	
Pollutant	**Level**	**Averaging Time**	**Level**	**Averaging Time**
Carbon Monoxide	9 ppm (10 mg/m^3)	8-hour[(1)]	None	
	35 ppm (40 mg/m^3)	1-hour[(1)]		
Lead	0.15 µg/m^3 [(2)]	Rolling 3-month Average	Same as Primary	
	1.5 µg/m^3	Quarterly Average	Same as Primary	
Nitrogen Dioxide	53 [(3)] ppb	Annual (Arithmetic Mean)	Same as Primary	
	100 ppb	1-hour[(4)]	None	
Particulate Matter (PM_{10})	150 µg/m^3	24-hour[(5)]	Same as Primary	
Particulate Matter ($PM_{2.5}$)	15.0 µg/m^3	Annual[(6)] (Arithmetic Mean)	Same as Primary	
	35 µg/m^3	24-hour[(7)]	Same as Primary	
Ozone	0.075 ppm (2008 std)	8-hour[(8)]	Same as Primary	
	0.08 ppm (1997 std)	8-hour[(9)]	Same as Primary	
	0.12 ppm	1-hour[(10)]	Same as Primary	
Sulfur Oxides	0.03 ppm	Annual (Arithmetic Mean)	0.5 ppm	3-hour[(1)]
	0.14 ppm	24-hour[(1)]		

(1) Not to be exceeded more than once per year.

(2) Final rule signed October 15, 2008.

(3) The official level of the annual NO_2 standard is 0.053 ppm, equal to 53 ppb, which is shown here for the purpose of clearer comparison to the 1-hour standard.

(4) To attain this standard, the 3-year average of the 98th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed o0.100 ppm (effective January 22, 2010).

(5) Not to be exceeded more than once per year on average over 3 years.

(6) To attain this standard, the 3-year average of the weighted annual mean $PM_{2.5}$ concentrations from single or multiple community-oriented monitors must not exceed 15.0 µg/m^3.

(7) To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 35 µg/m^3 (effective December 17, 2006).

(8) To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor with an area over each year must not exceed 0.075 ppm (effective May 27, 2008).

(9) (a) To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.08 ppm.
(b) The 1997 standard – and the implementation rules for that standard—will remain in place for implementation purposed as EPA undertakes rulemaking to address the transition from the 1997 ozone standard to the 2008 ozone standard.
(c) EPA is in the process of reconsidering these standards (set in March 2008).

(10) (a)EPA revoked the 1-hour ozone standard in all areas, although some areas have continuing obligation under that standard ("anti-backsliding").
(b) The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is ≤ 1.

1.2.Monitoring Priorities

The Air Monitoring & Quality Assurance (AMQA) section of the DEC Air Quality Division has a small staff of professionals which coordinate with the Municipality of Anchorage, the Fairbanks North Star Borough, the City & Borough of Juneau and other smaller communities to support and operate the statewide monitoring system. To protect public health and the environment, the 2011 Alaska Monitoring Plan is focused on seven primary issues.

- Fine particulate matter ($PM_{2.5}$) monitoring
- Coarse particulate matter (PM_{10}) monitoring
- PM Difference ($PM_{10-2.5}$) monitoring
- Carbon monoxide (CO) monitoring
- Lead (Pb) monitoring
- Ozone (O_3) monitoring
- Wildland fire monitoring ($PM_{2.5}$)
- Rural communities and tribal village monitoring (primarily PM_{10})

1.2.1 Fine Particulate Matter-$PM_{2.5}$

The primary source of fine particulate matter is combustion. $PM_{2.5}$ is a major health issue for communities across the State of Alaska. More and more health studies show the higher rate of disease associated with particles penetrating deep into the lungs. For the people of Alaska, this problem is exacerbated by increased exposure to fine particulate during extended wintertime temperature inversions and wildland fires during the summer months. $PM_{2.5}$ monitoring is currently being conducted in all the major networks. Only the lead monitoring site in Noatak does not monitor for fine particulate.

Fairbanks has consistently experienced the highest $PM_{2.5}$ values measured in the state. During the winter months, Fairbanks' strong temperature inversions have contributed to trapping fine particle emissions in the lowest levels of the atmosphere. Based on winter $PM_{2.5}$ levels alone, Fairbanks had come close to exceeding the annual fine particulate standard (set at 15 $\mu g/m^3$) for the past seven years. Since the strengthening of the $PM_{2.5}$ standard in December 2006, Fairbanks routinely records 20-30 exceedances each winter over the new 24 hour standard of 35 $\mu g/m^3$. Based on these exceedances, in December 2008 the Fairbanks North Star Borough was designated non-attainment for the $PM_{2.5}$ NAAQS. Fairbanks North Star Borough, DEC, the University of Alaska, and a group of other air quality professionals are currently investigating the problem to develop an effective control strategy for bringing the community into attainment status.

Particulate pollution in Juneau was recognized in 1970s prompted by public complaints concerning road dust and woodstove emissions especially during wintertime inversions. The current monitoring site located in the Mendenhall Valley at the Floyd Dryden Middle School was originally established January 1, 1980. Based on exceedances throughout the 1980s, Juneau was designated non-attainment for PM_{10} in November 1991. The State of Alaska, and the City and Borough of Juneau developed a control strategy with an aggressive road paving program and a program to ban wood burning during periods of predicted temperature inversions. Data collected

over the last decade indicate that the coarse particulate part of the problem was solved. In December 2008, the State of Alaska proposed to the EPA to place Juneau under a Limited Maintenance Plan for PM_{10}. Although never designated as non-attainment for $PM_{2.5}$, increases in fuel costs for residential heating and revision of the NAAQS in 2006 lowering the 24-hour standard to 35 $\mu g/m^3$ is reason for concern. Monitoring values observed in the Mendenhall Valley during wintertime inversions are often close to exceeding the new limit. The City and Borough of Juneau are aggressively enforcing the burn ban and issuing citations with fines for noncompliant residents. Monitoring is ongoing with recent updates to instrumentation.

The Municipality of Anchorage began monitoring for $PM_{2.5}$ in November 1998 and is currently monitoring at three sites in the network. The Municipality continues to be in compliance with the $PM_{2.5}$ NAAQS.

In the 1990s and up to 2008 the population of the central Matanuska-Susitna Valley grew very rapidly. The communities of Wasilla and Palmer continue to grow and every year the DEC still receives several public complaints related to smoke from land clearing operations. To help local leader address air quality issues and to better protect public health, DEC installed a $PM_{2.5}$ continuous sampler in the downtown area of each community.

As part of a shift in the National Monitoring Strategy, Alaska began adding continuous $PM_{2.5}$ analyzers to Federal Reference Method (FRM) monitoring sites. The national long range plan was to convert all manual samplers to continuous analyzers to provide a more comprehensive monitoring database. The strategy required a collocation of continuous samplers with FRM monitors to determine if a bias existed in the collected data. This was considered an important step as agencies in the lower 48 states were noticing that the newer technology analyzers were producing significant data disparities. While analyzers have improved, and many have been designated as federal equivalent methods, running them collocated with an FRM sampler is still preferred by DEC to validate their performance as significant discrepancies exist and have been documented nationwide. The collocation is important, as good quality, continuous particulate data plays a critical role in calculating daily Air Quality Indices (AQI). The AQI is used to help develop air quality advisories and protect public health. Alaska continues to study the accuracy of these samplers. Continuous $PM_{2.5}$ analyzers are now in place at three monitoring sites in the Anchorage network, four sites in the Fairbanks North Star Borough, two sites in the Mat-Su Valley, and one site in Juneau

Through an intergovernmental agreement with the Municipality of Anchorage and the State of Washington real-time $PM_{2.5}$ data from the continuous monitors in Anchorage, Mat-Su, and Juneau are now available to the public through the Alaska Air Monitoring Network website at https://fortress.wa.gov/ecy/aaqm/Default.htm. DEC is working to connect the Fairbanks North Star Borough continuous monitoring data to the website before the end of 2010.

1.2.2 Coarse Particulates-PM_{10}

The State of Alaska has been monitoring for dust in Anchorage, Juneau, the Mat-Su Valley, and Fairbanks for over twenty years. There are two locations in the State that were designated as non-attainment for PM_{10}, the Municipality of Anchorage and Juneau, both in 1991.

Eagle River, a community of about 30,000 located approximately 10 miles north of downtown Anchorage, is currently designated as a nonattainment area for airborne particulate, or PM_{10}. This designation is the result of air quality violations recorded between 1985 and 1987. A PM_{10} control plan was developed to address the PM_{10} problem in Eagle River. Because most of the PM_{10} in Eagle River was emitted from unpaved roads, this plan focused on paving or surfacing gravel roads in the area. This strategy has been successful. No violations have been measured since October 1987. A "Limited Maintenance Plan" has been proposed for Eagle River and is in the public review process.

The Anchorage bowl is currently considered an attainment area for PM_{10}. However, Anchorage has experienced exceedances of the NAAQS related to natural events such as volcanic eruptions and wind storms. Experience has shown that the effects of a volcanic eruption can linger for years following the event. Following the eruption of the Mt. Spurr volcano in August 1992, the NAAQS for PM_{10} was exceeded 18 times between 1993 and 1995. Intense wind storms in March 2001 and March 2003 created blowing dust conditions that contributed to a number of exceedances of the NAAQS. Because these exceedances were the largely the result of natural events, EPA has not considered them when evaluating Anchorage attainment status with respect to PM_{10}.

Although natural events have contributed to some exceedances, most PM_{10} in Anchorage is believed to have man-made origins. PM_{10} can be generated from vehicle traffic on unswept roads loaded with winter traction sand or from unpaved roads and parking lots. Anchorage sometimes nearly exceeds the NAAQS during spring break-up especially near heavily traveled roads where traffic stirs up a winter's worth of accumulated road sand.

The Municipality of Anchorage and State of Alaska have modified road maintenance practices in an effort to reduce PM_{10} emissions from roadways. In 1996 they began using a coarser, cleaner traction sand to reduce the amount of fines (silt particles less than 75 microns in diameter) being applied to the roadway network. In recent years the Municipality of Anchorage has used magnesium chloride brine, a chemical dust suppressant to reduce PM_{10} emissions during the spring break-up when PM_{10} concentrations tend to be highest.

As discussed above, Juneau was designated non-attainment for PM_{10}. However, data collected over the last 13 years has shown effective control of road dust. The State of Alaska and City and Borough of Juneau have submitted a PM_{10} Limited Maintenance Plan to Region 10 EPA. Monitoring is ongoing at the Floyd Dryden Middle School site.

The southern Matanuska-Susitna Valley, located 40 miles northeast of Anchorage, is transitioning from a rural-agricultural to an urban-suburban character. The cities of Wasilla and Palmer are the fastest growing communities in the state. Dust monitoring is currently performed at three sites; downtown Palmer, Wasilla, and in the Butte, a small community southeast of Palmer. Monitoring data typically show several exceedances of the PM_{10} NAAQS every year. Increased road paving has significantly reduced the road dust levels across the valley. However, all of the exceedances are related to exceptional events, high winds off the Matanuska River and Knik River drainages which entrain glacial silt raising dust levels into the unhealthy range.

These exceptional events occur during the spring, summer and into the fall until snow cover occurs.

1.2.3 Carbon Monoxide-CO

Strong wintertime temperature inversions and complex terrain resulted in non-attainment status for CO in Alaska's two largest population centers, Anchorage and Fairbanks. Both communities were designated as *Moderate Non-attainment* for CO in the late 1970s and re-designated as *Serious Non-attainment* in 1996. However, after implementation of air quality control strategies and improvement to automobile emission controls, both communities have collected years of CO data showing no violations of the NAAQS. Both communities requested re-designation to attainment and were placed in "limited maintenance status" in 2004.

The Anchorage CO monitoring network is currently comprised of four monitoring sites, one in east Anchorage, one in downtown Anchorage, one in west Anchorage near the airport, and one in Eagle River, a suburb of Anchorage ten miles to the northeast. The Municipality of Anchorage network has not recorded an exceedance of the CO NAAQS since December 1996.

The Fairbanks North Star Borough CO monitoring network originally consisted of three monitoring sites. The monitoring data has not shown an exceedance of the CO NAAQS for nearly a decade. Because of continued compliance with the standard and the need to refocus on $PM_{2.5}$ non-attainment, the Fairbanks monitoring program had requested EPA and was approved for a reduction in the number of CO monitoring sites. Fairbanks currently operates one CO monitoring site.

1.2.4 Lead Monitoring-Pb

To comply with the November 2008 revision of the Pb NAAQS, DEC established a source oriented monitoring site near the Red Dog Mine in the Northwest Arctic Borough. The Red Dog Mine extracts zinc and lead ore from an open-pit mine and concentrates the ore for export. The lead NAAQS requires source-oriented monitoring for all facilities that have potential annual emissions equal to or greater than one ton of lead. The Red Dog Mine is the only emission source in the State of Alaska that meets this criterion. The area around the mine is extremely remote rugged terrain with no road access. The monitoring location selected was the Native Village of Noatak; the closest population to the Red Dog Mine. EPA sanctioned the change in the monitoring strategy from source-oriented to population-oriented because of Alaska's rural character. The monitoring site was established in January 2010 and consists of collocated samplers which collect samples for total suspend particulate (TSP). The samples are collected and returned to Anchorage for laboratory analysis at the DEC EH lab.

1.2.5 Ozone Monitoring-O_3

The March 27, 2008 revision of the O_3 NAAQS requires the State of Alaska to establish an O_3 monitoring program by April 1, 2010. The regulation requires at least one SLAMS O_3 site in a core based statistical area (CBSA) with a population greater than 350,000. The Anchorage/Mat-Su Valley population forms the only combined MSA in the State of Alaska which meets the criteria. The Municipality of Anchorage monitoring program established two monitoring sites in

April 2010. The sites are initially designated as special purpose monitors until data analysis can be performed to determine the appropriate SLAMS site location. Another O_3 site will be located in Fairbanks with establishment of the NCore site. The US National Park Service operates a CASTNET O_3 monitoring site at the Denali National Park, which is under consideration to provide background regional O_3 concentration data.

1.2.6 Rural Community and Tribal Village Monitoring

The State provides support to Alaska's rural communities make baseline assessments of local air quality. Because a majority of the citizens in these communities are Alaskan Native, much of the monitoring is supported by EPA's Indian Environmental General Assistance Program (IGAP) or EPA's Tribal Air Grant process. The IGAP program provides limited funding for equipment and training for monitoring for baseline assessments but not for regulatory purposes.

The State believes the high dust levels reported in the rural communities of Buckland, St Mary's, Kotzebue, Bethel, Kiana, Kivalina and others represent the conditions that would be found in other rural communities across the state if they performed PM_{10} monitoring. This conclusion has been supported by numerous tribal studies done in the past few years. Most of the tribal monitoring has been done in the Northwest Arctic Borough but some villages elsewhere in rural Alaska support the same conclusion.

This year, the DEC, along with the State of Alaska DOT and the University of Alaska – Fairbanks are working together to identify and test potential dust control strategies for use in rural Alaska. The DEC is involved in the DOT project in that it has the University of Alaska – Fairbanks assessing the efficacy of the palliatives applied for dust control using a monitor called the "*Dustm*." Eight villages that have shown dust problems in the past (values exceeding the PM_{10} NAAQS although it was just baseline monitoring), have been chosen for a DOT demonstration project. Two of those villages, Galena and Fort Yukon have been selected for air monitoring to assess the efficacy of the palliatives used in the dust control provided by the DOT using the *Dustm* (UAF) and TEOM (DEC). In addition to the two villages, North Pole is going to be used as a test site to correlate the *Dustm* (UAF) to the TEOM and/or EBAM (DEC). The State might use the FRM Andersen high volume monitors in Ambler and Buckland to assess the use of palliatives in those two villages as well. Ambler is a special case in that the village is located in a region with high asbestos which naturally occur in the rocks. Therefore the PM_{10} concentrations (fugitive road dust) could be potentially much more dangerous to the health of the residents than elsewhere. The State is not planning to seek a PM_{10} non-attainment designation for rural communities at this time, but may in the future if the easier solutions for dust control are not found to be effective.

Portions of rural Alaska may also have a $PM_{2.5}$ wood smoke problem. Strong winter inversions in interior Alaska coupled with weak economies, higher home heating bills, and easy access to wood have seen Alaskan's woodstove use on the rise. The impact on these small communities is unknown at this time, but cannot be overlooked in terms of protecting public health. However, at this time, the State is not planning any monitoring to assess the $PM_{2.5}$ concentrations in rural Alaska.

1.2.7 Wildland Fire Monitoring

During the summer months when wildland fires spread thick, grey smoke over interior Alaska, Fairbanks and many other communities are often inundated with very high fine particulate levels. During the summers of 2004 and 2005, the community suffered through days with particulate levels that were more than 10 times the old standard of 65 $\mu g/m^3$. At times, smoke from these fires covered most of interior Alaska from the Bering Sea eastward to the Canadian border. The addition of two monitoring staff in 2005 from State general fund dollars has assisted in the protection of the public from smoke impacts. The meteorologist position has direct access to all National Weather Service data and has worked closely with state and federal fire suppression staff to develop smoke forecasts and air quality advisories to better protect public health. This position has also been involved with developing a real-time smoke monitoring capability for taking direct measurements of smoke downwind of the fires. In summer 2010, DEC is planning to place two continuous fine particulate monitors at Fort Yukon and Galena, both in Alaska's interior, which are anticipated to be impacted by summer fire events.

1.2.8 Other Monitoring Issues

The State has a number of other monitoring projects on which the AMQA staff plan to bring to completion.

1.2.8.1 Air Toxics

The Kotzebue Air Toxics Monitoring Study was conducted in Northwest Alaska between December 2004 and April 2006. After many logistical and staff related delays, the field monitoring was successfully completed. DEC teamed up with Washington State University (WSU) for analytical services and to help identify compounds of concern. DEC has completed the review and analysis of the analytical data, and is in the process of finalizing the project write-up. Loss of staff involved with this project and re-assignment of monitoring priorities has delayed the completion of the final report, which is expected to be out by the end of 2010.

1.2.8.2 Rural Diesel Health Study

As part of the low sulfur diesel initiative, DEC evaluated the impact of diesel emissions on the residents of a small rural Alaskan community. After an extensive search, the Native Village of St Mary's was selected as the location for the investigation. The study monitored ambient air down-stream from the village power plant for NO_X, SO_2, and diesel particulates ($PM_{2.5}$ filter analysis using a TEOM with an FDMS module, diesel particulate assessment using a diesel particulate matter (DPM) cassette, and diesel particle analysis using an aethalometer). Field monitoring started in January 2006 and ran through April 2006. The collected data was analyzed and a final draft report has been developed and is undergoing peer review. An unexpected loss of staff and reassignment of monitoring priorities has delayed the final version of this report, and a new target release date is set for late 2010.

1.2.8.3 CIRIAMS Network

The Municipality of Anchorage received additional air quality funding through the congressional delegation in 2005 and has expanded the Upper Cook Inlet air monitoring network to include the Mat-Su Valley and upper Kenai Peninsula as part of the Cook Inlet Region Integrated Air Monitoring System (CIRIAMS).

The CIRIAMS monitoring network is intended to provide real-time data from continuous particulate monitors to the public and help the Department issue more timely air quality advisories. Continuous particulate monitor are already located at two sites in Anchorage at the Department of Health and Human Service (DHHS) site and the Garden site. The network also includes the continuous particulate monitors located at the Palmer and Wasilla sites. DEC is planning another site in the Kenai/Soldotna area. The project was delayed but is anticipated to be rescheduled for installation later in 2010. Similar to the other CIRIAMS sites in Anchorage and the Mat-Su Valley, Kenai/Soldotna site monitoring shelter will house two continuous particulate monitors to provide data for PM_{10}, $PM_{2.5}$, and $PM_{10-2.5}$. The monitors will be integrated with the data acquisition system to allow for real time data access on the Alaska Air Monitoring website.

1.3. Network Modifications

DEC reviews and modifies the State's air monitoring network annually based on the needs of the State, available funding and EPA guidance. The 2010/11 monitoring network will include expansion of the Fairbanks North Star Borough network. Budget cuts and staff shortages have had a significant impact on the DEC's ability to conduct planned monitoring activities. Except for the above described expansion to the Fairbanks monitoring network, the summer forest fire smoke monitoring and road dust related sampling activity in support of the Alaska Department of Transportation &PF, no significant changes to the network are expected. Detailed descriptions of the network monitoring sites follow in Chapters 2 – 6, and a summary table of AQS site identification numbers and site specific input parameters in Appendix C.

Alaska's 2011 Air Monitoring Network Plan

Chapter 2 - Anchorage

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2 ANCHORAGE MONITORING SITE DESCRIPTION

2.1 *General Information*

The Municipality of Anchorage (MOA) has a population[1] of 279,243 making it the largest city in Alaska. The MOA encompasses 1,697 square miles of land and 264 square miles of water and is located between the Chugach Mountains to the east, the Knik Inlet to the north, the Cook Inlet to the west, and the Turnagain Arm to the south. The average high and low temperatures in January are 22 ºF / 9 ºF.[2] The average high and low in July are 65 ºF / 52 ºF. Annual precipitation is 15.9 inches, with 69 inches of snowfall.

Anchorage was first designated non-attainment for Carbon Monoxide (CO) on January 27, 1978. It was designated as a serious non-attainment area on July 13, 1998. In the early 1980s Anchorage experienced up to 50 exceedances of the NAAQS in a single year. However with improvements in the motor vehicle emission controls and the implementation of a vehicle inspection and maintenance program, CO concentrations have declined significantly. The last violation of the NAAQS occurred in 1996. The EPA re-designated Anchorage as a maintenance area effective July 23, 2004. Appendix A lists the definitions of each designation.

Although the last time Eagle River violated the PM_{10} NAAQS was in 1988, it is currently designated as a nonattainment area. The MOA undertook an ambitious paving and road surfacing program in the late-1980s that effectively controlled the PM_{10} problem. The MOA has prepared a PM_{10} Maintenance Plan for Eagle that is currently under review by the State and EPA. If this Plan is approved by EPA, Eagle River will be re-designated as a maintenance area for PM_{10}. PM_{10} levels in the MOA are occasionally affected by natural events such as volcanoes and wind-blown glacial dust that can lead to exceedances of the PM_{10} NAAQS. When volcanic ash-fall in the MOA is significant, such as that experienced from the eruption of Mt. Spurr in 1992, PM_{10} levels can be elevated for years afterward because of residual ash being continually re-entrained and re-deposited from wind storms. The MOA also experiences elevated PM_{10} along its major roads, especially during spring break-up when winter traction sand and other fine particulate matter deposited on the road is stirred-up by passing traffic. The MOA is currently working with Municipal and State road maintenance officials to reduce PM_{10} concentrations caused by street sweeping.

The MOA air quality program currently operates five air monitoring stations in the municipality. The stations include monitors variously designated as State and Local Air Monitoring Site (SLAMS) and as Special Purpose Monitors (SPM). The MOA SLAMS

[1] Population data from U. S. Census Bureau, July 2008.

[2] Temperature data are from Point Campbell located near Cook Inlet. The waters of Cook Inlet have a moderating effect on temperatures, especially in the winter. Winter temperatures can be 20 ºF colder in east Anchorage than they are near the Inlet.

and SPM monitor designations are described in Table 2-1. Figure 2.1.1 shows the entire Anchorage monitoring network. Appendix B lists siting criteria.

Because the Anchorage–Matanuska/Susitna metropolitan statistical area has a combined population exceeding 350,000, federal regulations require at least one SLAMS ozone (O_3) monitoring station. In April 2010 Anchorage began O_3 monitoring at the Garden site in east Anchorage and at the Parkgate site in Eagle River. The Parkgate site is located approximately 15 kilometers (km) (9.5 miles) to the northeast, downwind of the Anchorage bowl where the majority of the population in the area resides.[3]. The Parkgate site was selected because of the possibility of it being affected by anthropogenic O_3 formed from precursors generated in the city core. Initially both sites will be listed as SPM until the data can be evaluated for a final SLAM site designation.

Table 2-1: SLAMS and SPM sites in the Municipality of Anchorage

$PM_{2.5}$					
Site Name	**Location**	**AQS ID**	**Designation**	**Install Date**	**Scale**
Garden	Anchorage	02-020-0018	SLAMS [1]	Nov, 1998	neighborhood
DHHS	Anchorage	02-020-0052	SPM	Sept, 2008	middle
Parkgate	Eagle River	02-020-1004	SPM	Oct, 2008	neighborhood
PM_{10}					
Site Name	**Location**	**AQS ID**	**Designation**	**Install Date**	**Scale**
Garden	Anchorage	02-020-0018	SPM	Nov, 1998	neighborhood
DHHS	Anchorage	02-020-0052	SPM	Sept, 2008	middle
Tudor	Anchorage	02-020-0044	SPM	Oct, 1996	microscale
Parkgate	Eagle River	02-020-1004	SLAMS [2]	Oct, 1987	neighborhood
CO					
Site Name	**Location**	**AQS ID**	**Designation**	**Install Date**	**Scale**
Garden	Anchorage	02-020-0018	SLAMS	Jan, 1979	neighborhood
DHHS	Anchorage	02-020-0052	SPM	Sept, 2007	middle
Parkgate	Eagle River	02-020-1004	SPM	Dec,2005	neighborhood
Turnagain [3]	Anchorage	02-020-0048	SLAMS	Oct, 1998	neighborhood
O_3					
Site Name	**Location**	**AQS ID**	**Designation**	**Install Date**	**Scale**
Garden	Anchorage	02-020-0018	SPM	April, 2010	neighborhood
Parkgate	Eagle River	02-020-1004	SPM	April, 2010	neighborhood

[1] The $PM_{2.5}$ SLAMS monitor at the Garden site is a Partisol 2000 FRM sampler. The Municipality of Anchorage is seeking to re-designate a BAM1020 monitor as the Garden $PM_{2.5}$ SLAMS monitor.

[2] The PM_{10} SLAMS monitor at the Parkgate site is a GMW-1200 FRM sampler.

[3] The Municipality of Anchorage intends to discontinue CO monitoring at the Turnagain site prior to 1 October 2010. MOA is seeking permission to discontinue monitoring and close the Turnagain CO site. The "grayed out" listing of Turnagain CO in the table above signifies MOA's intended discontinuation of this site contingent on the agreement of the ADEC and EPA Region 10.

[3] The prevailing wind direction is southwest during much of the April-October period when O_3 monitoring is required.

The Municipality of Anchorage is seeking to re-designate a BAM1020 monitor as the Parkgate PM_{10} SLAMS monitor.

Figure 2.1:1: Map of Anchorage area. Red dots indicate monitoring sites.

2.2 *GARDEN SITE - ANCHORAGE*

3000 East 16th Avenue **AQS ID 02-020-0018**
Parameters: CO, $PM_{2.5}$, PM_{10}, & O_3 **Established: January 1, 1979**

2.2.1 Site Information

The Garden monitoring site is located at the Trinity Christian Reformed Church between 16th Avenue, Garden Street, and Sunrise Drive at latitude 61°12' 21.1" north (61.205861), longitude 149°49' 29.00" west (-149.824722), and 39 meters (128 feet) above sea level. Figure 2.2:1 shows a street map of the central Anchorage area and a satellite image of the area. The site is located in a suburban, residential area. Garden is a neighborhood, population-oriented CO and PM site.

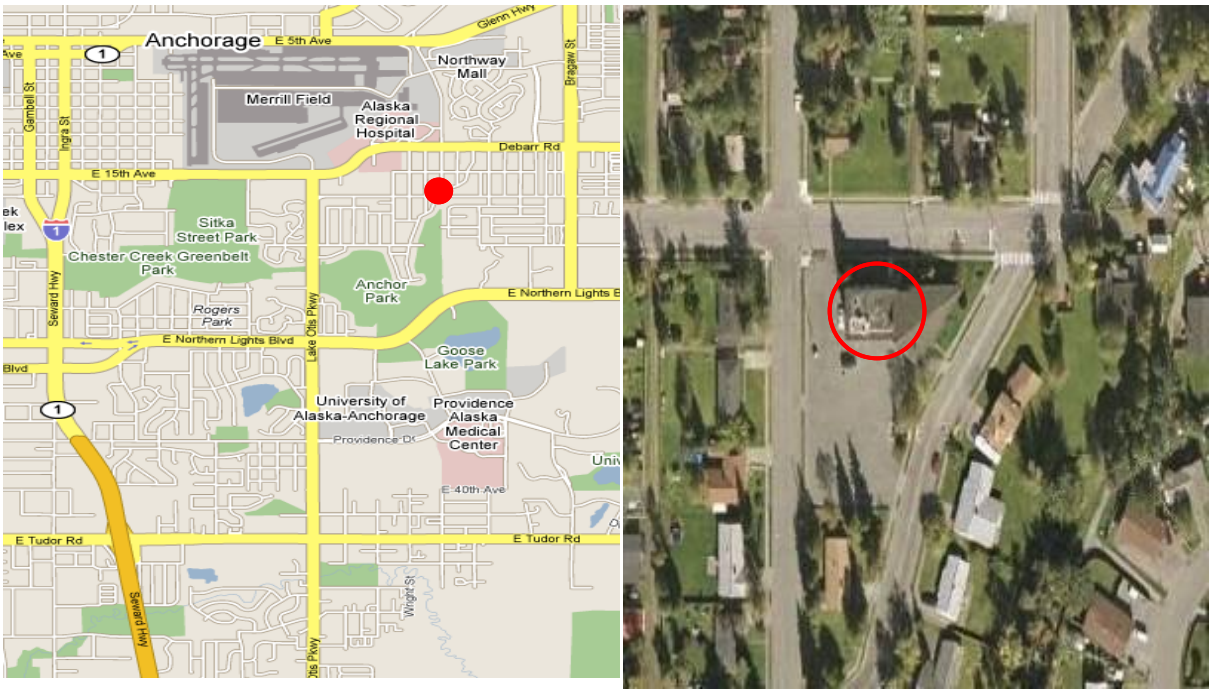


Figure 2.2:1: Street map and satellite image of the Garden monitoring site. The red circles indicate the site's location.

2.2.2 Sources

CO levels are closely associated with automobile activity and combustion from local residential heating systems in the area. Data suggest that cold starts and warm-up idling are especially significant sources of CO. Wood heating may also be a contributor. Warm-up idling and wood heating in the neighborhood are likely significant sources of $PM_{2.5}$. Fine and coarse particulate matter may also be impacted from the combustion from local heating systems as well as dust from the local road system. All roads in the vicinity are paved; the alleys are mostly unpaved, and roadways are sanded for traction during the winter months. Other contributing sources for coarse and fine particulate matter are: the Merrill Field airport (1 km north) and the Alaska Railroad (3 km

northwest). Other sources in the Anchorage Bowl which could influence this site are the Municipal Light and Power (90 and 250 megawatt gas turbines – 5 km west), Chugach Electric (48 MW gas turbine – 6 km southeast), Fort Richardson (18 MW gas turbine – 8 km northeast) and Elmendorf Air Force Base (22 MW gas turbine – 6 km northwest). This site, like others in the MOA, is seasonally affected by wind-blown glacial loess, and occasionally impacted by wildfire smoke and ash from volcanic eruptions.

2.2.3 Monitors

The Garden Site is currently equipped with:

- $PM_{2.5}$ (SPM) – One Thermo Electron (formerly Rupprecht and Patashnick) Partisol 2000 sampler operates on a 1-in-6 day sampling schedule.
- PM_{10} (SPM) – One General Metal Works high-volume sampler operates on a 1-in-6 day sampling schedule.
- $PM_{2.5}$, PM_{10}, PM_{Coarse} (SLAMS $PM_{2.5}$, SPM PM_{10} & PM_{Coarse}) – Two Met One BAM 1020X monitors were installed in June 2008, and were tested for correlation with collocated FRM $PM_{2.5}$ and PM_{10} samplers. MOA has been submitting $PM_{2.5}$ and PM_{10} hourly data from these monitors to AQS since Jan 2009.
- CO (SLAMS) – A single Thermo Electron 48i CO monitor operates seasonally (October – March).
- O_3 (SPM) – A single Teledyne API 400E O_3 analyzer was installed in March 2010 and is operated seasonally (April – September).

2.2.4 Siting

The particulate matter samplers are located on the roof at the south end of the Trinity Christian Reformed Church. Access to the site is by use of a window from a split level section of the church. This split level area is several meters from the monitoring site. The roof height is six meters (19 feet), and there are no trees in the vicinity that significantly exceed the height of the samplers. The airflow to these samplers is unobstructed. The samplers are approximately 14 meters (32 feet) south of the nearest traffic lane of 16^{th} Avenue.

The CO inlet probe is fixed to the north wall of the church 3 meters (9.5 feet) above the ground approximately 10 meters (32 feet) from the nearest traffic lane of 16^{th} Avenue. Between the inlet and 16^{th} Avenue is one tall spruce tree. The church itself obstructs air flow from the south. The probe inlet for the ozone analyzer is located 1 meter above the roof and is unobstructed.

2.2.5 Traffic

There are six other major roadways within three kilometers with approximate average daily traffic ranging from 14,000 to 54,000 vehicles per day. All roads are paved; alleys are usually gravel surface.

Figure 2.2:2: Pictures of the Garden Site

North	East	South	West
			
Views in four directions from the Garden Site			
			
Views in four directions towards the Garden Site			

Figure 2.2:3: View of CO probe at Garden Site. The red circle indicates where the probe is located.

TUDOR SITE - ANCHORAGE
3335 East Tudor Road **AQS ID 02-020-0044**
Parameters: PM_{10} **Established: October 12, 1996**

2.2.6 Site Information

The Tudor monitoring site is located at 3335 East Tudor at latitude 61°10' 51.9" north (61.181083), longitude 149°49' 2.8" west (-149.817389), and 50 meters (164 feet) above sea level. Figure 2.3:1 shows a street map of the central Anchorage area and a satellite picture of the area immediately surrounding the Tudor site. The site is located in an urban, commercial location. Tudor is a microscale, population-oriented site.

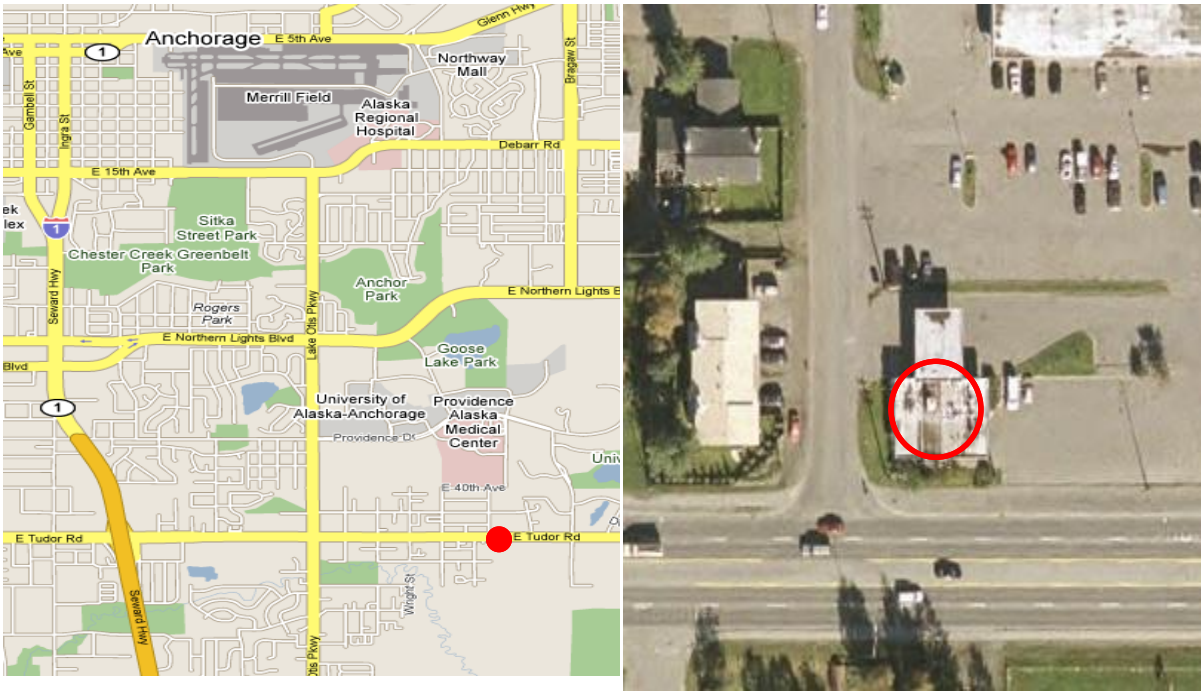


Figure 2.2:4: Street map and satellite image of the Tudor monitoring site. The red circle indicates the sites location.

2.2.7 Sources

The primary source of course particulate matter at this site is from automobile activity. This site is located in approximately seven meters from Tudor Road. This section of Tudor Road carries an average daily traffic volume of 40,144 (2008). Another potential source is the Merrill Field airport (5 km to the north). The Alaska Railroad passes over 8 km away. This site, like others in Anchorage, is seasonally affected by wind-blown glacial loess, and occasionally affected by wildfire smoke and volcanic eruptions.

2.2.8 Monitors

The Tudor Site is currently equipped with:

- PM_{10} (SPM) – Three General Metal Works high-volume samplers. The Hi-Vol samplers operate on a 1-in-2 day sampling schedule. Alternating samples are run in collocation at this site on a 1-in-12 day schedule for precision determination.
- PM_{10} (SPM) – A single Thermo Electron TEOM 1400a continuous monitor was installed in April 2005 to provide information in real time for evaluating the Air Quality Index.

2.2.9 Siting

The particulate matter samplers are located on the roof near the southeast edge. The roof height is 3.3 meters (10.5 feet), and there are no other structures. The 6 meter (20 feet) tall mountain ash trees between the samplers and the roadway do not significantly exceed the height of the samplers. The airflow to these samplers is unobstructed. The samplers are approximately 7 meters north of the nearest traffic lane of Tudor Road.

2.2.10 Traffic

Besides Tudor Road, there are three other roadways within one kilometer (Lake Otis Blvd., Elmore Road, and Providence Drive) with traffic volumes exceeding 10,000 per day. There are numerous high volume roadways within a five kilometer radius. All roads are paved; however alleys in the area are usually gravel surface.

Figure 2.2:2 : Pictures of the Tudor Site

North	East	South	West
			
Views in four directions towards the Tudor Site			

2.3 *TURNAGAIN SITE - ANCHORAGE*

3201 Turnagain Street **AQS ID 02-020-0048**
Parameters: CO **Established: October 15, 1998**

2.3.1 Site Information

The Turnagain CO monitoring site is located at the corner of Turnagain Street and 32nd Avenue at latitude 61°11' 29.4"north (61.192222), longitude 149° 56' 6.9" west (-149.985833), and 21 meters (69 feet) above sea level. Figure 2.4:1 is street map of the western part of Anchorage and a satellite picture of the Turnagain site and surrounding area. The site is located in a suburban location. Turnagain is a neighborhood scale, population-oriented site.

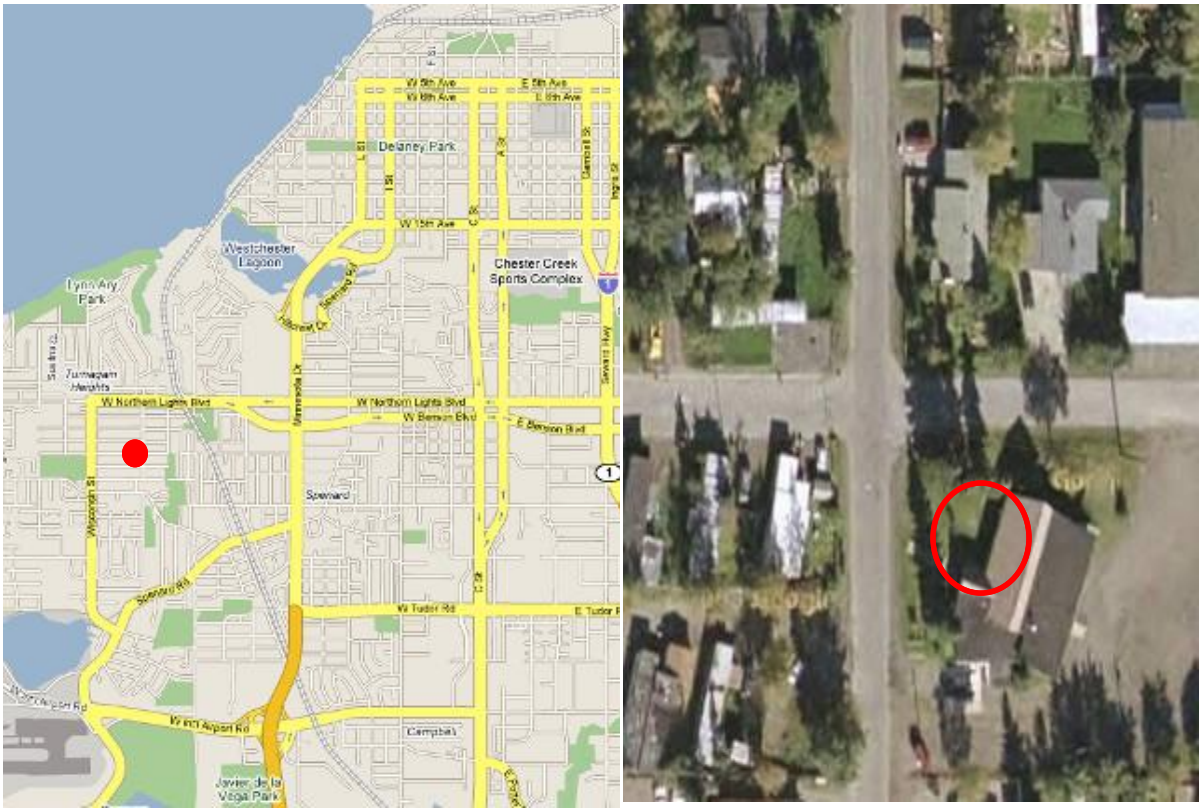


Figure 2.3:1: Street map and satellite image of the Turnagain monitoring site. The red circles indicate the sites location.

2.3.2 Sources

CO is closely associated with automobile activity and combustion from local residential heating systems in the area. Data suggest that cold starts and warm-up idling are an especially significant source of CO. Wood heating may also be a contributor. Less significant sources which might have influence on this site include the Anchorage International Airport and Lake Hood Float Plane Base which are located 2 kilometers

southwest. Chugach Electric (48 MW gas turbine) is located 4 kilometers southeast. More distant sources include Municipal Light and Power (90 and 250 megawatt gas turbines) and Elmendorf Air Force Base (22 MW gas turbine).

2.3.3 Monitors

The Turnagain Site is currently equipped with:

- CO (SLAMS) – A single Thermo Electron 48C CO monitor operates seasonally (October – March).

Pending EPA approval, the Municipality of Anchorage intends to discontinue monitoring at this site prior to commencement of the next monitoring season which begins on October 1, 2010.

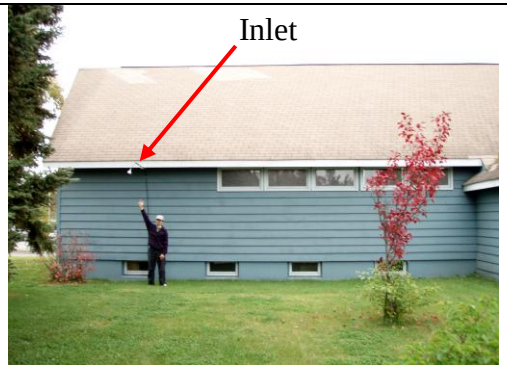
2.3.4 Siting

The monitor is installed in the Unitarian church. The inlet probe is approximately 3.0 meters (9.5 feet) above the ground. The inlet probe is approximately 18.5 meters (58 feet) from the nearest traffic lane of Turnagain Street. Between the inlet and Turnagain Street are several tall white spruce trees. The church itself obstructs air flow from the south and east.

2.3.5 Traffic

There are five major roadways within 3 kilometers with approximate average daily traffic ranging from 18,000 to 54,000 vehicles per day. There are residential streets and alleys in the vicinity.

Figure 2.3:2: Pictures of the Turnagain Site

North	East	South
		
Views in three directions towards the Turnagain Site		
North	**West**	**South**
		
Views in three directions from the Turnagain Site		

2.4 *DHHS - ANCHORAGE*

727 L Street. **AQS ID 02-020-0052**
Parameters: CO, $PM_{2.5}$, PM_{10} **Established: September 27, 2007**

2.4.1 Site Information

The Department of Health and Human Services (DHHS) monitoring site is located in the employee parking lot for DHHS at latitude 61° 12' 54.1" north (61.215027), longitude 149° 54' 11.2" west (-149.903111), and 35 meters (115 feet) above sea level. Figure 2.5:1 shows a street map of the western part of Anchorage and a satellite picture of the DHHS site and surrounding area. The site is located downtown. The Municipality of Anchorage considers the DHHS site to be middle scale, representing a dimensional area up to 0.5 km.

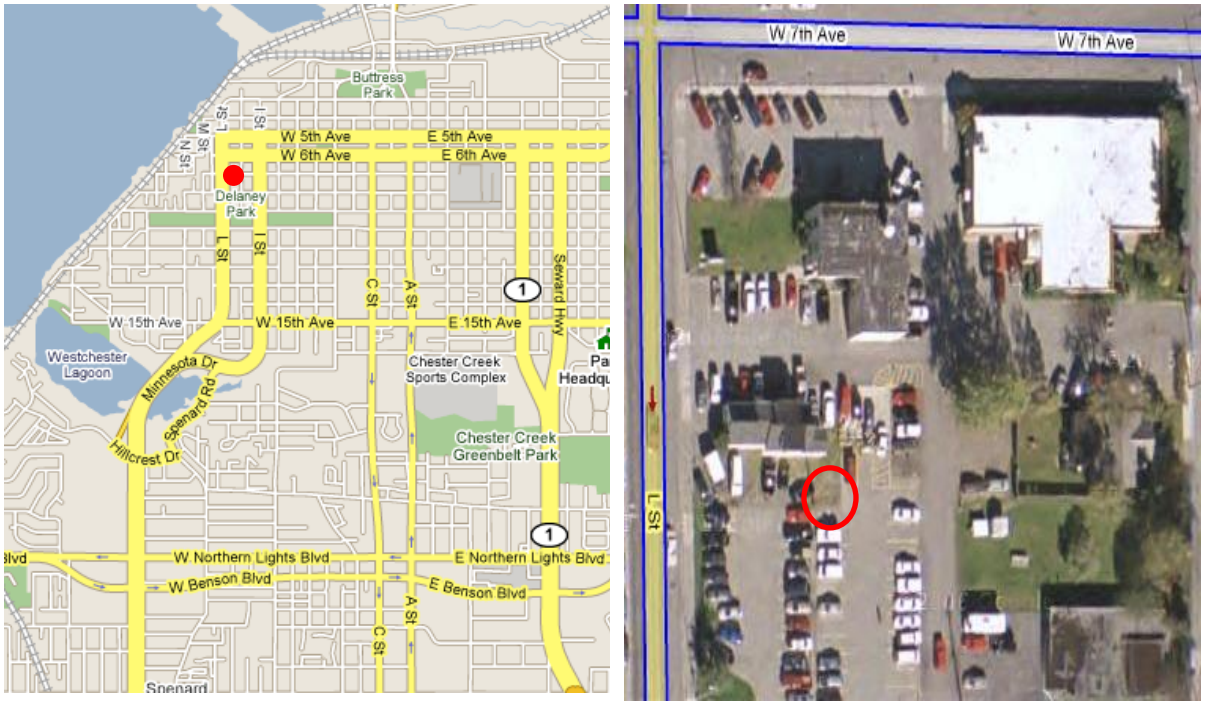


Figure 2.4:1: Street map and satellite image of the DHHS monitoring site. The red circles indicate the sites location.

2.4.2 Sources

This site is located in approximately 28 meters east of L Street with an average daily traffic volume (2008) of 12,924. There are numerous streets within a one kilometer radius with daily traffic volumes exceeding 5,000. The site is surrounded by parking areas for downtown workers which can be a source of cold start CO emissions especially in the evening when workers leave for the day. The Alaska Railroad passes within 800

meters of this site, and the rail yard, where locomotives commonly idle, is located approximately two kilometers to the northeast. This site was established by the Municipality of Anchorage in September 2007 to represent typical exposure in the downtown business district.

2.4.3 Monitors

The DHHS Site is equipped with:

- CO (SPM) – A single Thermo Electron 48C CO monitor which operated seasonally (October – March).
- PM $_{2.5}$, PM_{10}, PM Coarse (SPM) – Two Met One BAM 1020X monitors were installed in September 2008. MOA has been submitting $PM_{2.5}$ and PM_{10} hourly data from these monitors to AQS, since January 2009.

2.4.4 Siting

The monitors are installed in a small shed building located at 727 L Street. The CO inlet probe is approximately 3 meters (9.5 feet) above the ground. The inlet probe is approximately 28 meters (85 feet) from L Street, the nearest traffic lane. The probe extends off the northwest corner of the shed, and air flow to the probe is unobstructed for 270 degrees. The PM_{10} and $PM_{2.5}$ inlets each extend 1 meter above the shed roof with 2 meters of separation between them. This site has sufficient separation distance from surrounding buildings to meet EPA siting criteria.

2.4.5 Traffic

There are four major roadways within 1.6 km with average daily traffic counts ranging from 11,830 to 15,120 vehicles per day.

Figure 2.4:2: Pictures of the DHHS Site

North	East	South	West
			
Views in four directions from the DHHS Site			
			
Views in four directions towards the DHHS Site			

2.5 *PARKGATE, EAGLE RIVER- ANCHORAGE*

11723 Old Glenn Highway **AQS ID 02-020-1004**
Parameters: CO, $PM_{2.5}$, PM_{10}, & O_3 **Established: January 1, 1974**

2.5.1 Site Information

The Parkgate PM_{10} monitoring site is located at the Parkgate Business Center building in Eagle River (a bedroom community of Anchorage that lies within the Municipality) at latitude 61° 19' 36.0" north (61.326667), longitude 149° 34' 10.8" west (-149.569667), and 100 meters (328 feet) above sea level. Figure 2.6:1 is a street map of the western Eagle River area and a satellite picture of the Parkgate site and surrounding area. The site is located in a suburban/commercial use area with monitoring site classified as neighborhood scale, population-oriented monitoring site.

The Eagle River dust problem goes back to the late 1980s when many of the roads and parking lots were not paved. Eagle River was declared non-attainment for PM_{10}. The MOA, by the early 1990's, had paved or surfaced nearly all the gravel roads in the nonattainment area. No violations of the NAAQS have been recorded in over 20 years. MOA has applied for re-designation of Eagle River to attainment status, and if approved, will be classified as a maintenance area for PM_{10}.

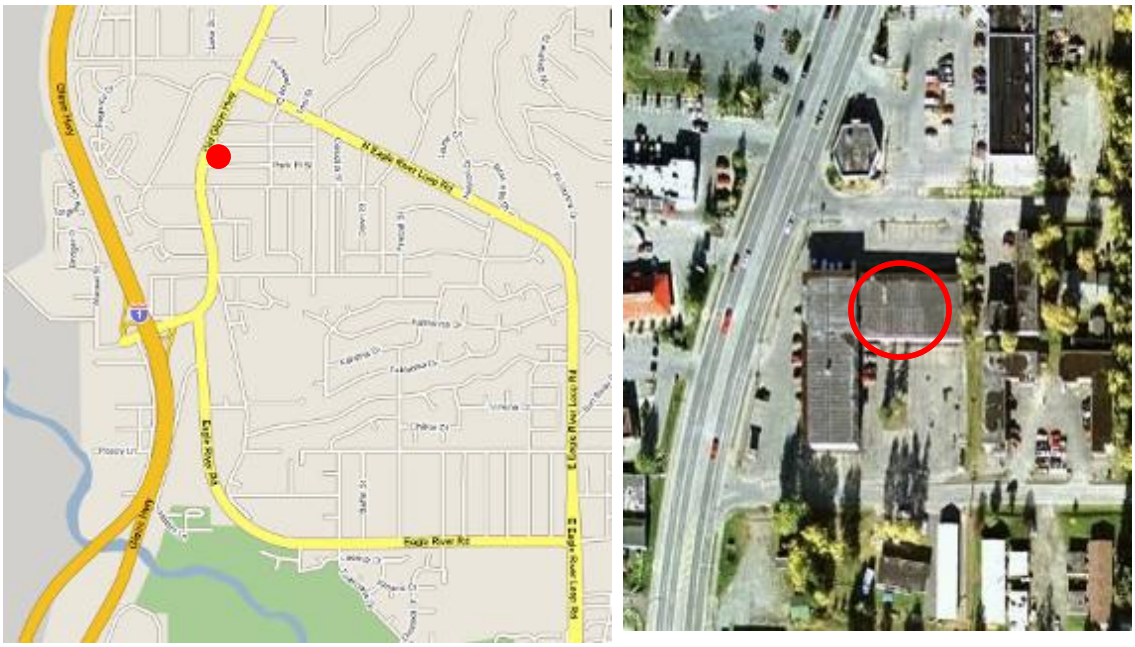


Figure 2.5:1: Street map and satellite image of the Eagle River monitoring site. The red circle indicates the sites location.

2.5.2 Sources

This site is located approximately 44 meters east of the Old Glenn Highway which carries an average daily traffic volume of 22,700. Re-entrained roadway dust from this road is a significant source of coarse particulate matter. Traffic is a major source of CO. The site

is also located near a number of retail and employee parking areas which are a source of cold start emissions. The Alaska Railroad passes within 4 kilometers of the site. Like other sites in the MOA, Eagle River is seasonally affected by wind-blown glacial loess, and occasionally affected by wildfire smoke and volcanic eruptions.

2.5.3 Monitors

The Eagle River Site is currently equipped with:

- PM_{10} (SLAMS) – One General Metal Works high-volume sampler. This sampler is operated on a 1-in-6 day sampling schedule.
- CO (SPM) – A single Thermo Electron 48C CO monitor is operated seasonally (October – March).
- PM_{10} (SLAMS), $PM_{2.5}$ & PM Coarse (SPM) – Two Met One BAM 1020X monitors were installed in October 2008, and were tested for correlation with a collocated FRM PM_{10} sampler. MOA has been submitting $PM_{2.5}$ and PM_{10} hourly data from these monitors to AQS, since Jan 2009.
- O_3 (SPM) – A single Teledyne API 400E ozone analyzer was installed in March 2010 and is operated seasonally (April – September).

2.5.4 Siting

The particulate matter samplers are located on the roof of the first story of the Parkgate Business Center. The roof height is 5 meters (16 feet). There is another section of the building 13 meters (41 feet) to the west that is two stories tall (4 meters above the first story roof height). No trees in the vicinity significantly exceed the height of the samplers. The airflow to these samplers is unobstructed. The samplers are approximately 44 meters east of the nearest traffic lane of the Old Glenn Highway and 23 meters (73 feet) south of Easy Street.

The CO inlet probe is approximately 3 meters (9.5 feet) above the ground and is attached to the east side of the building. The CO probe inlet is approximately 42 meters east of the nearest traffic lane of the Old Glenn Highway and 23 meters (73 feet) south of Easy Street. Airflow to the probe inlet is unobstructed from the north, south, and east. The Parkgate building itself obstructs air flow to the CO probe inlet from the west.

The probe inlet for the O_3 analyzer is located one meter above the 2nd level roof for a total 10 meters (30 feet) elevation above ground. The O_3 probe is unobstructed.

2.5.5 Traffic

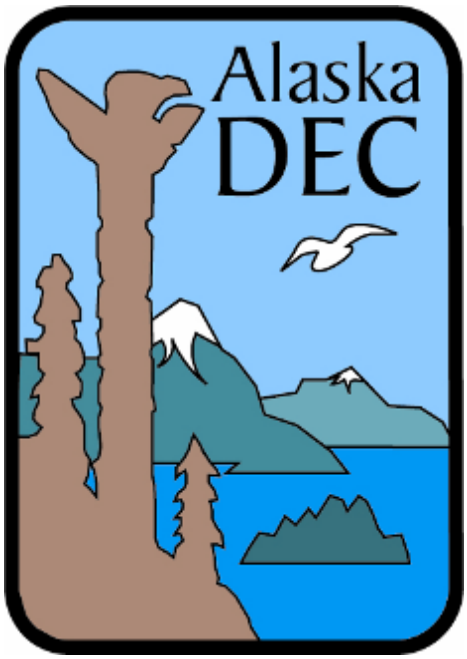
There are two major roadways within 3 kilometers ranging from 15,500 to 29,000 vehicles per day. There are typical residential and commercial streets and alleys in the vicinity. All roads are paved and alleys are gravel surface.

Figure 2.5:2: Pictures of the Parkgate Site

North	East	South	West
			
Views in four directions Towards the Parkgate Site			
			
Views in four directions from the Parkgate Site			

Alaska's Air Monitoring 2011 Network Plan

Chapter 3 - Fairbanks



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Anchorage, AK 99501

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3 FAIRBANKS MONITORING SITES

3.1 *General Information*

Fairbanks is the second largest city in Alaska (population[1] 34,500), located within the Fairbanks North Star Borough (FNSB; population 87,560). Fairbanks is situated on the banks of the Chena River in the upper Tanana Valley. Interior Alaska experiences seasonal temperature extremes. The average temperatures range from -2°F to -19°F in the winter and from 53°F to 72°F in the summer. Temperatures have been recorded as low as -78°F in mid-winter, and as high as 93°F in summer. Average annual precipitation is 11.3 inches. Ice fog is common during the winter. Fairbanks experiences 21 hours of direct daylight between May 10th and Aug. 2nd each summer, and less than 4 hours of daylight between Nov. 18th and Jan. 24th each winter.

Fairbanks was designated non-attainment for carbon monoxide (CO) on November 15, 1990. The community developed a rigorous Inspection and Maintenance (I&M) program to reduce tail pipe emissions from automobiles and the EPA required automobile manufacturers to reduce environmental pollution, both of which have helped improve area air quality in the Fairbanks North Star Borough. Not having had any CO exceedances for several years, Fairbanks requested re-designation and was placed in CO "maintenance" status on July 23, 2004. Appendix A lists the definitions of each designation.

The FNSB Air Program operates and manages five monitoring stations: one State and Local Air Monitoring Site (SLAMS) for CO, one SLAMS site for $PM_{2.5}$, one Speciation Trend Network (STN) site, and three Special Purpose Monitoring (SPM) sites for $PM_{2.5}$. The FNSB SLAMS, STN, and SPM sites are identified below in Table 3-1:1. Appendix B lists siting criteria for each type of monitoring site.

The Fairbanks and North Pole monitoring sites are located within the Northern Alaska Air Quality Control Region. Figure 3-1:1 is a map showing the entire Fairbanks and North Pole area. The red dots indicate the locations of the five monitoring sites. Fairbanks is bordered by hills to the north and west, with the flats opening up to the south and east.

Table 3.1:1 SLAMS and SPM sites in the Fairbanks North Star Borough

$PM_{2.5}$					
Site Name	**Location**	**AQS ID**	**Designation**	**Install Date**	**Scale**
State Office	Fairbanks	02-090-0010	SLAMS/STN	Oct, 1998	neighborhood
TAC (Peger Rd)	Fairbanks	n/a	SPM	Nov, 2007	neighborhood
North Pole	North Pole	n/a	SPM	Nov, 2008	neighborhood
NCore	Fairbanks	n/a	SPM	Oct, 2009	neighborhood
CO					
Site Name	**Location**	**AQS ID**	**Designation**	**Install Date**	**Scale**
Old Post Office	Fairbanks	02-090-0002	SLAMS	Jan, 1972	micro

[1] Population data from 2005 US Census.

<u>Figure 3.1:1</u> Map of the Fairbanks and North Pole Area. Red dots indicate the locations of the monitoring sites.

3.2 *OLD POST OFFICE SITE - FAIRBANKS*

250 Cushman Street **AQS ID 02-090-0002**
Parameters: CO **Established: January 1, 1972**

3.2.1 Site Information

The site is located in the Old Post Office building at 250 Cushman Street at latitude 64° 50' 43" north, longitude 147° 43' 16" west , and 140 meter (460 feet) above sea level. Figure 3.2:1 shows a street map of downtown Fairbanks and satellite image of the area. The site is located in the middle of the central business district. The Old Post Office is a micro-scale, population-oriented site located in downtown Fairbanks.

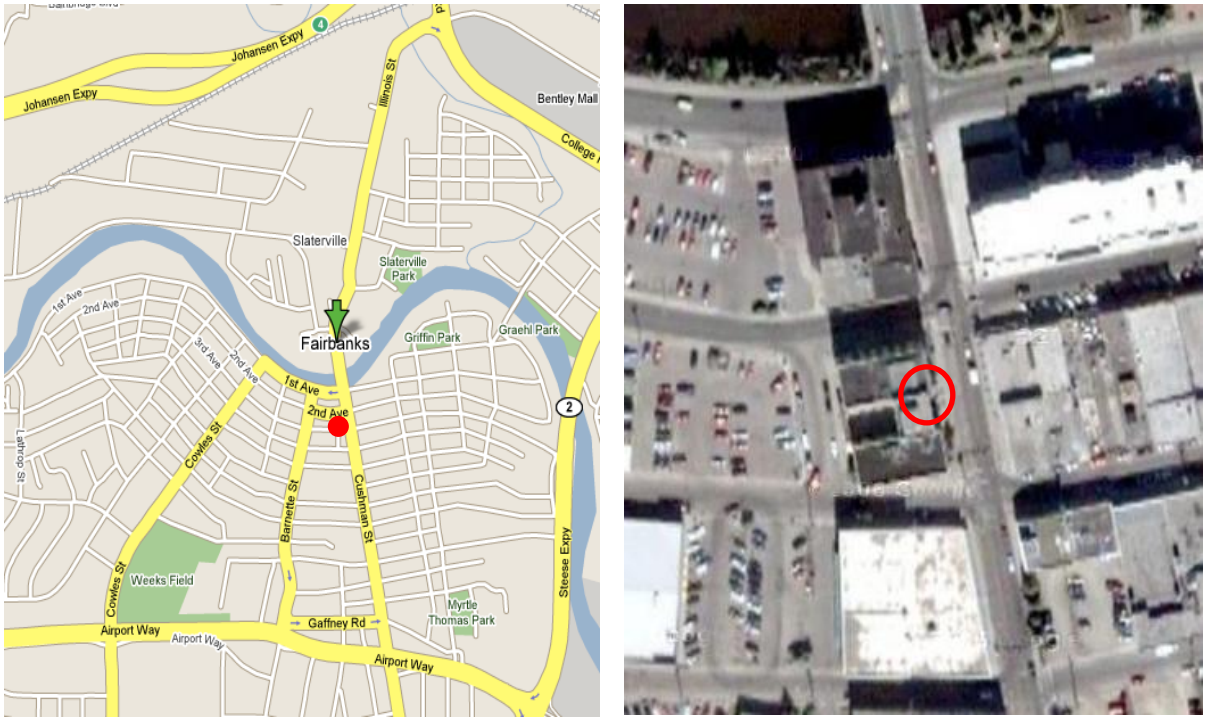


Figure 3.2:1 Map and satellite image of the Old Post Office monitoring site. The red circles indicate the site location.

3.2.2 Sources

The dominant source of CO emissions for this site is automobile exhaust. Within 200 meters of the site, land use is predominantly business (generally medical practices and small offices) with some small single family dwellings. Many older downtown houses have chimneys and may be using woodstoves in the winter for supplemental heat. The Alaska Railroad industrial area (north) and the Aurora Energy coal fired power plant (west) are both located within one mile of the site. Coal-fired power plants operated by the University of Alaska (to the west) and Fort Wainwright Army Post (to the east) are located within five miles. Fairbanks is occasionally impacted by wildland fire smoke in the summer months.

3.2.3 Monitors

The Old Post Office site is currently equipped with:

- CO (SLAMS) – A single Thermo Electron 48C CO monitor operates seasonally (October – March) with an inlet approximately 3 meters above the ground.

3.2.4 Siting

The Old Post Office is located between 2nd and 3rd Avenues on the west side of Cushman Street. The probe passes through the eastern exterior wall and extends out one meter at a height of two meters above the ground. The inlet is three meters from the nearest traffic lane on Cushman Street, and ten meters (32 feet) from the intersection at 2nd Avenue. There are no parking lots in the vicinity of the probe, but there is parallel parking on both 2nd and 3rd Avenues.

3.2.5 Traffic

This site is located at one of the busiest intersections in downtown Fairbanks. Traffic within one mile of the site sees daily traffic counts ranging from 3,700 to 7,400 vehicles per day.

Figure 3.2:3 Pictures of the Old Post Office Site

North	East	South
		
Views in three cardinal directions from the Old Post Office Site		
North	**South**	**West**
		
Views in three cardinal directions toward the Old Post Office Site		

3.3 *STATE OFFICE BUILDING - FAIRBANKS*

675 Seventh Avenue **AQS IDs 02-090-0010**
Parameters: $PM_{2.5}$ **Established: January 1, 1972**

3.3.1 Site Information

The site is located on the State Office Building at 675 7th Avenue. The latitude is 64° 50' 27" north, longitude is 147° 43' 23" west, and 140 meters (460 feet) above sea level. Figure 3.3:1 shows a street map of the downtown Fairbanks area and satellite image of the area. The site is located in the middle of the central business district. This is a neighborhood-scale, population-oriented $PM_{2.5}$ site.

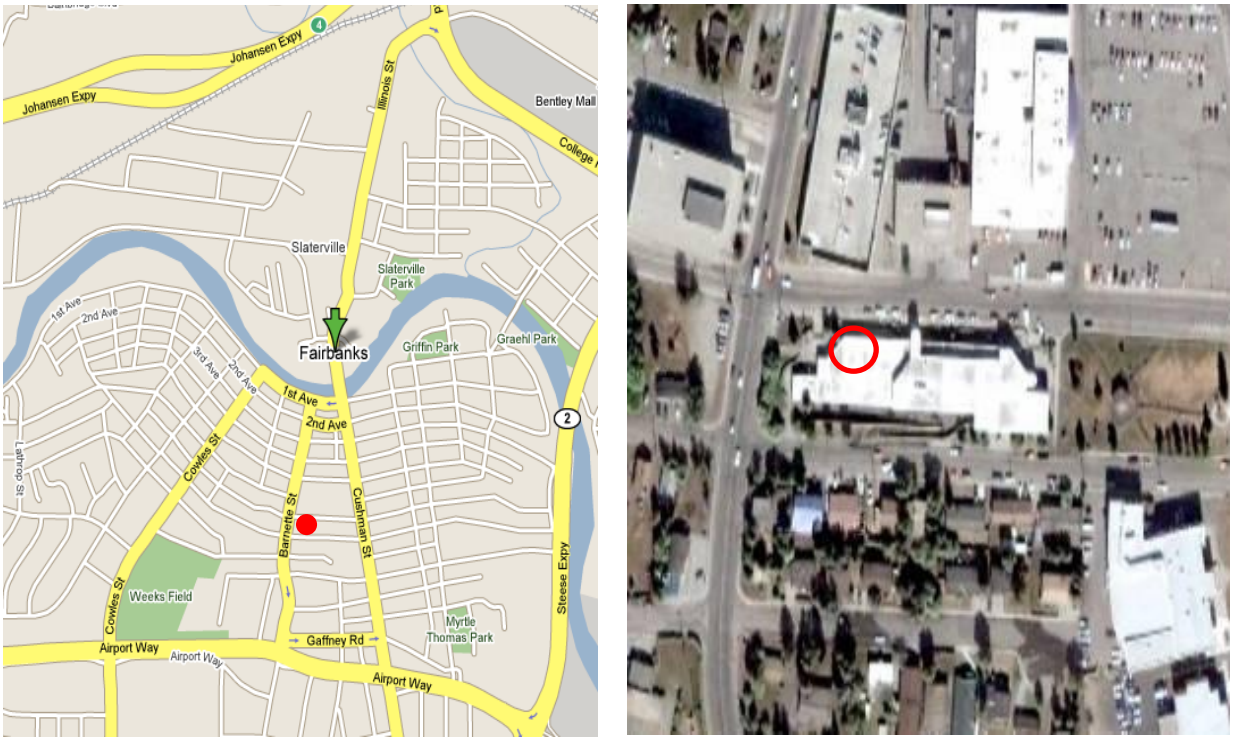


Figure 3.3:1 Map and satellite image of the State Office Building. The red dot and circle indicate the site location.

3.3.2 Sources

The dominant source of fine particulate matter ($PM_{2.5}$) for this site changes season to season. During the long winter months the primary sources of fine particulates are; home heating, vehicle exhaust, and wood smoke. During the summer months, the main source is from wildland fire smoke.

3.3.3 Monitors

The State Office Building site is currently equipped with:

- $PM_{2.5}$ (SLAMS) – Two Thermo Electron (formerly Rupprecht & Patashnick) Partisol 2000 samplers. One sampler runs on a 1-in-3 day sampling schedule with the second operating as a collocated monitor once every 6th day.
- $PM_{2.5}$ (SPM) – A single Met-One Beta Attenuation Monitor (BAM 1020) was installed to provide information in real time for evaluating the Air Quality Index.
- $PM_{2.5}$ (STN) – A single Met-One Super SASS Speciation Monitor. This multi filter sampler is set to sample on a 1-in-3 day sampling schedule.
- $PM_{2.5}$ (STN) – A single URG 3000N Speciation Monitor. This single filter sampler is set to sample on a 1-in-3 day sampling schedule.

Two of the monitors provide speciation data for fine particulate are shown with a STN designation, an acronym for Speciation Trend Network.

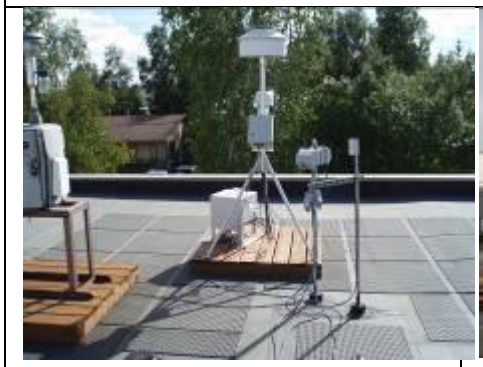
3.3.4 Siting

The equipment is located on the west end of the State Office Building's first story roof. The inlets for all samplers are approximately six meters above the ground. There is unrestricted airflow around the samplers. The building has a partial second floor that is approximately 3.75 meters higher than the roof the samplers sit upon. The nearest second floor wall is approximately thirty meters west of the samplers. There is a birch tree approximately ten meters south of the samplers; its height exceeds that of the inlets.

3.3.5 Traffic

This site is located in downtown Fairbanks with numerous roads within one mile of the site. Area roads have daily traffic counts ranging from 3,700 to 7,400 vehicles per day. There are no parking lots in the vicinity of the probe, but there is parallel parking on 7th Ave.

Figure 3.3.2: Pictures of the State Office Building

North	East	South	West
			
Views in four directions from the State Office Building			
		**Not available, equipment in close proximity to edge of the roof**	
Views in four directions towards the State Office Building Site			

3.4 *NCORE – FAIRBANKS*

809 Pioneer Road **AQS ID: n/a**
Parameters: $PM_{2.5}$ **Established: October 29, 2009**

3.4.1 Site Information

The site will be located near the Fairbanks North Star Borough building on Pioneer Road at latitude 64° 50′ 44.6″ north, longitude 147° 43′ 38.2″ west, and 472 feet (144 meters) above sea level. Figure 3.4:1 shows a street map and the satellite image of the local area. This is a neighborhood-scale, population-oriented site. Currently a test site is operated at this location.

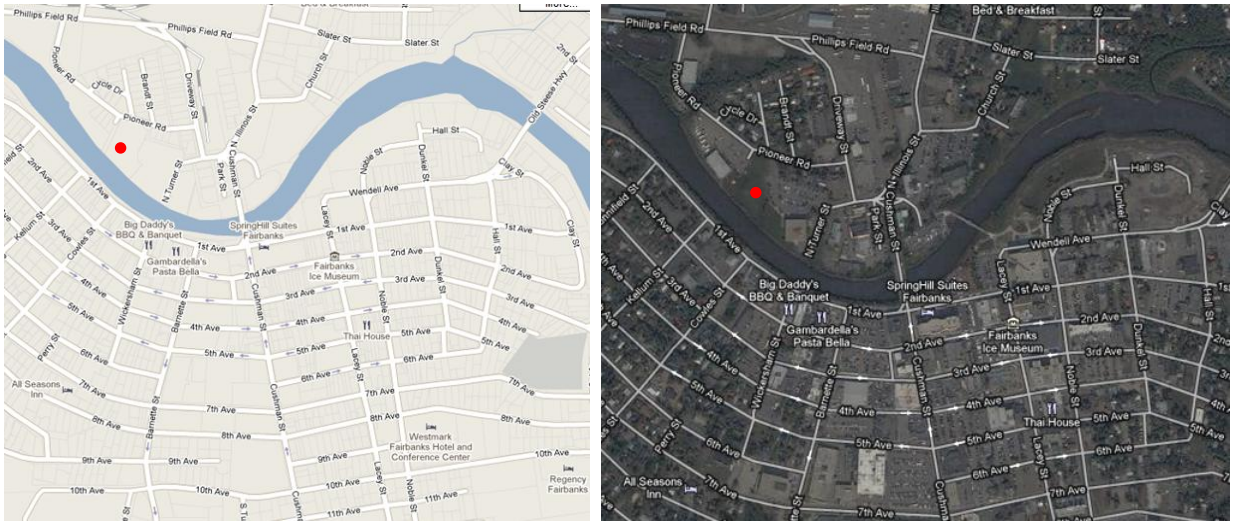


Figure 3.4:1 Map and satellite image of the NCore monitoring site. The red dot indicates the site location.

3.4.2 Sources

The dominant source of fine particulate matter ($PM_{2.5}$) for this site changes season to season. The source contribution to winter time $PM_{2.5}$ is still being studied. Wood smoke from home heating is currently considered one of the major sources. During the summer months, the main source is from wildland fire smoke.

3.4.3 Monitors

The NCore monitoring site is currently equipped with:

- $PM_{2.5}$ (SPM) – One Thermo Electron (formerly Rupprecht & Patashnick) Partisol 2000 sampler on a 1-in-3 day alternating sampling schedule.
- $PM_{2.5}$ (SPM) – One Thermo Scientific Model 8500 Series FDMS TEOM
- Elemental Carbon – a Magee Scientific Aethalometer with BGI 2.5 µm sharp cut cyclone samples continuously.

In the fall of 2010, the NCore site monitoring site will be expanded to include a new temperature-controlled shelter and additional monitors for:

- continuous $PM_{2.5}$
- continuous PM_{10}-$PM_{2.5}$
- carbon monoxide (CO)
- sulfur dioxide (SO_2)
- nitrogen oxide (NO)
- total reactive nitrogen (NO_Y)
- ozone (O_3)
- lead (TSP-Pb) (under review)
- surface meteorology for wind speed/direction(WS/WD), ambient temperature (T), and relative humidity (RH)

Data collection is to begin January 1, 2011.

3.4.1 Siting

The site is located approximately 35 meters north of the Chena River near the Fairbanks North Star Borough Building. There is a small patch of birch trees 6-10 meter tall that sit approximately 25 meters to the east of the site. The heights of the trees exceed the height of the monitor inlets. There is a 12 meter tall building approximately 70 meters to the southeast of the site and a 7 meter tall building approximately 60 meters to the west.

3.4.2 Traffic

This site is located in downtown Fairbanks with numerous roads within one mile of the site. Area roads have daily traffic counts ranging from 3,700 to 7,400 vehicles per day. There are parking lots in the vicinity of both adjacent buildings.

<u>Figure 3.4:2</u> Pictures of the NCore monitoring site.

North	East	South	West
			
Views in four directions from the NCore site			
			
Views in four directions towards the NCore site			

3.5 *TAC (PEGER ROAD) SITE - FAIRBANKS*

3175 Peger Road **AQS ID: n/a**
Parameters: $PM_{2.5}$ **Established: Nov. 1, 2007**

3.5.1 Site Information

The site is located at the Transit Admin Center (TAC) on Peger Road at latitude 64° 49′ 08″ north, longitude 147° 46′ 27″ west, and 133 meters (436 feet) above sea level. Figure 3-5 shows a street map of the local area. This is a neighborhood-scale, population-oriented site.

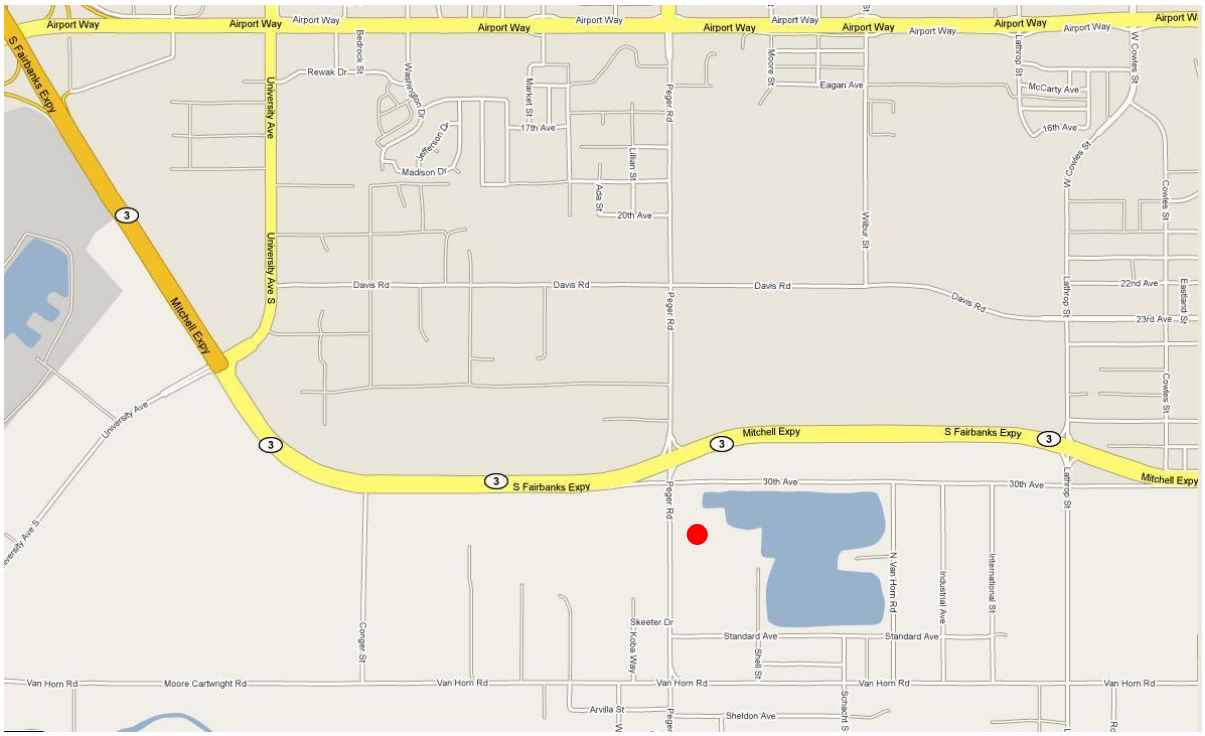


Figure 3.3:1 Map of the TAC (Peger Road) monitoring site. The red dot indicates site location.

3.5.2 Sources

The source of constituent pollutants of $PM_{2.5}$ in Fairbanks is unclear. The FNSB Winter Monitoring Project conducted during the winters of 2008-09, 2009-10, and 2010-11is to evaluate wintertime pollutant characteristics and develop a strategy to reduce the concentration in Fairbanks.

3.5.3 Monitors

The TAC site is currently equipped with:

- $PM_{2.5}$ (SPM wintertime only) – One Thermo Electron (formerly Rupprecht & Patashnick) Partisol 2000 sampler on a 1-in-3 day alternating sampling schedule.
- $PM_{2.5}$ (SPM) – A single Met-One Beta Attenuation Monitor (BAM 1020) was installed to provide information in real time for evaluating the Air Quality Index.
- $PM_{2.5}$ (SPM wintertime only) – A single Met-One Super SASS Speciation Monitor. This multi filter sampler is set to sample on a 1-in-3 day sampling schedule.
- Elemental Carbon (SPM wintertime only) – a Magee Scientific Aethalometer with BGI 2.5 μm sharp cut cyclone samples continuously.
- Wind speed/wind direction – One R. M. Young Model 05305VM (Windbird) combined wind vane anemometer. The wind direction and wind speed data is continuously recorded.

3.5.4 Siting

The TAC site is in an industrial area, approximately 222 meters (730 feet) from the Peger Road/Mitchell Expressway intersection. One of the $PM_{2.5}$ Partisol samplers is located approximately 82 meters (270 feet) to the east of the rest of the monitoring equipment and acts as a non-road baseline to compare with the roadway site.

3.5.5 Traffic

This location is in an industrial area near the Mitchell Expressway, the average daily traffic for this location is unknown at this time.

Figure 3.5:2: Pictures of the TAC (Peger Rd.) site.

North	East	South	West
			
Views in four directions from the TAC site			
			
Views in four directions towards the TAC Site			

3.6 *NORTH POLE ELEMENTARY SITE – NORTH POLE*

250 Snowman Lane **AQS ID: n/a**
Parameters: $PM_{2.5}$, WS/WD, Temp, Chemical Speciation, Black Carbon **Established: Dec. 20, 2008**

3.6.1 Site Information

The site is located at the North Pole Elementary School on the east side of the parking lot at 64° 45.122' north, 147° 20.842′ west, and 146 meters (479 feet) above sea level. Figure 4.8:1 shows a street map of the local area. This is a neighborhood-scale, population-oriented site.

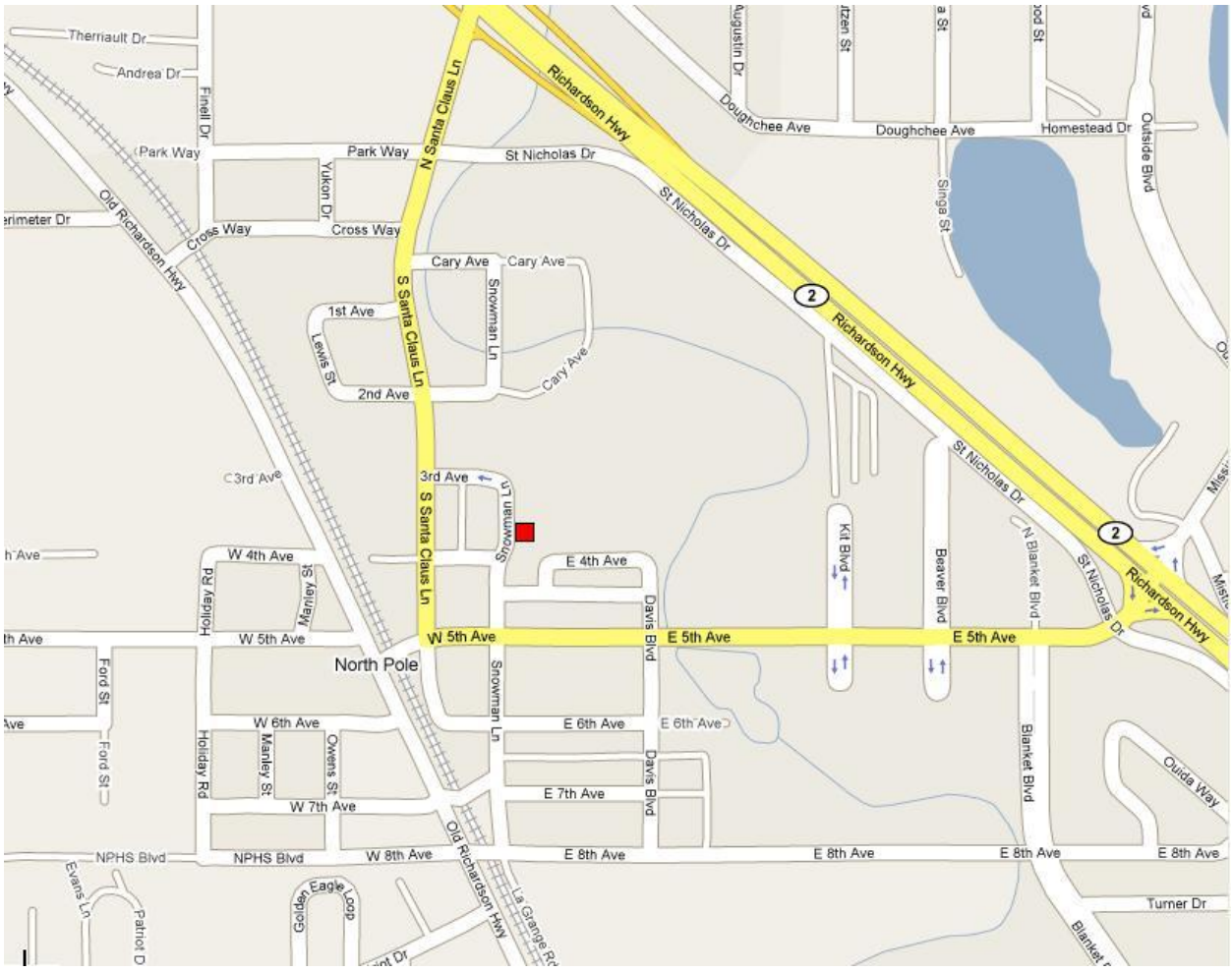


Figure 3.6:1 Map of the North Pole monitoring site. The red square indicates site location.

3.6.2 Sources

The source of constituent pollutants of $PM_{2.5}$ in North Pole is unclear. The FNSB Winter Monitoring Project conducted during the winters of 2008-09, 2009-10, and 2010-11 is to

evaluate wintertime pollutant characteristics and develop a strategy to reduce the concentration in North Pole.

3.6.3 Monitors

The North Pole Elementary site is currently equipped with:

- $PM_{2.5}$ (SPM) – One Thermo Electron (formerly Rupprecht & Patashnick) Partisol 2000 sampler on a 1-in-3 day alternating sampling schedule.
- $PM_{2.5}$ (SPM) – A single Thermo Electron TEOM/FDMS 1400a/8500 samples continuously.
- Elemental Carbon (SPM) – a Magee Scientific Aethalometer with BGI 2.5 μm sharp cut cyclone samples continuously.
- $PM_{2.5}$ (SPM wintertime only) – A single Met-One Super SASS Speciation Monitor. This multi filter sampler is set to sample on a 1-in-3 day sampling schedule.
- Wind Speed/Wind Direction - MetOne Sonic Anemometer Model 50.5H

3.6.4 Siting

The North Pole Elementary School site is located on the eastside parking lot of North Pole Elementary School on Snowman Lane. The monitoring instrumentation is housed in a self-contained monitoring shelter. The sample inlets extend above the roof of the shelter at approximately 4 meters above ground level.

3.6.5 Traffic

Average daily traffic for this location is unknown. The site is within approximately 1000 feet (300 meters) from the Richardson Highway. Land use within a 400 meter radius of the site is mixture of commercial, industrial, and residential. Annual average daily traffic along the Richardson Highway through North Pole is 10,400 vehicles per day. The daily traffic along Snowman Lane is unknown but expected to be less than 5,000 vehicles per day.

Figure 4.8.2: Pictures of the North Pole Site

North	East	South	West
			
Views in four directions from the North Pole site			
			
Views in four directions towards the North Pole Site			

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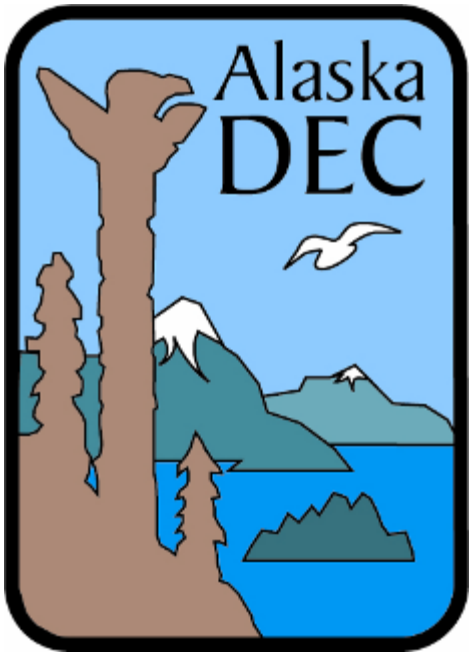
Chapter 4 - Juneau



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4 JUNEAU MONITORING SITES

4.1 *General Information*

The City and Borough of Juneau is located in Southeast Alaska, including the mainland side of Gastineau Channel and Douglas Island. The city and borough encompasses 2,594 square miles of land and 488 square miles of water. Juneau has a mild, maritime climate with average winter temperatures ranging from 25°F to 35°F and average summer temperatures ranging from 44°F to 65°F. Annual precipitation varies throughout the region with 92 inches in downtown Juneau and 54 inches at the airport ten miles to the north-west. Snowfall averages 101 inches at the airport. The population[1] of the Juneau-Douglas area is 30,700.

Currently there is one particulate matter monitoring site in Juneau which is operated by Alaska DEC staff. The AQS ID number for the site is 02-110-0004, Floyd Dryden Middle School (PM_{10} and $PM_{2.5}$). Figure 4.1:1 below indicates the location of the site.

Juneau was designated non-attainment for PM_{10} on November 15, 1990. The two primary sources of PM_{10} required the community to develop two separate action plans to minimize exceedance of the standard. The first was to start paving streets to minimize the impact of road-dust and the second was to issue air quality notices when residents would limit use their woodstoves to reduce the impact from wood-smoke. The City and Borough of Juneau and the Alaska DEC has been re-designate as a PM_{10} maintenance area with the US EPA. Definitions of designations and siting criteria can be found in Appendix A.

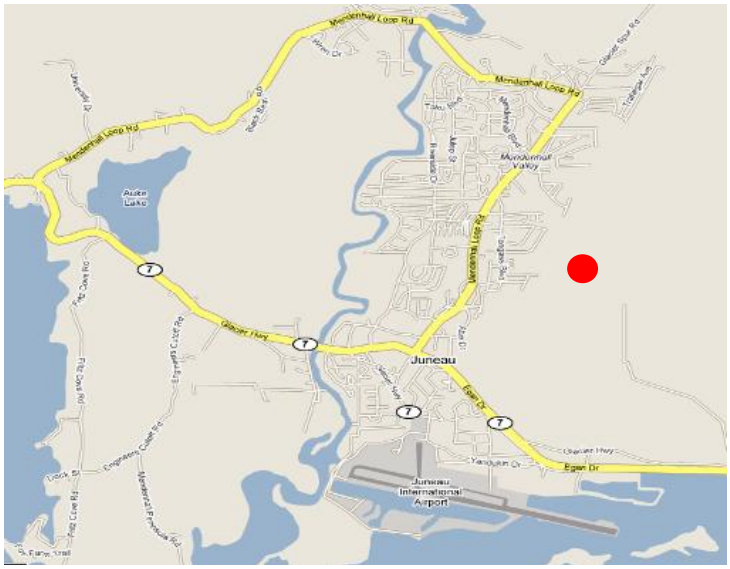


Figure 4.1:1: Street map of Mendenhall Valley. Red circle indicates the monitoring site.

[1] Population data 2005 U.S. Census.

4.2 *FLOYD DRYDEN MIDDLE SCHOOL SITE - JUNEAU*

3800 Mendenhall Loop Road **AQS ID 02-110-0004**
Parameters: $PM_{2.5}$, PM_{10} **Established: January 1, 1980**

4.2.1 Site Information

The Juneau site is located on the roof of Floyd Dryden Middle School in the Mendenhall Valley, off Mendenhall Loop Road between North El Camino Street and Spruce Lane. The latitude is 58° 23' 30" north (58.388889), the longitude is 134° 33' 30"west (-134.565556), and the site is located 45 meters (143 feet) above sea level. Figure 4.2:1 is a satellite image of the site and a map of the surrounding area. The site is located in the middle of a residential area and is a neighborhood-scale, population-oriented site.

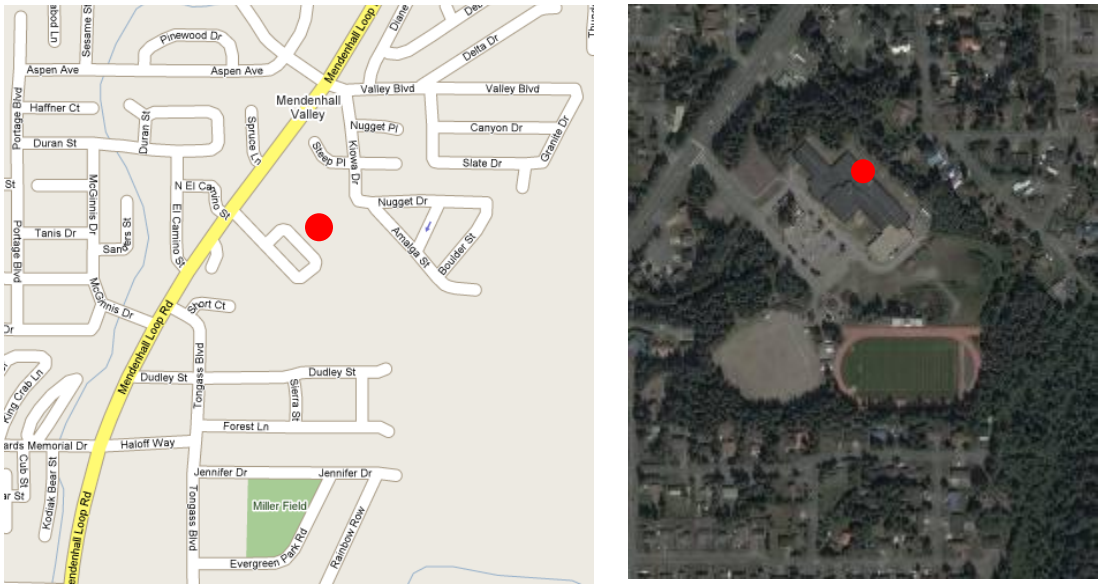


Figure 4.2:1: Map and satellite image of the Floyd Dryden monitoring site. The red circle indicates the monitoring site.

4.2.2 Sources

The Mendenhall Valley is located northwest of Juneau and is separated from the Lemon Creek Valley by the west-east oriented Heintzelman Ridge. With the exception of wildfire smoke from Canada and the Alaskan mainland, pollution sources outside the valley are not expected to impact the monitoring site at Floyd Dryden Middle School. The sources of particulate matter within the Mendenhall Valley include: residential wood smoke, dust from ball fields, playgrounds, road-dust tracking, automobile exhaust, fugitive dust from construction/land clearing, and smoke from open burning.

Juneau International Airport (average of 1050 passengers daily) is 3.2 km (2 miles) away at the south end of Mendenhall Valley, and may potentially affect the Floyd Dryden site when winds are from the south. Within 8 km (5 miles) are a gravel pit and the

Mendenhall Glacier, both of which may cause crustal material to be re-entrained during dry windy conditions. On occasion during summer months, wildfire smoke, carried by long range transport from North-Western Canada, has been known to impact the Mendenhall Valley.

4.2.3 Monitors

The Floyd Dryden Site is currently equipped with:

- $PM_{2.5}$ (SPM) – One Thermo Scientific (formerly Rupprecht and Patashnick) Partisol 2000 FRM sampler running on a 1-in-6 day sampling schedule.
- PM_{10} (SLAM) – Two Thermo Scientific Partisol 2000 FRM samplers running collocated on a 1-in-6 day sampling schedule.
- $PM_{2.5}$ (SLAM) – A single MetOne Instruments BAM 1020 Beta Attenuation continuous sampler provides information in real time for evaluating the Air Quality Index.

4.2.4 Siting

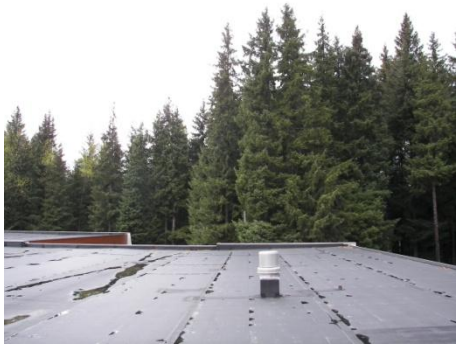
The samplers are installed on the roof of Floyd Dryden Middle School, approximately six meters (19 feet) above the ground. There is a furnace flue approximately 20 meters (64 feet) to the east of the sampler roof location. There is also a nearby dryer vent coming out of the building on the ground level directly below the current sampler location. The school has a penthouse which is approximately four meters above the roof and 6 meters (19 feet) to the south of the closest monitor.

The samplers are installed approximately 65 meters (207 feet) from the nearest traffic lane. A row of 15 meter (48 feet) tall trees are within 25 meters (80 feet) on the northern side of the site. Airflow is generally uninterrupted with the exception of the trees to the north-northeast. These trees are not considered to be a barrier because most elevated PM concentrations occur during winter inversions and/or during times when the wind is less than five mph. Under these conditions, the particulate concentrations are thought to have homogeneous dispersion. The monitors are on the north side of the school and away from the parking lot.

4.2.5 Traffic

The Floyd Dryden site is approximately 65 meters east of Mendenhall Loop Road (the main roadway into the valley; 12,770 vehicles per day). All roads are paved and, in the winter, sanded for traction.

Figure 4.2:2: Pictures of the Floyd Dryden site.

North	East	South	West
			
Views in four cardinal directions from the Floyd Dryden Site			
			
Views in four cardinal directions toward the Floyd Dryden Site			

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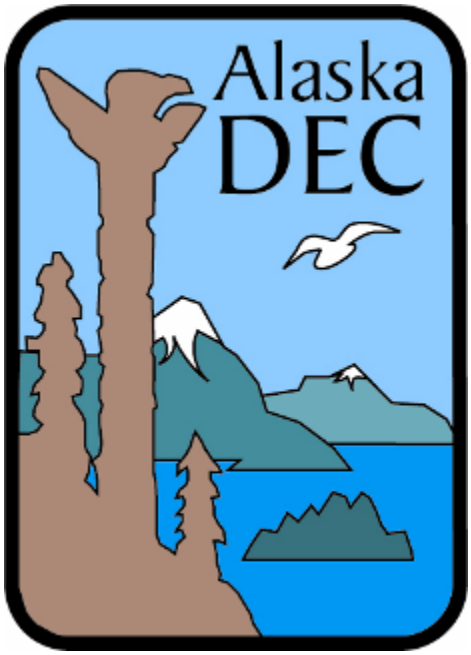
Chapter 5 – Matanuska Susitna Valley



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5 MATANUSKA-SUSITNA VALLEY MONITORING SITES

5.1 General Information

The Mat-Su Borough has a population[1] of 76,006 and covers 24,682 square miles of land and 578 square miles of water. There are three incorporated cities, several unincorporated communities, and twenty-five recognized community councils within the Mat-Su Borough. Average temperatures in the winter range from 6°F to 14°F; in the summer, 47°F to 67°F. Annual precipitation is 16.5 inches, with 58 inches of snowfall.

The State of Alaska has been conducting air quality monitoring investigations into particulate matter concentrations in the Matanuska–Susitna (Mat-Su) Valley since 1998. Monitoring was initiated in response to staff observations and well-documented accounts of wind-blown dust off the Matanuska and Knik River drainages. Particulate matter (PM) is divided into three factions depending on the size of the particle: PM_{10}, $PM_{2.5}$, and $PM_{10-2.5}$. Monitoring in Mat-Su Valley began with sampling for PM_{10} which means coarse particulate that is all particulate matter of a particle size less than or equal to 10 micrometers (µm). PM_{10} is usual with crustal materials, which in this case is primarily wind-blown glacial silt from the river basins. $PM_{2.5}$ is referred to fine particulate and is particulate matter equal or less than 2.5 µm and usually associated with smoke. $PM_{10-2.5}$ is a recent monitoring development to further differential PM_{10} from $PM_{2.5}$ and represents the faction of particles in the size range between PM_{10} and $PM_{2.5}$.

Currently, there are three particulate monitoring sites located near the population centers in the southern Mat-Su Borough. All three sites are operated by Alaska Department of Environmental Conservation, Air Quality Division staff.

The designated State & Local Air Monitoring Site (SLAM) site is located at Harrison Court in the unincorporated area of Butte. The Harrison Court site AQS ID number is 02-0170-0008. The other two monitoring sites located in Palmer and Wasilla are special purpose monitoring (SPM) sites. The Palmer site is located between E Dahlia Avenue and E Elmwood Avenue near S Gulkana Street. The Wasilla site is located behind Fire Station 61 near the intersection of W Swanson and Lucille. Figure 5.1:1 provides the map locations for all three monitoring sites.

[1] Population data 2005 U.S. Census.

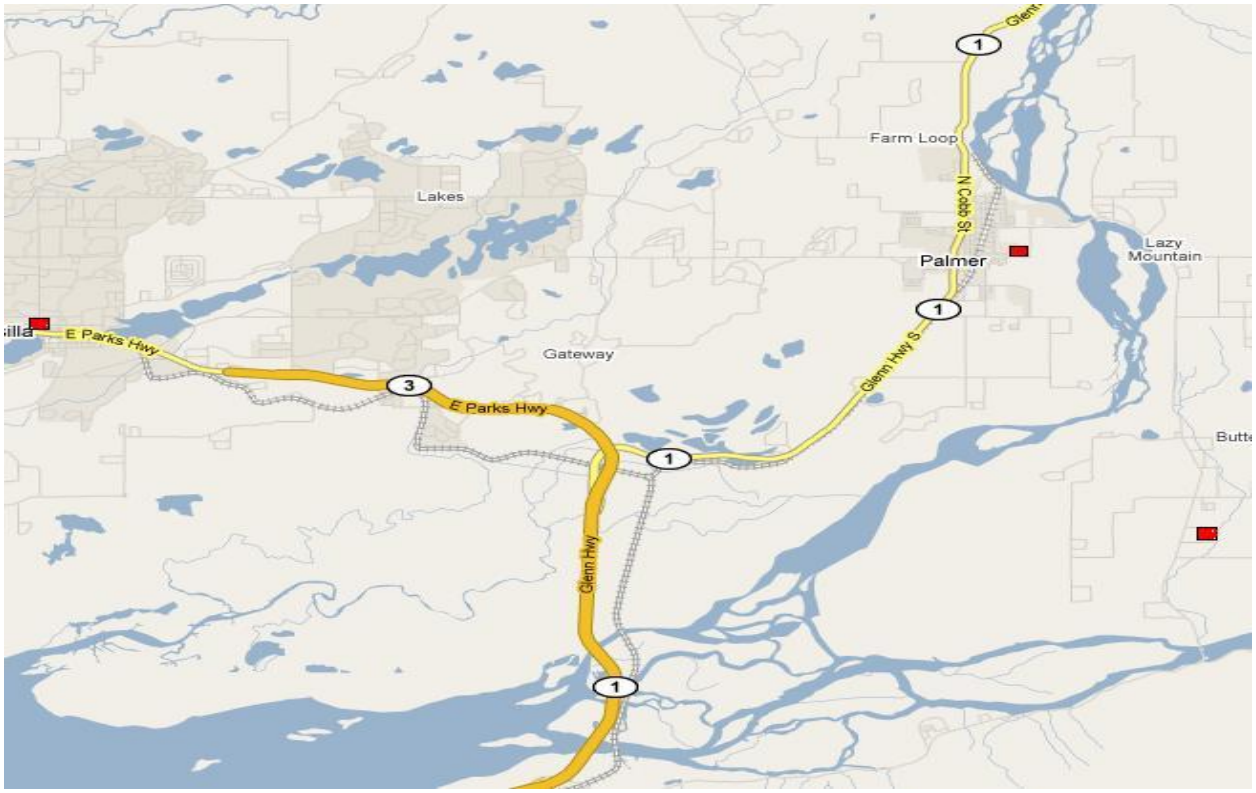

Figure 5.1:1 Map of the Southern Mat-Su Borough area. The red squares indicate the location of the three monitoring sites.

5.2 HARRISON COURT (BUTTE) SITE- MATANUSKA-SUSITNA BOROUGH

Harrison Court **AQS ID 02-170-0008**
Parameters: PM_{10}, $PM_{2.5}$ **Established: April 11, 1998**

5.2.1 Site Information

The Harrison Court monitoring site is located on a cul-de-sac at the end of Harrison Court, latitude 61° 32' 2.986" north (61.534163), longitude 149° 1' 53.96" (–149.031655), and 28 meters (90 feet) above sea level. This site has manual samplers for $PM_{2.5}$ and $PM_{10,}$ as well as a continuous monitor for $PM_{10.}$ Figure 5.2:1 is a street map of the monitoring site and surrounding area. Harrison Court is a neighborhood PM site.

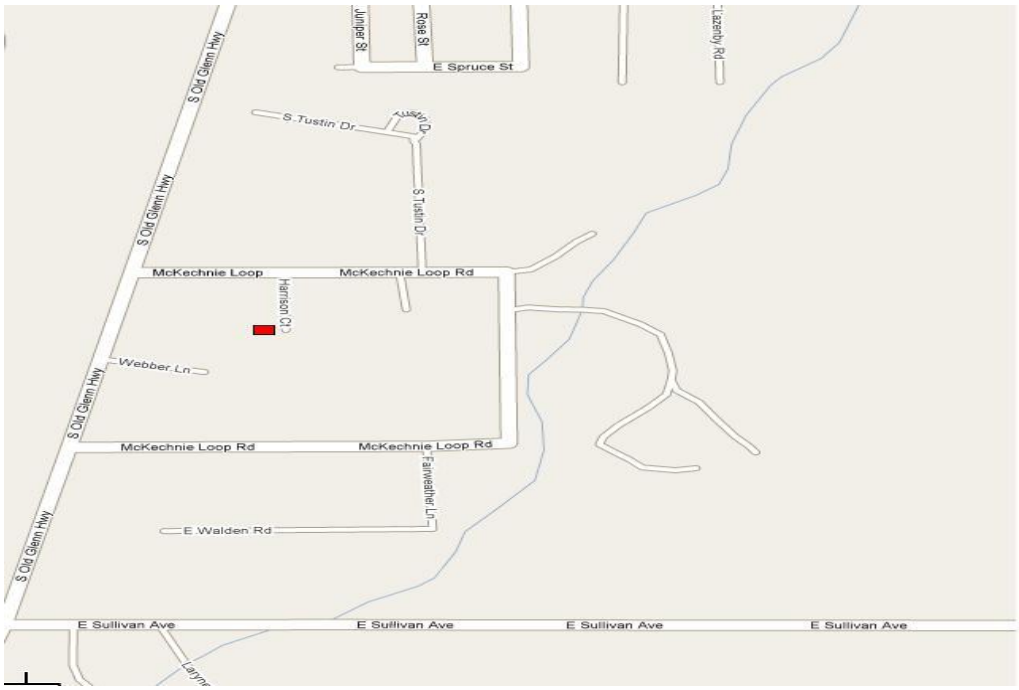

Figure 5.2:1 Map of the Butte area. The red square denotes the Harrison Court site.

5.2.2 Sources

The major sources of coarse particulate matter impacting this site are dust from the Knik and Matanuska River basins. Both are glacier fed meandering rivers that deposit glacial silt over wide braided riverbeds and out to the Cook Inlet tidal zone. During times when the river is low (spring and fall) dry, windy weather suspends large amounts of silt in the air from the tidal flats and gravel bars. Several air quality alerts are issued per year during spring and fall months because of wind-blown dust events. Additionally, within 8 km (5 miles) are two small gravel airstrips (activity unknown but expected to be light), a dirt-track motor raceway, many acres of farmland, and recreation areas along both river basins. Most land in the area is undeveloped forest. Sources of fine particulate matter include residential wood smoke, vehicular exhaust, and forest fires.

5.2.3 Monitors

The Harrison Court (Butte) Site is currently equipped with:

- $PM_{2.5}$ (SLAMS) – Two Thermo Electron (formerly Rupprecht & Patashnick) Partisol 2000 samplers. Two samplers are operated on alternating 1-in-6 day schedules. This operating mode results with samples collected at the site which are in accordance with the EPA 1-in-3 day air monitoring schedule.
- PM_{10} (SPM) – One General Metal Works high-volume sampler. Operated on a 1-in-6 sampling schedule.
- PM_{10} (SPM) – A single Met-One BAM 1020 continuous monitor was installed to provide information in real time for evaluating the Air Quality Index.

5.2.4 Siting

The manual operated equipment is located on the roof of the trailer and the continuous monitor is housed inside the trailer. All inlets are at a height of approximately four meters (13 feet) above the ground. There is uninterrupted airflow around the inlets. The monitoring objective of this site is to measure airborne glacial loess raised by high winds on the Knik and Matanuska river beds, as well as measure exposure to fine particulate matter from automobiles and home heating in this rural location. The trailer is on the southwest corner of the unpaved Harrison Court cul-de-sac. Photographs of the Harrison Court site are presented in Figure 5.2:2.

5.2.5 Traffic

There are only three house lots on Harrison Court, and traffic is very light. There are numerous unpaved roadways throughout the area. All main roads are paved. Average daily traffic for the area streets is not known.

Figure 5.2:2 Photographs of the Harrison Court Site

North	East	South	West
			
Views in four directions from the Harrison Court Site			
			
Views from four directions toward the Harrison Court Site			

5.3 PALMER SITE- MATANUSKA-SUSITNA BOROUGH

Palmer **AQS ID 02-170-0012**
Parameters: PM_{10}, $PM_{2.5}$ $PM_{10-2.5}$ **Established: October 1, 2008**

5.3.1 Site Information

The Palmer monitoring site is located on South Gulkana Street between East Dahlia Avenue and East Elmwood Avenue near the city tennis court and Little League baseball field. The site coordinates are latitude 61° 35.961' north (61.598898), longitude 149°6.217' west (-149.106220). The average elevation for Palmer is 73 meters (239 feet) above mean sea level. The monitoring site is located approximately 600 meters due east of the central downtown district. The predominant land use within a 400 meter (0.25 mile) radius is residential and commercial buildings with large, open grass-covered areas. A map of the site is presented in Figure 5.3:1.

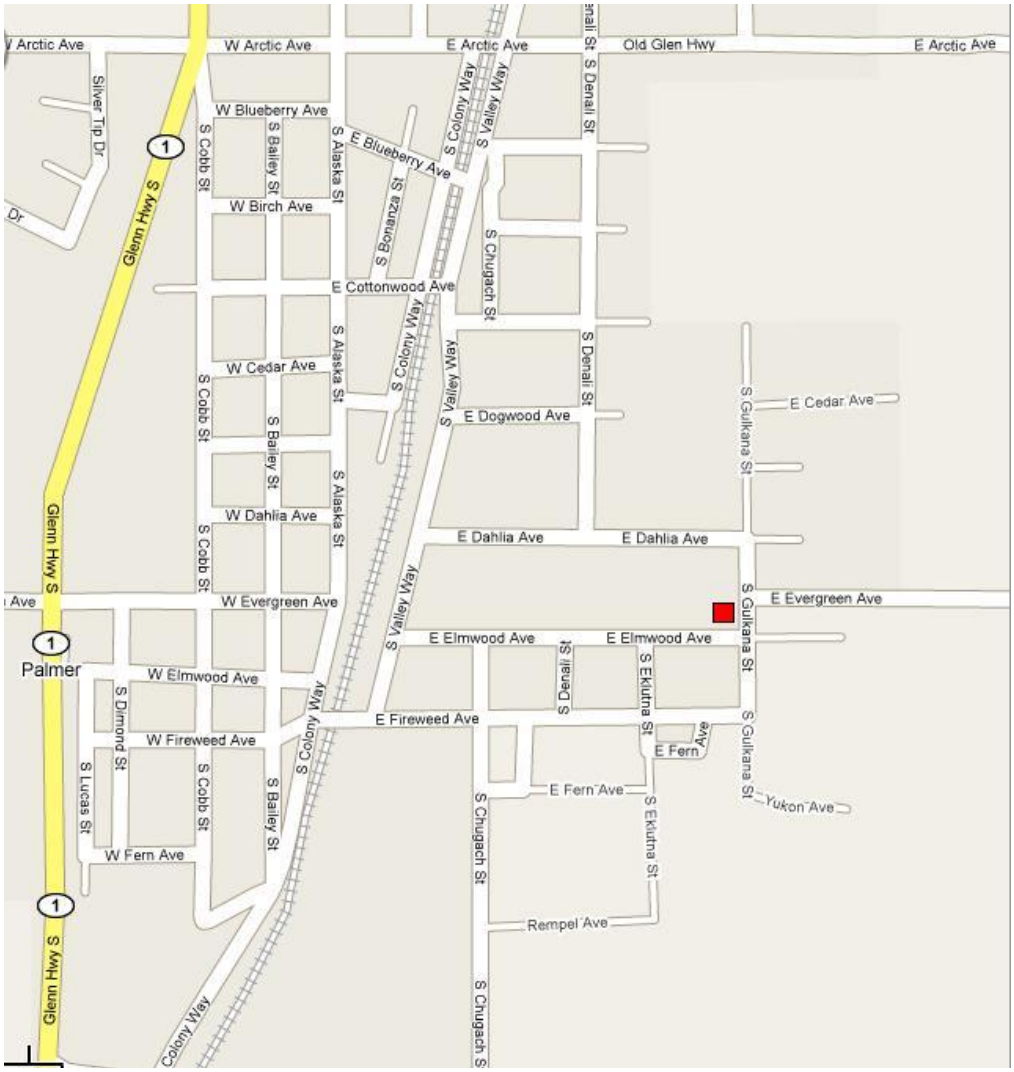

Figure 5.3:1 Map of the City of Palmer. The red square denotes the monitoring site.

5.3.2 Sources

The major source of coarse particulate matter impacting the Palmer site is glacial silt dust or loess from the Matanuska and Knik River basins. Both are glacier fed meandering rivers that deposit glacial silt. During times when the river is low (spring and fall) dry, windy weather suspends large amounts of silt in the air. Several air quality alerts are issued per year during spring and fall months because of wind-blown dust events. Other minor sources of coarse particulate are road dust from the local paved road and dust from the Little League ballpark infield. Sources of fine particulate matter include residential wood smoke, vehicular exhaust, and forest fires.

5.3.3 Monitors

The Palmer Site is currently equipped with:

- PM_{10} (SPM) – A single Met-One BAM 1020X continuous monitor was installed to provide information in real time for evaluating the Air Quality Index.
- $PM_{2.5}$ (SPM) - A single Met-One BAM 1020X continuous monitor was installed to provide information in real time for evaluating the Air Quality Index.
- $PM_{10\text{-}2.5}$ (SPM) – first generation upgrades to the Met-One BAM 1020X continuous monitors programmed to provide $PM_{10\text{-}2.5}$ data.
- Meteorological sensors for wind speed, wind direction, and ambient temperature.

5.3.4 Siting

The continuous particulate monitors are housed in an insulated temperature-controlled trailer. All inlets are at a height of approximately four meters (13 feet) above the ground. There is uninterrupted airflow around the inlets. The monitoring objective of this site is to measure coarse particulate from airborne glacial loess raised by high winds on the Knik and Matanuska river beds, as well as measure exposure to fine particulate matter from vehicular exhaust, wood smoke from residential heating and forest fires and then compare the emissions coarse versus fine particulates for PM difference. Photographs of the Palmer site are presented in Figure 5.3:2.

5.3.5 Traffic

All main roads in immediate area of the monitoring site are paved. Average daily traffic for the area streets is not known.

Figure 5.3:2 Photographs of the Palmer Site

North	East	South	West
			
Views in four directions from the Palmer Site			
			
Views from four directions toward the Palmer Site			

5.4 WASILLA SITE - MATANUSKA-SUSITNA BOROUGH

Wasilla **AQS ID 02-170-0013**
Parameters: PM_{10}, $PM_{2.5}$ $PM_{10-2.5}$ **Established: October 1, 2008**

5.4.1 Site Information

The Wasilla monitoring site is located in the 100 block of West Swanson Avenue behind the Station 61 Fire Station near the intersection with Lucille Street. The site coordinates are latitude 61° 34.998' north (61.598796), longitude 149° 27.212' west (-149.455255). The average elevation for Wasilla is 104 meters (341 feet) above mean sea level. The monitoring site is located approximately 500 meters west-northwest of the central downtown district and approximately 200 meters north of the George Parks Highway. The predominant land use in a 0.5 km radius area is residential and commercial buildings with paved roads, parking lots,

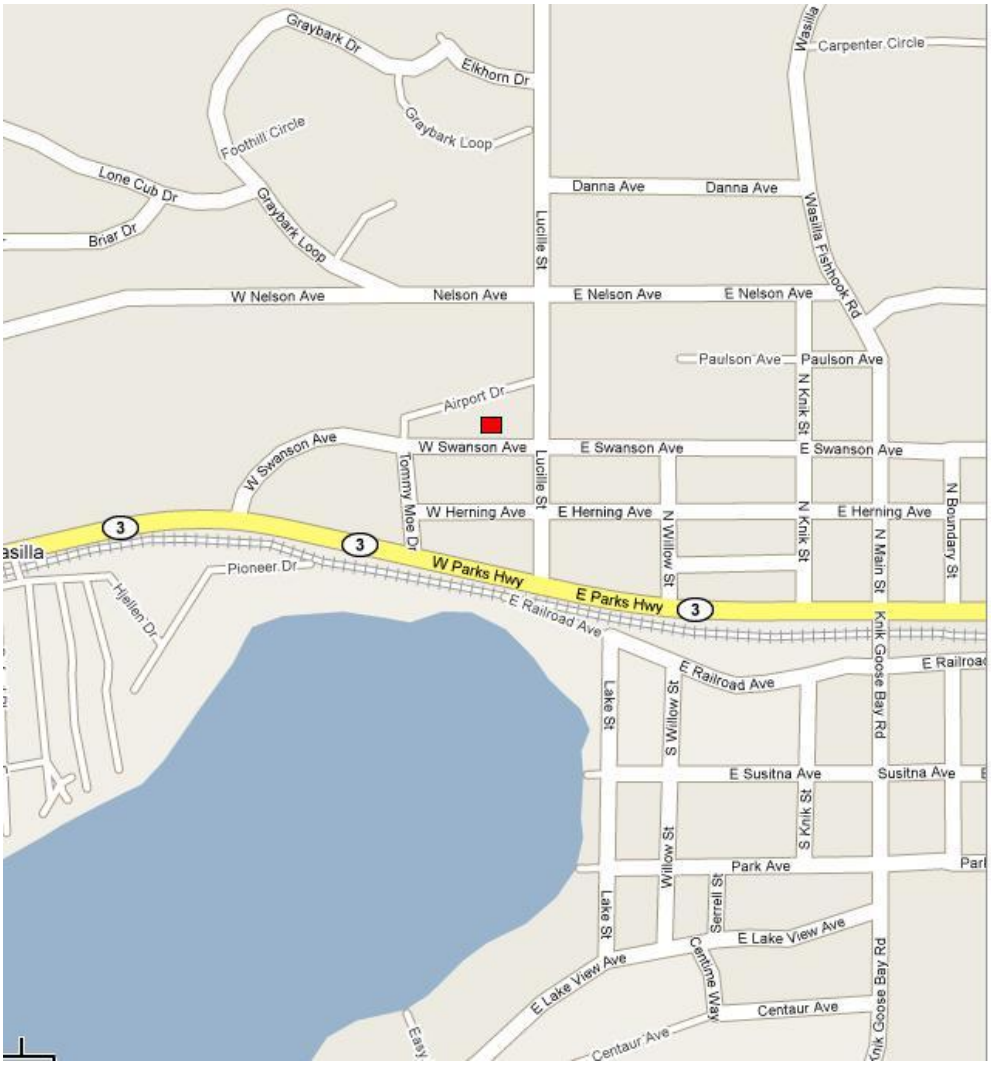

Figure 5.4:1 Map of the City of Wasilla. The red square denotes the monitoring site.

and mixed areas of land, both vegetated and graveled. A map of the site is presented in Figure 5.4:1.

5.4.2 Sources

The major sources of coarse particulate matter impacting the Wasilla site are wind-blown dust from unpaved areas, traffic dust and glacial silt from river beds feeding in the northern end of the Cook Inlet. Several air quality alerts are issued per year during spring and fall months because of wind-blown dust events. Sources of fine particulate matter include residential wood smoke, vehicular exhaust, and forest fires.

5.4.3 Monitors

The Palmer Site is currently equipped with:

- PM_{10} (SPM) – A single Met-One BAM 1020X continuous monitor was installed to provide information in real time for evaluating the Air Quality Index.
- $PM_{2.5}$ (SPM) - A single Met-One BAM 1020X continuous monitor was installed to provide information in real time for evaluating the Air Quality Index.
- $PM_{10\text{-}2.5}$ (SPM) – first generation upgrades to the Met-One BAM 1020X continuous monitors programmed to provide PM_{Coarse} data.
- $PM_{2.5}$ (SPM) – A single Thermo Electron (formerly Rupprecht & Patashnick) Partisol 2000 sampler. The manual sampler runs on a 1-in-6 day sampling schedule.

5.4.4 Siting

The continuous particulate monitors are housed in an insulated temperature-controlled trailer within a small security fenced area. All inlets are at a height of approximately four meters (13 feet) above the ground. There is uninterrupted airflow around the inlets. The monitoring objective of this site is to measure coarse particulate from airborne road dust, glacial loess raised by high winds on exposed ground and river beds, as well as measure exposure to fine particulate matter from vehicular exhaust, wood smoke from residential heating and forest fires and then compare the emissions course versus fine particulates. Photographs of the Wasilla Site are presented in Figure 5.4:2

5.4.5 Traffic

All main roads in immediate area of the monitoring site are paved. Average daily traffic for the area streets is not known. Commuter traffic and summer tourist traffic along the George Parks Highway can be heavy at times. The annual average daily traffic for the Parks Highway west of Fishhook Road was 16,494 in 2005 (as recorded by Alaska DOT).

Figure 5.4:2 Photographs of the Wasilla Site

North	East	South	West
			
Views in four directions from the Wasilla Site			
			
Views from four directions toward the Wasilla Site			

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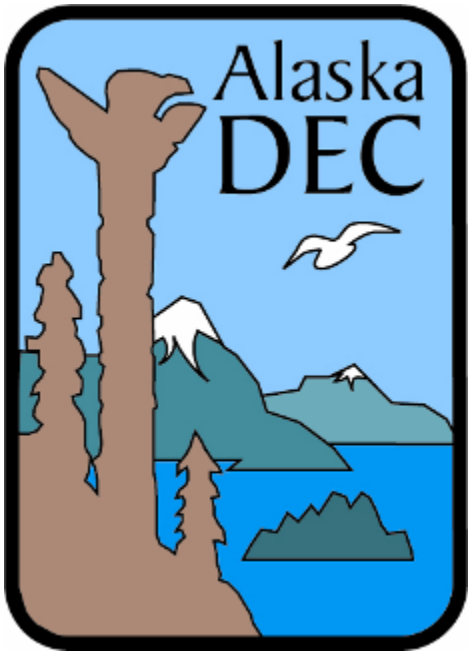
Chapter 6 – Noatak Lead Monitoring



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6 NOATAK LEAD MONITORING SITE

6.1 General Information

The EPA established the original NAAQS for lead in 1978 at 1.5 micrograms per cubic meter ($\mu g/m^3$). Between 1978 and now, more than 6000 studies have repeated shown the deleterious health effects from exposure to lead in the environment. Of primary importance is the finding that lead can cause neurological defects and learning disabilities in children at lower levels than previously thought. Low levels of lead can result in decreases in IQ and memory, slower learning and changes in behavior. On October 15, 2008 the EPA revised the NAAQS for lead from 1.5 $\mu g/m^3$ to 0.15 $\mu g/m^3$. As a requirement under the revised NAAQS, the EPA required monitoring to be conducted in all of the states to ascertain compliance with the new standard.

The overall objective of the monitoring program in the Native Village of Noatak is to determine Alaska's compliance status with the October 15, 2008 revision to the NAAQS for lead. The Red Dog Mine is the only entity in the state of Alaska that has the potential to emit over one ton of lead per year and; therefore, requires a source-oriented monitoring site under the revised NAAQS. The mine is located in a remote area of northwestern Alaska in the Northwest Arctic Borough which has an area of 40,762 square miles or about the size as the state of Indiana. The ambient air boundary of mine is located in extremely rugged terrain with no road access. The closest population center to the mine is Noatak, a village of approximately 450 residents located approximately 30 miles to the south. Figure 6.1:1 is a satellite image of the Northwest Arctic Borough showing Noatak and other villages in relation to the Red Dog Mine.

Area temperatures in the winter range from -45°F to 25°F and in the summer, 25°F to 75°F.

The Alaska Department of Environmental Conservation, Air Quality Division staff is conducting the sampling with the assistance of local site operators contracted through the Native Village of Noatak IRA. The sampling program in Noatak began in January 2010.

The samples are collected by drawing ambient air, at a known volume and rate, through a glass fiber filter. Any dust or particulate matter in that volume of air is captured onto the filter. Samples are collected over a 24-hour period. Samples are collected in accordance the EPA National Ambient Air Monitoring schedule. The airborne dust is referred to as total suspended particulate (TSP) matter. The samples are shipped to Anchorage for laboratory analysis to determine the lead (Pb) content of the airborne dust collected on the filter. The sampling and analysis method is referred to as TSP-Pb.

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<u>Figure 6.1:1</u>: Satellite image of the Northwest Arctic Borough area. The stars indicate Noatak, the Red Dog Mine, and other area villages.

6.2 NATIVE VILLAGE OF NOATAK SITE- NORTHWEST ARCTIC BOROUGH

Noatak, Alaska **AQS ID N/A**
Parameters: TSP *Pb* **Established: January 15, 2010**

6.2.1 <u>Site Information</u>

Currently there is one collocated State and Local Air Monitoring Systems (SLAMS) site in Noatak, Alaska located near the center of the village. The site coordinates are: latitude 67° 34.2' north (67.5701), longitude 162 °, 58.1' west (-162.9680). Site elevation is approximately 26 meters (85 feet) above sea level.

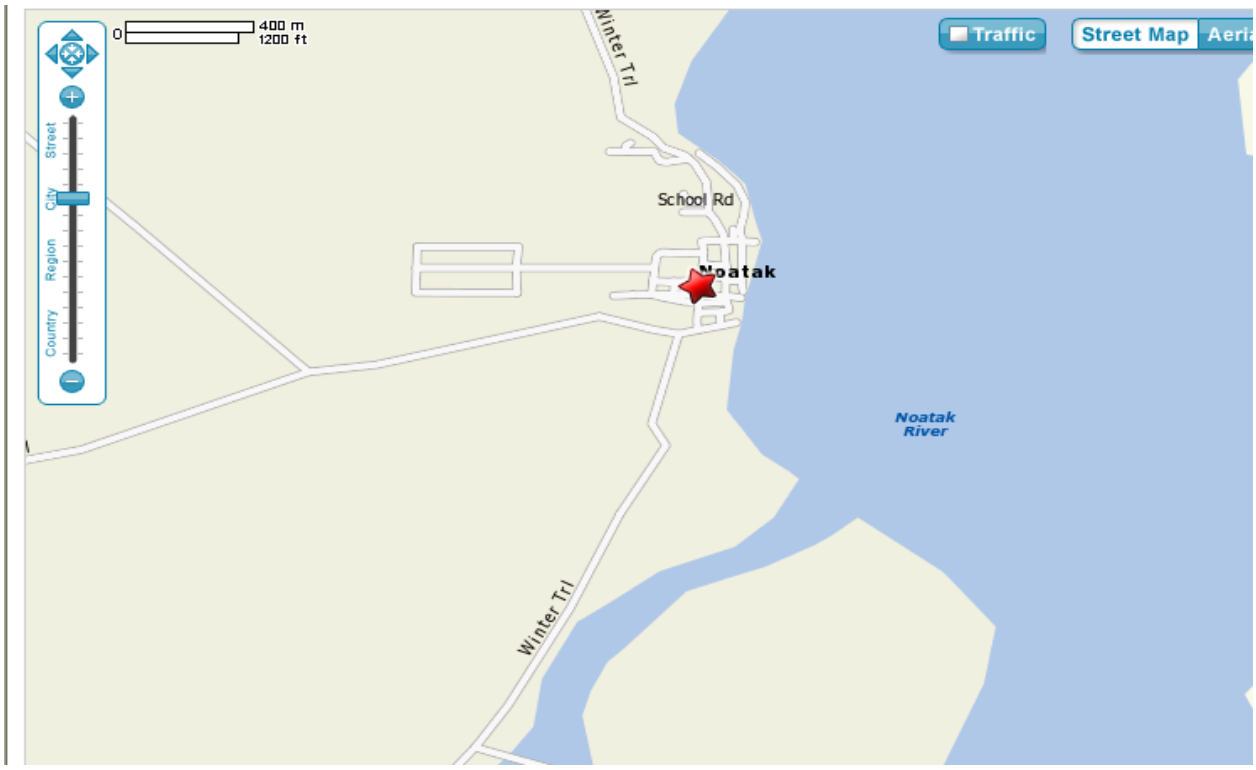

Figure 6.2:1 shows the map location of the Noatak monitoring site.

6.2.2 Sources

Sources of particulate matter containing lead that may impact this site would be fugitive dust transported over a great distance from the Red Dog Mine or from wind-blown soils with naturally occurring lead. The Noatak River feeds out of the Brooks Range depositing fine glacial silt throughout the meandering river basin. During times when the river is low (spring and fall) dry, windy weather suspends large amounts of silt in the air resulting with wind-blown dust events. Other sources of air-borne dust result from trucks and 4-wheeler all terrain vehicles run over unpaved village roads. Sources of fine particulate matter that may contain lead are engines which still burn leaded fuel like piston-engine aircraft. As with other communities in Alaska, strong wintertime temperature inversions increase air pollution concentrations.

6.2.3 Monitors

The Noatak monitoring site is currently equipped with:

- TSP-*Pb* (SLAMS) – Two General Metal Works TSP high-volume samplers, equipped with electronic mass flow controllers, and operated on a 1-in-6 day sampling schedule.

6.2.4 Siting

The manual operated samplers are located on a scaffolding platform. All inlets are at a height of approximately 3 meters (9-10 feet) above the ground. There is uninterrupted airflow around the

inlets. The platform is to be expanded in the summer of 2010 to meeting siting criteria for collocated samplers.

The monitoring objective of this site is to measure the lead content of total suspended particulate. Photographs of the Noatak site are presented in Figure 6.2.2.

6.2.5 Traffic

All the roads in the village are unpaved. Average daily traffic for area roads is not known but is a mixture of automobiles, trucks, but mostly four wheeled all terrain vehicles (ATVs). In the wintertime the traffic is mostly snow machines.

Figure 6.2:1: Photographs of the Noatak Site

North	East	South	West
			
Views in four directions from the Noatak Site			
			
Views from four directions toward the Noatak Site			

Alaska's 2011 Air Monitoring Network Plan

Appendices and Glossary

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APPENDIX A:

Designations

Non-attainment: any area that does not meet, or that contributes to poor ambient air quality in a nearby area that does not meet, the national primary or secondary ambient air quality standard for any pollutant on the national ambient air quality standards list.

Attainment: any area that meets the national primary or secondary ambient air quality standard for the pollutant.

Unclassifiable: any area that cannot be classified on the basis of available information as meeting or not meeting the national primary or secondary ambient air quality standard for the pollutant.

Maintenance: any area that is going through the transition from being designated a non-attainment area to attainment.

Note: Further information regarding designation can be found at:

http://epa.gov/air/oaqps/greenbk/define.html

http://www.epa.gov/air/caa/

APPENDIX B:

Siting Criteria

The Federal Environmental Protection Agency (EPA) Region 10 requested that the Alaska Department of Environmental Conservation (DEC) staff provide a table which demonstrates that each monitoring site complies with siting criteria identified in 40 CFR Part 58 Appendix E. Included are two tables: one for CO sites and one for PM sites. Certain sites have been found to have had their monitoring scale incorrectly designated. A discussion of the monitoring scale changes follows each table.

Carbon Monoxide Sites

Carbon monoxide (CO) inlet probes should be at least 1 meter away, both vertically and horizontally, from any supporting structure or wall. For microscale sites the probe height must be between 2.5 and 3.5 meters, whereas for other scale sites the probe must be between 3 and 15 meters high.

A probe must have unrestricted airflow for at least 270 degrees, or 180 degrees if it is located on the side of a building. Obstructions must be a minimum distance away equal to twice the distance by which the height of the obstruction exceeds the height of the probe. Trees should not be present between the dominant CO source or roadway and the inlet probe.

The following is a list with definitions on monitoring site scaling;

Microscale—defines the concentrations in air volumes associated with area dimensions ranging from several meters up to about 100 meters.

Middle Scale—defines the concentration typical of areas up to several city blocks in size with dimensions ranging from about 100 meters to 0.5 kilometer.

Neighborhood Scale—defines concentrations within some extended area of the city that has relatively uniform land use with dimensions in the 0.5 to 4.0 kilometers range.

Urban Scale—defines the overall, citywide conditions with dimensions on the order of 4 to 50 kilometers. This scale would usually require more than one site for definition.

The following table (Table B-1) lists all CO monitoring sites in Anchorage and Fairbanks (including SPM) and how they fit the siting criteria from Appendix E of 40 CFR Part 58.

Table B-1 CO monitoring sites in Anchorage and Fairbanks.

Site Name	Monitoring Scale	Probe Distance from Wall (meters)	Height (meters)	Unrestricted Air Flow	Spacing from Roadway (meters)	Trees
Garden	Neighborhood	1	3	180 degrees unobstructed	7	Yes
Turnagain	Neighborhood	1	3	180 degrees unobstructed	12 from 500 VPD roadway	Yes
DHHS	Neighborhood	1	3	270 degrees unobstructed	28	None
Parkgate	Neighborhood	1	2.5	180 degrees unobstructed	22	None
Old Post Office	Microscale	1	3	180 degrees unobstructed	3	None

In the 2000 network assessment the Garden Site was stated to be "micro" scale based on the probes vicinity to the roadway. After further review of Appendix E and Appendix D of EPA 40 CFR 58, EPA-450/3-75-077, and further discussion within DEC, we are now classifying this site as "neighborhood" scale.

Particulate Matter (PM_{10} and $PM_{2.5}$) Sites

For microscale sites particulate matter inlets must be between 2 and 7 meters from ground level. For other siting scales the probe must be between 2 and 15 meters high.

A sampler must have at least 2 meters separation from walls, parapets, penthouses, etc… A sampler must have unrestricted airflow for at least 270 degrees, or 180 degrees for street canyon sites. Obstructions must be a minimum distance away from the sampler with the separation equal to twice the distance by which the height of the obstruction exceeds the height of the sampler inlet.

Microscale sampler inlets must be located between 5 and 15 meters from the nearest traffic lane for traffic corridor sites, and between 2 and 10 meters for street canyon sites. The minimum separation distance between the probe and nearest traffic lane for middle, neighborhood, or urban scale sites depends upon the number of vehicles per day (VPD) that use the roadway according to a rather complicated table in Appendix E of 40 CFR Part 58. TableB-2 lists all PM monitoring sites in Alaska (including SPM) and how they fit the siting criteria from Appendix E of 40 CFR Part 58.

Table B-2: PM monitoring sites in Alaska

Site Name	Monitoring Scale	Height (meters)	Spacing from Obstructions (meters)	Spacing from Roadway (meters)	Traffic (VPD)	Trees
Garden	Neighborhood	10	12m to 5m tall penthouse	10	< 5,000	None
Tudor	Microscale	3.3	None	7	46,900	
DHHS	Middle	3	None	28	15,120	None
Parkgate	Neighborhood	6	13m to 4m tall penthouse	44	11,000	None
Harrison Court	Neighborhood	4	> 8	150	Unknown, probably < 5,000	None
Palmer	Neighborhood	4	> 8	18	Unknown, probably < 5,000	None
Wasilla	Neighborhood	4	> 8	20	16,494	None
State Office Building	Neighborhood	6	30m to 3.75m tall penthouse	20	7,400	1 tree at 10m away
TAC (Peger Road)	Neighborhood	2.5	> 60	222	7651	None
North Pole	Neighborhood	4	>20	~ 300 to Richardson Highway	10,400	Several to east > 30m
Floyd Dryden	Neighborhood	6	Furnace flue @ 20m, 4m penthouse @ 15m	65	12,770	12 meter tall @ 25m away

APPENDIX C:

Network Site Summary

State Code	County Code	Site ID	Parameter Code	POC	Method Code	Unit Code	Frequency	Parameter Description	Instrumentation	City Name	Street Address	Notes
02	020	0018	88101	1	117	105	1/6	Pm2.5 - Local Conditions	Partisol 2000	Anchorage	TRINITY CHRISTIAN CHURCH/3000 E 16TH	
02	020	0018	81102	1	063	001	1/6	Pm10 Total 0-10um Stp	Anderson Hi-Vol	Anchorage	TRINITY CHRISTIAN CHURCH/3000 E 16TH	
02	020	0018	42101	1	054	007	cont	Carbon Monoxide	Thermo 48C	Anchorage	TRINITY CHRISTIAN CHURCH/3000 E 16TH	
							cont	Ozone	Teledyne AP1 400E	Anchorage	TRINITY CHRISTIAN CHURCH/3000 E 16TH	Not (yet) reported to AQS
							cont	Pm2.5 - Local Conditions	Met One BAM 1020X	Anchorage	TRINITY CHRISTIAN CHURCH/3000 E 16TH	Not reported to AQS
							cont	Pm10 – Local Conditions	Met One BAM 2010X	Anchorage	TRINITY CHRISTIAN CHURCH/3000 E 16TH	Not reported to AQS
							1/3	Pm2.5 Raw Data	Thermo TEOM	Anchorage	TRINITY CHRISTIAN CHURCH/3000 E 16TH	Not reported to AQS
02	020	0044	81102	2	063	001	1/6	Pm10 Total 0-10um Stp	Anderson Hi-Vol	Anchorage	3335 E TUDOR RD ANCHORAGE AK 99508	
02	020	0044	85101	1	063	105	1/6	Pm10 - Lc	Anderson Hi-Vol	Anchorage	3335 E TUDOR RD ANCHORAGE AK 99508	
02	020	0044	81102	1	063	001	1/3	Pm10 Total 0-10um Stp	Anderson Hi-Vol	Anchorage	3335 E TUDOR RD ANCHORAGE AK 99508	
							cont	Pm10 - Lc	Thermo TEOM	Anchorage	3335 E TUDOR RD ANCHORAGE AK 99508	Not reported to AQS
02	020	0048	42101	1	054	007	cont	Carbon Monoxide	Thermo 48C	Anchorage	3201 TURNAGAIN STREET	
02	020	0050	42101	1	054	007	cont	Carbon Monoxide	Thermo 48C	Anchorage	727 L STREET	
02	020	0050	81101	3	170	105	cont	Pm2.5 - Local Conditions	Met One BAM 1020X	Anchorage	727 L STREET	
02	020	0050	85101	1	122	105	cont	Pm10 – Local Conditions	Met One BAM 2010X	Anchorage	727 L STREET	
02	020	1004	85101	1	063	105	1/6	Pm10 - Lc	Anderson Hi-Vol	Eagle River	PARKGATE-EAGLE RIVER, EAGLE RIVER	
02	020	1004	42101	1	054	007	cont	Carbon Monoxide	Thermo 48C	Eagle River	PARKGATE-EAGLE RIVER, EAGLE RIVER	
							cont	Ozone	Teledyne AP1 400E	Eagle River	PARKGATE-EAGLE RIVER, EAGLE RIVER	Not (yet) reported to AQS
			81101	3	170	105	cont	Pm2.5 - Local Conditions	Met One BAM 1020X	Eagle River	PARKGATE-EAGLE RIVER, EAGLE RIVER	

State Code	County Code	Site ID	Parameter Code	POC	Method Code	Unit Code	Frequency	Parameter Description	Instrumentation	City Name	Street Address	Notes
			85101	1	122	105	cont	Pm10 – Local Conditions	Met One BAM 2010X	Eagle River	PARKGATE-EAGLE RIVER, EAGLE RIVER	
02	020	1004	81102	1	063	001	1/6	Pm10 Total 0-10um Stp	Anderson Hi-Vol	Eagle River	PARKGATE-EAGLE RIVER, EAGLE RIVER	
02	090	0002	42101	1	054	007	cont	Carbon Monoxide	Thermo 48C	Fairbanks	FEDERAL BLDG/2ND & CUSHMAN	
02	090	0010	88101	1	117	105	1/3	Pm2.5 - Local Conditions	Partisol 2000	Fairbanks	STATE OFFICE BUILDING/675 7TH AVE	
02	090	0010	88101	2	117	105	1/6	Pm2.5 - Local Conditions	Partisol 2000	Fairbanks	STATE OFFICE BUILDING/675 7TH AVE	
02	090	0010	88501	3	731	105	cont	Pm2.5 - Local Conditions	Met One BAM FEM	Fairbanks	STATE OFFICE BUILDING/675 7TH AVE	
02	090	0010	88502	6	810	105	1/3	Pm2.5 - Local Conditions	Met One SASS	Fairbanks	STATE OFFICE BUILDING/675 7TH AVE	
							1/3	Pm2.5 - Local Conditions	Partisol 2000	Fairbanks	TAC/3175 PEGER RD	Not reported to AQS
							cont	Pm2.5 - Local Conditions	Met One BAM	Fairbanks	TAC/3175 PEGER RD	Not reported to AQS
							1/3	Pm2.5 - Local Conditions	Met One SASS	Fairbanks	TAC/3175 PEGER RD	Not reported to AQS
							cont	Black Carbon	Magee Scientific Aethalometer	Fairbanks	TAC/3175 PEGER RD	Not reported to AQS
							1/3	Pm2.5 - Local Conditions	Partisol 2000	North Pole	NORTH POLE ELEMENTARY SCHOOL 250 SNOWMAN LANE	Not reported to AQS
							cont	Pm2.5 Raw Data	Thermo TEOM/FTMS	North Pole	NORTH POLE ELEMENTARY SCHOOL 250 SNOWMAN LANE	Not reported to AQS
							cont	Black Carbon	Magee Scientific Aethalometer	North Pole	NORTH POLE ELEMENTARY SCHOOL 250 SNOWMAN LANE	Not reported to AQS
							1/3	Pm2.5 - Local Conditions	Met One SASS	North Pole	NORTH POLE ELEMENTARY SCHOOL 250 SNOWMAN LANE	Not reported to AQS
02	110	0004	81101	3	170	105	cont	Pm2.5 Local Conditions	Met One BAM FEM	Juneau	F DRYDEN JR HIGH/MENDENHALL LOOP RD	
02	110	0004	85101	1	126	105	1/6	Pm10 – Local Conditions Primary	Partisol 2000	Juneau	F DRYDEN JR HIGH/MENDENHALL LOOP RD	
02	110	0004	85101	1	126	105	1/6	Pm10 – Local Conditions	Partisol 2000	Juneau	F DRYDEN JR HIGH/MENDENHALL LOOP RD	
02	110	0004	88101	1	117	105	1/6	Pm2.5 - Local Conditions	Partisol 2000	Juneau	F DRYDEN JR HIGH/MENDENHALL LOOP RD	
02	170	0008	81102	1	063	001	1/6	Pm10 Total 0-10um Stp	Anderson Hi-Vol	Mat-Su Valley	HARRISON COURT/BUTTE	
02	170	0008	85101	1	122	105	cont	Pm10 Total 0-10um Stp	Met One BAM	Mat-Su Valley	HARRISON COURT/BUTTE	

State Code	County Code	Site ID	Parameter Code	POC	Method Code	Unit Code	Frequency	Parameter Description	Instrumentation	City Name	Street Address	Notes
02	170	0008	88101	1	117	105	1/3	Pm2.5 - Local Conditions	Partisol 2000	Mat-Su Valley	HARRISON COURT/BUTTE	
							cont	Pm2.5 - Local Conditions	Met One BAM 1020X	Mat-Su Valley	PALMER	Not reported to AQS
							cont	Pm10 – Local Conditions	Met One BAM 2010X	Mat-Su Valley	PALMER	Not reported to AQS
							cont	Pm2.5 - Local Conditions	Met One BAM 1020X	Mat-Su Valley	WASILLA	Not reported to AQS
							cont	Pm10 – Local Conditions	Met One BAM 2010X	Mat-Su Valley	WASILLA	Not reported to AQS
							1/6	Pm2.5 - Local Conditions	Partisol 2000	Mat-Su Valley	WASILLA	Not reported to AQS
							1/6	TSP-Pb Stp	General Metal Works High-Vol	Noatak	NOATAK	Not (yet) reported to AQS
							1/6	TSP-Pb Stp	General Metal Works High-Vol	Noatak	NOATAK	Not (yet) reported to AQS

APPENDIX D:

Glossary

SLAMS: State and local monitoring station
The SLAMS consist of a network or roughly 4000 monitoring station nation-wide. Distribution depends largely on the needs of the State and local air pollution control agencies to meet their respective State Implementation plan (SIP) requirements. The SIPs provide for the implementation, maintenance and enforcement of the NAAQS in each air quality control region with in a state. The State of Alaska monitoring network currently has 13 SLAMS sites for carbon monoxide and PM. .

NAMS: national air monitoring station
The NAMS are a subset of the SLAMS network with emphasis on urban and multi- source areas. There are no current NAMS*-designated monitors in the monitoring network

SPMS: special purpose monitoring station
Special Purpose monitoring stations are not permanently established and can be adjusted to accommodate changing needs and priorities for special studies needed by the State and local agencies. The SPMS are used to supplement the fixed monitoring network as circumstances require.

Air Quality Index (AQI)
The AQI is an index for reporting daily air quality and what associated health concerns the public should be aware of. The AQI focuses on health effects that might happen with in a few hours or days of breathing polluted air. The AQI rates the air quality in 6 steps from good to hazardous.

$\mu g/sm^{3:}$ micro-gram per standard cubic meter.

TEOM – FDMS: Thermo Election Inc. Tapered Element Oscillating Microbalance Filter Dynamic Measurement System continuous monitoring sampler. This sampler can sample for coarse or fine particulate matter.

BAM 1020: Met-One Inc. Beta Attenuation Monitor model 1020 continuous monitoring sampler. This sampler can sample for course and fine particulate matter.

Course particulate matter: PM_{10} – particulate matter less than or equal to 10 microns in size.

Fine particulate matter: $PM_{2.5}$ – particulate matter less than or equal to 2.5 microns