FINAL

25 June 1998
Updated 02 July 1998

Alaska's PM2.5 Monitoring Network Description

State of Alaska Department of Environmental Conservation
Air & Water Quality Division
Air Quality Improvement Section
555 Cordova Street
Anchorage AK 99501

Table of Contents

Table of Contents ii

List of Figures iii

List of Photographs iv

1. Introduction
   - Geography 1
   - Topography 3
   - Economy 3
   - Population 3

2.Alaska Particulate Matter
   - PM10 – Past History 4
   - Sources of Particulate Matter 4

3. PM2.5 Monitoring Network Considerations
   - Goals 7
   - Multi-year Plan 7
   - Population Centers 7
   - MSAs 8
   - PM2.5/PM10 Modeling 8
   - Site Selection 8
   - QA/QC 9
   - Laboratory Operations 9

4. Monitoring Network
   - Anchorage 10
   - Mat-Su Valley 12
   - Fairbanks 13
   - Juneau 13
   - Southeast Alaska 14
   - Background, Transport and IMPROVE 14
   - PM10 Monitoring Network Description 15

5. Timeline 16

Appendices — Site descriptions for PM2.5 particulate monitors
Attachment A: PM2.5 Monitoring Network Design 1998-1999 17
Attachment B: Municipality of Anchorage – Rogers Park 19
Attachment C: Municipality of Anchorage — Gambell 23
Attachment D: Matanuska-Susitna Valley – Pioneer Peak 29
Attachment E: City of Fairbanks – State Office Building 35
Attachment F: Mendenhall Valley of Juneau – Floyd Dryden 39

List of Figures

Figure 1	Regional map of Alaska	2
Figure B1	Topographical map of Anchorage	19
Figure B2	Street map of north-central Anchorage	20
Figure C1	Topographical map of Anchorage	23
Figure C2	Street map of north-central Anchorage	24
Figure D1	Topographical map of the eastern Matanuska Valley	29
Figure D2	Street map of Palmer area.	30
Figure D3	Harrison Subdivision	31
Figure E1	Topographical map of Fairbanks	35
Figure E2	Planimetric map of Fairbanks	36
Figure F1	Topographical map of the Mendenhall Valley	39
Figure F2	Street map of Mendenhall Valley	40

List of Photographs

Anchorage:
Photograph B1 Rogers Park, facing north 21
Photograph B2 Rogers Park, facing east 21
Photograph B3 Rogers Park, facing south 21
Photograph B4 Rogers Park, facing west 21
Photograph B5 Rogers Park from the north 22
Photograph B6 Rogers Park from the west 22

Anchorage:
Photograph C1 Aerial photograph of Gambell monitoring station 25
Photograph C2 Gambell site, facing south-south-east 26
Photograph C3 Gambell site, facing SSE from Chester Creek Valley 26
Photograph C4 Gambell site, facing north from the roof 26
Photograph C5 Gambell site, facing east from the roof 26
Photograph C6 Gambell site, facing south from the roof 26
Photograph C7 Gambell site, facing west from the roof 26

Mat-Su Valley:
Photograph D1 Butte site, facing north from the roof 31
Photograph D2 Butte site, facing east from the roof 31
Photograph D3 Butte site, facing south from the roof 32
Photograph D4 Butte site, facing west from the roof 32
Photograph D5 Butte site from the east 32
Photograph D6 Butte site from the north 32

Fairbanks:
Photograph E1 State Office Building site, facing north 37
Photograph E2 State Office Building site, facing east 37
Photograph E3 State Office Building site, facing south 37
Photograph E4 State Office Building site, facing west 38
Photograph E5 State Office Building site from the northwest 38

Juneau:
Photograph F1 Aerial photograph of Floyd Dryden Middle School 41
Photograph F2 Floyd Dryden site from the south 42
Photograph F3 Floyd Dryden site from the west 42
Photograph F4 Floyd Dryden site, facing south 42
Photograph F5 Floyd Dryden site from the east 42
Photograph F6 Floyd Dryden site, facing northwest 43
Photograph F7 Floyd Dryden site, facing northeast 43
Photograph F8 Floyd Dryden site, facing east 43

Final

02 July 98

Alaska's PM2.5 Monitoring Network Description

1. Introduction.

The State of Alaska has evaluated the rural and urban centers of the state to identify potential candidates for inclusion in the initial phase of PM2.5 monitoring. The following information has been provided to identify and support the selected sites.

Geography. Alaska, the 49th state, comprises one sixth of the United State's landmass, spanning 20 degrees of latitude (51°N – 71°N). Alaska contains 65% of the U.S. continental shelf, more shoreline than the rest of the 49 states combined, 17,000 square mile of glaciers, 3,000,000 lakes over 20 acres in size, and receives 40 % of the U.S. fresh water runoff. Superimposed over a map of the "lower 48 states", Alaska's boundaries would extend from the east coast to the west coast and reach from the Mexican border to Canada.

The state can be subdivided into nine distinct regions (see Figure 1):

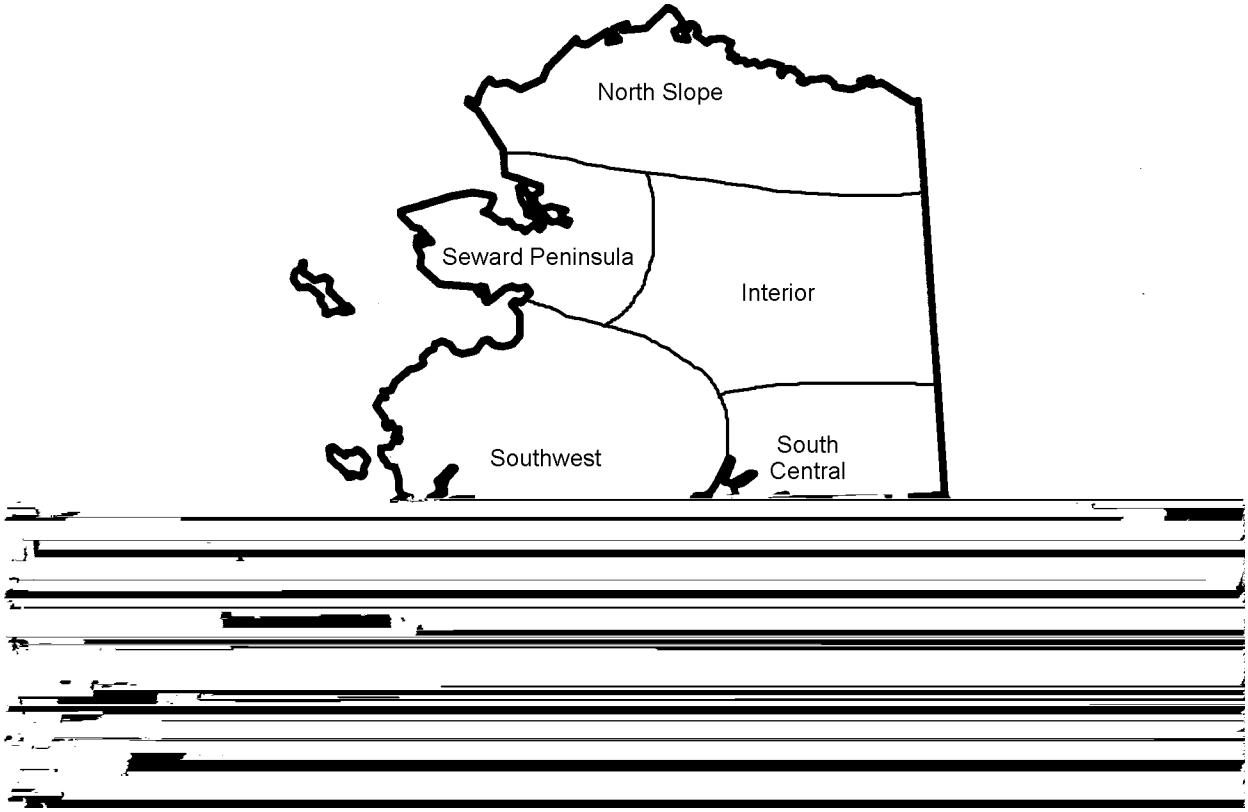
The **Panhandle** is a temperate rain forest in the southwestern part of Alaska that is mainly comprised of mountainous islands and protected marine waterways. Rainfall exceeds 100 inches per year in many areas. Most communities are small and contain less than 5,000 people. The State's capital, Juneau, is the largest city in the region with a population of approximately 30,000.

The **South Gulf Coast** is one of the rainiest regions in the world and is covered with rugged mountains and barren shoreline. The target of many Gulf of Alaska storms, this coastline only contains a handful of small fishing communities.

Southcentral Alaska is fairly temperate in comparison to the rest of Alaska. Rainfall varies widely across the region, averaging between 15 inches a year in the Matanuska-Susitna (Mat-Su) Valley and 60 inches per year in Seward. This region contains 60-70% of the state's population with Anchorage, the state's largest city, containing over 250,000 people. Bounded by active volcanoes on the southwest and glacial river plains to the northeast, this sector of the state has experienced 24-hour dust levels in excess of 1,000 $\mu g/m^3$.

The **Alaska Peninsula** and its westward extension, the **Aleutian Chain** form the southwestern extension of the mountainous Aleutian Range. This region is comprised of remote islands and small, isolated fishing villages. This area is one of the world's most economically important fishing areas, as well as a vital migratory route and nesting destination for birds.

Geographical Regions of Alaska



Southwest Alaska encompasses the vast Yukon-Kuskoquim River Delta, a wide low-lying area formed by two of the state's major river systems and dotted with hundreds of small lakes and streams. This region is heavily impacted by old, dying storm systems which rotate northward into the Bering Sea. Communities in this region receive between 40 and 70 inches of precipitation a year. This portion of the state is quite windy, experiencing winds between 15 – 25 miles per hour throughout the year. These winds, coupled with fine delta silt, help to create dust problems for some southwestern communities. Rural villages normally contain fewer than 5,000 people and are located along the major rivers and coastline. Regional hubs such as Galena and Bethel are few and may contain up to 8,000 residents.

Interior Alaska describes the vast expanse of land north of the Alaska Range and south of the Brooks Range. This region contains Fairbanks, Alaska's second largest city, with a population of between 50,000 – 75,000 people. The climate varies greatly with clear, windless, -50°F winter weather giving way to summer days with 90°F temperatures and afternoon thunderstorms. Sectors of this region also experience high winds and high concentrations of re-entrained particulates from open riverbeds.

The **Seward Peninsula** is the section of Alaska which extends westward into the Bering Sea between Norton Sound and Kotzebue Sound. This hilly region is barren and windswept with 15-25 mile per hour winds common. Rainfall in this region averages

between 15 and 24 inches per year. Villages in this region are small except for Nome which has over 3,000 people.

The **North Slope** region, located north of the Brooks Range, is an arctic desert receiving less than ten inches of precipitation annually. Wind flow is bimodal, with the easterlies dominating the meteorological patterns. Winter wind speeds average 15-25 mile per hour dropping off slightly during the summer. The North Slope is extremely flat and supports huge summertime populations of bears, caribou, and migratory birds. There are very few communities besides Point Barrow and Deadhorse/Prudhoe Bay in this region.

Topography. Alaska is topographically challenged. The state contains seven major mountain ranges whose features influence a majority of all regional flow patterns. The mountains channel flow, create rotor winds, cause up slope and down slope flow, initiate drainage winds, produce wind shear and extreme mechanical turbulence.

For air quality impact analyses, Alaska's rugged mountains can only be described as complex, complex terrain making most air quality models unsuited for use in the state. The complexity of most local meteorology renders the use of site specific met data inadequate for control strategy development.

Economy. The Alaskan economy is centered on the oil industry, the mining industry, commercial fishing, logging and tourism. Of the five, only the oil and mining industries provide a year-round source of income to the state and require the full time operation of stationary, power generation equipment. The mining industry is scattered across the state with a zinc mine near Kotzebue, a coal mine at Healy, a silver mine near Juneau, and major gold mine north of Fairbanks. Numerous smaller mining ventures exist across the state, but they have not received air quality operating permits at this time.

The state's oil industry operates production wells in Cook Inlet and on the North Slope. North Slope oil is pumped 800 miles through the Trans-Alaska Pipeline System (TAPS) to Valdez for shipment to refineries in the lower 48 states. The TAPS has several pump stations to maintain the flow of oil in the pipeline. The majority of new oil exploration work is being conducted on the North Slope. Three in-state refineries, Mapco (North Pole) and Petro Star (Valdez and North Pole) process small amounts of North Slope crude. Cook Inlet crude is processed at the Tesoro refinery in Nikiski, located near Kenai, Alaska. In addition to oil, the Unocal Chemical Plant in Nikiski converts Cook Inlet natural gas into fertilizer.

Population. Alaska is long on land and short on population. Unlike cities in the lower 48 states, Alaskan communities are extremely diverse and clustered throughout the state. With the exception of small mining communities, most towns and villages are located in protected coastal bays, along major rivers and adjacent to the limited road system.

Only six communities have over 10,000 people and only one is larger than 100,000. With

the exception of Anchorage, Fairbanks, Juneau, Ketchikan and the Wasilla-Palmer area, the normal Alaskan city's population base is less than 5,000 people making their sources of anthropogenic pollution potential very small. The western half of the state contains many small native villages supported by a few regional hubs.

2. Alaska Particulate Matter

PM10 – Past History. Alaska has experienced numerous excedances of the "old" PM10 standard over the past twenty years and will continue to suffer from high levels of coarse fraction particulate well into the 21st Century. While the PM10 problem in Southeast Alaska was primarily related to woodstove use, dust that was re-entrained from unpaved roads and winter traction sand did contribute to localized microscale PM10 excedances.

In the Upper Cook Inlet, wind blown dust and volcanic ash has been significant in the region's frequent PM10 standard violations.

Locally, the Municipality of Anchorage has been plagued with microscale excedances of the standard related to re-entrainment of dust from unpaved roads and winter sanding materials. Palmer and Wasilla, located forty miles north of Anchorage in the Mat-Su Valley, have both been impacted by wind blown dust from the Matanuska and Knik River drainages.

Sources of Particulate Matter. Alaska's sources of particulate pollution are easy to identify but difficult to speciate due to their similar morphologies. While non-antropogenic sources such as volcanic eruptions and wind blown dust from dry river beds are the largest sources of particulates in the state, anthropogenic sources do play a significant role in degrading the air quality in the populated centers. Wood smoke, automobile and airplane emissions, dust from paved and unpaved roads, home heating, and coal and gas fire power plants all impact our largest communities.

Woodstove use has decreased in Southcentral Alaska due to the installation of natural gas. In most areas that still exhibit high woodstove use, the residential density is usually low. The areas of exception are Palmer, Wasilla, Peters Creek, and Chugiak.

In Southeast Alaska, a rain forest with annual precipitation of over 100 inches, easy access to firewood has made woodstove use common. As residents try to cut yearly fuel costs, the smoke from wood-fired heating devices fills narrow river valleys more often. Vehicle travel over unpaved roads and along major arterials still covered with winter sanding materials re-entrains loose crustal materials causing huge columns of dust. Source apportionment analyses have not been successful in identifying the specific cause of past PM10 dust related violations.

In the more rural areas of the state anthropogenic sources of air pollution are limited. These communities have few streets, but those that do exist are unpaved and serve as a source of PM10. Residential home heating is normally fuel oil although woodstove use is

prevalent in the smaller outlying areas of central and eastern Alaska. The small size of these communities makes the magnitude of the problem limited.

While automobile and power generation emissions have not been shown to be major contributors to past PM10 violations in Alaska, they may be significant players in PM2.5. While the meteorology of Alaska is not believed to be conducive to the formation of secondary particulates, severe winter inversion and seasonal high winds may cause fine particulate and automobile emissions to be more of a contributor than originally believed.

Anchorage. Through the years, Anchorage has had a history of high particulate days. Volcanic eruptions, high winds, forest fires, re-entrained road sanding materials, and long range transport of glacial till have all played a role in making Anchorage dusty. To add to the problem, the upper Cook Inlet morphology is a mix of eroding mountains, weathered volcanic ash and glacial silt. As the largest town on the edge of the "last frontier," Anchorage has also suffered from a high percentage of unpaved roads which has added to the problem by providing a source for crustal material track-out and entrainment.

The 1989 eruption of Mount Redoubt, southwest of Anchorage, resulted in a light dusting of fine ash over the Municipality. The impact of this eruption was observed in the Municipality's PM10 levels for the next three years. The eruption of Mount Spurr in 1992 was much more dramatic as the primary ash cloud passed directly over downtown Anchorage blocking out the sun with PM10 readings over 3,000 $\mu g/m^3$ and dropping ¼ - ½ inch of ash on the city. This time the impacts were felt for five years as the ash, repositioned during frequent windstorms, re-deposited during winter-street sanding, and spread by vehicle traffic, remained in the Anchorage environment and slowly became part of the soil.

While the bulk of the volcanic ash impact appears to be over, Anchorage still sees elevated PM levels each spring as high winds along the Chugach Mountains transport glacial silt across the region. These infamous dust storms have made the Mat-Su Valley, located forty miles north of Anchorage, one of the most fertile areas of the state. To combat high dust levels, Anchorage has instituted a new winter sanding program, which emphasizes the use of deicers and limits the amount of traction sand used, and includes an aggressive spring street sweeping program. Continued commitment to improved air quality should go a long way towards keeping the PM10 levels below the standard.

Despite these efforts, Anchorage is expected to occasionally see elevated PM10 values, which will necessitate continued monitoring to ensure protection of public health. Anchorage will also exceed the PM10 standard for a period after the next volcanic eruption, but we expect that new PM control strategies will help minimize the period of impact.

Little is known about the PM2.5 levels in Anchorage and the upper Cook Inlet Basin. While initial monitoring suggests that levels may be low and do not vary much, the volume of fine dust entrained during a spring wind event cannot be overlooked. Anchorage does not contain a large industrial base or number of vehicles. This along with a relatively

cool climate makes the likelihood of experiencing a secondary particulate problem very small.

Fairbanks. Fairbanks is located in the upper Tanana Valley on the north side of the Tanana River. Originally founded as a gold mining community, Fairbanks does not have a crustal PM10 problem. Monitoring in residential and downtown areas over the past 10 years has never documented a PM problem. Fairbanks does have three major coal fire power plants and considerable winter woodstove use, which the State believes warrants PM2.5 investigations. In addition, the spring and summer fire season has caused occasional wood smoke complaints and red sunsets.

Juneau. Juneau had wood smoke and local road dust problems in the 1980s and early 1990s. A highly effective wood smoke control program which included burn bans and local enforcement all but eliminated PM10 excedances related to woodstove use. The installation of a neighborhood microscale monitoring site in 1989, identified the existence of a road dust problem. Through the use of CMAQ funding, Juneau conducted an extensive road-paving project which solved the Mendenhall and Lemon Creek Valleys' road dust problem.

Although there is no longer an apparent need to conduct PM10 monitoring in Juneau, the present wood smoke control strategy does call alerts at 75 $\mu g/m^3$. Because 85 - 95 % of the Valley's PM10 concentrations are believed to be PM2.5, Juneau will need to set up PM2.5 monitoring sites in the Mendenhall and Lemon Creek Valleys to ensure compliance with the new fine particulate standard.

Sitka, Ketchikan, Skagway, Haines, Wrangel and Petersburg. Over the past ten years, the department has received wood smoke complaints from Southeast Alaska communities. In response, PM10 monitoring has been performed, but no problems were ever documented at the 150 $\mu g/m^3$ level. The state believes that any of these cites could have a PM2.5 problem on a given year. The state intends to select representative sites in these communities over the next three to five years to assess the magnitude of the problem.

Mat-Su Valley. The Mat-Su Valley has a well-documented dust problem in the spring and early fall when strong gradient winds lift hundreds of tons of fine dust off the glacial riverbeds. The resulting PM10 concentrations have exceeded 800$\mu g/m^3$ over 24-hourr periods, with hourly values exceeding 2,000 $\mu g/m^3$. While PM10 monitoring will continue in this area, the State believes that it is also important to conduct at least one year's worth of PM2.5 monitoring. The State does not have an adequate understanding of the relationship between the fine glacial silt and PM2.5 and is concerned that the fine fraction may be higher than originally thought. Based on the volume of material being moved and the distance its being transported, it seems prudent to investigate this area further.

3. PM2.5 Monitoring Network Considerations

Goals. The primary goal of PM monitoring in Alaska is to protect the health and welfare of residents and visitors to the Great Land. To meet this objective, monitoring sites will be installed at locations specifically selected to evaluate PM2.5 levels impacting the public. Investigations will initially focus on the areas with the highest potential for exceeding the fine particulate standards. Where problems exist, communities with high population density will be given priority. Where impacts are seasonal monitoring studies will be designed to examine seasonal impacts on local residents.

For monitoring prioritization, the State will install SLAMS objective #1 microscale stations if we receive complaints from the public which through SPM investigations show that there is a micro-scale problem in an area. A SLAMS obective #1 station may also be installed if localized emissions are observed impacting a residential areas. The State defines high population density for SLAMS objective #2 as a residential area in a community with a population of at least 5,000 people. Anchorage has the highest population density in Alaska with approximately 57 persons per square kilometer.

Alaska does not experience the complicated emission sources or suffer from the population densities common in the lower 48 states. Therefore, our monitoring goals do not reflect the complicated objectives required by most state in their network designs. With the exception of population oriented locations such as Anchorage and Fairbanks, most of our monitoring will employ SPM sites focusing on seasonal monitoring for source evaluation. Even our two largest cities focus more on 24-hour NAAQS compliance of microscale impacts.

Our long-term goals are split between the use of SPM monitors to help characterize the most representative locations for SLAMS sites and the evaluation of potential microscale impacts on the public.

Multi-Year Plan. Alaska is committed to study the siting of SLAMS monitors. The State has one nephlomoter that can be used to evaluate the SLAMS monitor siting. We would like to commence characterization studies by October 1, 1998, depending the availability of equipment. Three years are anticipated to characterize the siting of Anchorage SLAMS monitors, one year for Juneau, and two years for Fairbanks. The State intends to use data collected during these studies to determine whether PM2.5 monitoring sites chosen initially are located optimally or not. This data may be used to relocate monitors if we feel that it is necessary in order to improve the quality of the network.

Population Centers. Alaska does not meet the traditional concept of population centers envisioned in the development of guidance for the new PM2.5 standard. While Alaska has what we call “population centers,” they more closely resemble the concept staging bases and supply centers used in the 1800s to explore the West. Alaska only has five communities over 15,000 people: Anchorage – 255,000, Fairbanks – 65,000, Juneau – 30,000, Wasilla/Palmer – 20,000 (projected to 40,000 by the year 2000), and Ketchikan –

15,000. Each of these five cities should be considered separately and independent from the others when considering air quality impacts and influences on neighboring communities.

MSAs. Alaskan communities are for the most part separate units dispersed across the "Great Land". With the exception of the Upper Cook Inlet region of Southcentral Alaska, no city emits air pollution that might impact its neighbors. Alaska does not contain an industrial base in the true sense of manufacturing. The major industries are oil production, commercial fishing, logging, and tourism. A community's air pollution normally is comprised of the local electrical power plant, home heating devices (oil-fire heater or woodstove), automobiles, airplanes, RTVs, boats, re-entrained dust from paved and unpaved roads and the local natural sources (windblown dust, volcanic ash, wildfires, etc.). Because the local anthropogenic sources have little bouyancy and vertical velocity, elevated concentrations are rarely found outside the facility boundary.

The closest thing Alaska has to an MSA would be the Upper Region of Cook Inlet, which covers the communities of Kenai, Anchorage, Wasilla and Palmer. While not a true MSA, the area more closely approximates an airshed boundary in which some communities have emissions that might have minor impacts on each other. At this time, the State does not believe that the emissions from any one of these communities will play a significant roll in the adjacent region's ability to attain either of the PM standards. Each community will be evaluated with the assumption that all impacts came from sources within its boundary. While this statement is true for anthropogenic sources, it might not be for wind blown dust. High winds along the Knik River drainage can entrain huge volumes of fine particles which track southward towards Anchorage and may play a significant role in Anchorage's PM10/PM2.5 concentrations. Wind blown transport and subsequent deposition may also impact the area's long-term re-entrained dust levels.

PM2.5/PM10 Modelling. Alaska is not planning on conducting any modelling analyses in support of their PM2.5 Network Description. Uncertainties in particulate source emissions, unsuccessful attempts to characterize source contributions in the past and a homogeneous geological structure throughout the region makes this an impossible task. Alaska does not possess sufficient resources and manpower to conduct the type of study necessary to adequately define all of the unknowns. Further, staff believe that the proposed courses of action will be sufficient to identify Alaska's PM2.5 compliance status and take appropriate action as necessary.

Site Selection. The location of PM2.5 sites in Alaska will be based on our present understanding of local sources and their potential contributions to anticipated PM2.5 levels. The site selections will contain a mix of SLAMS and SPM monitoring locations to address neighborhood-scale, microscale and associated gradients where necessary to develop effective control strategies. Note: The State uses SPM and SLAMS designations interchangeably and believe that all monitoring sites should follow the FRM protocol to collect valid data. The SPM designator is used identify seasonal and investigative monitoring programs. The State's initial network design will have monitors installed at locations that

have larger population centers exhibited a high potential for experiencing a PM2.5 problem: areas with high woodstove use, frequent dust storms.

The State does not fully understand the impact of potential PM2.5 sources in each Alaskan community. Instead we propose to site monitors in the best locations by following the guidance provided. If after one year any of these sites exhibit low PM2.5 levels, the site will be considered for relocation either within an existing network to help better define the best monitoring location or in a new area of concern to determine if a problem exists. The State will seek agreement from the EPA Region 10 before moving SPM sites. This is consistent with the State's policy of operating SPM sites following SLAMS monitoring guidance. Areas that exhibit elevated concentrations, but do not exceed the standard, will continue to operate for a minimum of three years. Sites that identify excedances of the standard will remain operational for at least three years after attaining the standard to ensure a final solution has been implemented.

QA/QC. The State will be following the federal guidance on monitoring and QA/QC until such time that we have sufficient validated information to seek and receive approval to modify the federal method. The Department plans to investigate potential modifications to the method in the following areas:

- filter weighing
- temperature and pressure requirements
- field data collection
- filter handling

The State has identified the need for audit samplers as part of our initial monitoring network design. While the decision was made not to fund state audit samplers, Alaska still believes that each state needs at least one audit sampler for use in managing the state PM2.5 monitoring network. There is also a need to conduct PM2.5 audits as part of the state's Title V oversight of industry's ambient monitoring.

Laboratory Operations. Alaska has no experience in the operation of a PM2.5 laboratory. All of our planning is based on the lab requirements listed in the PM2.5 Monitoring Method. The state has requested upgrade for two labs, one in Anchorage and a second in Juneau, to meet the geographic needs of the state without jeopardizing data quality. To date, projected funding will only cover one lab. This will place a severe burden on available staffing and put the data quality of crustal-based filter loads at risk.

As proposed, the State is planning to conduct the filter weighing operation for Fairbanks and Juneau out of the State's lab in Juneau. Filters will be pre- and post-weighed by the laboratory supervisor. All filters, except for the Juneau sampling, will be shipped via U.S. Mail. Laboratory services for monitoring in Southcentral will be performed at the Anchorage Air Pollution Control Agency's lab in Anchorage. The municipality will conduct pre- and post-weights for their sampling sites.

The final draft of the State QAP for PM2.5 monitoring will be submitted to EPA by November 30, 1998. The State QAP will address chain-of-custody procedures for sample handling.

4. Monitoring Network.

The State of Alaska will establish one PM2.5 monitoring network for the entire state. That network will be managed by the State in coordination with EPA Region 10 for the protection of the health of Alaskan residents and visitors. Attachment A contains a listing of the monitoring sites, proposed locations and their scheduled start up dates. A copy of the proposed network design will be posted on the Department's WWW page (http://www.state.ak.us:1221/local/akpages/ENV.CONSERV/) to provide the public access to monitoring network planning. The public will also be able to use the Web to direct comments to the department on monitoring issues.

The state plans to conduct characterization studies in Anchorage, Fairbanks and Juneau over the next three years to determine the adequacy of selected PM2.5 sites. This process is more critical for the Anchorage and Fairbanks sites because of their population density and emission characteristics. The Juneau monitoring site was originally selected to examine wood smoke emissions that are primarily composed of fine particulate. Anchorage will conduct the first study, followed by Fairbanks and then Juneau. The timing on these investigations will depend on the availability of the characterization samplers and funding.

With the exception of the Anchorage PM2.5 CORE site and the Fairbanks PM2.5 monitoring site, each fine particulate matter monitoring location installed in 1998 will contain at least one PM10 sampler running on a one-in-three sampling schedule. A review of the PM10 monitoring network is being conducted and the revised network description will be discussed in a separate document to be provided to EPA on August 1, 1998.

Meteorological monitoring at each PM2.5 site is desirable but is not practical at this time. The State would like to install meteorological instrumentation at the Anchorage CORE , Gambell, the Fairbanks State Office Building, and Butte monitoring sites. The equipment has already been purchased for the Butte site and will be installed later this summer. More instrumentation will be added, as time and funding allow. Ideally the State would like to have all of the proposed meteorological instrumentation installed and operating by December 31, 1999.

Anchorage. The Anchorage Air Pollution Control Agency (AAPCA) will install and operate five PM2.5 FRM monitoring sites in the Municipality. An additional two sites will be installed and run by the State. These sites will be comprised of one CORE SLAMS site, one non-CORE SLAMS site and three SPM sites. In addition, the State will operate a SLAMS transport site within the Municipality to examine the movement of fine dust from the Mat-Su Valley into the Anchorage Bowl. The state has also considered installing a "background" site in the Anchorage area.

As part of the 1998 monitoring network, the AAPCA will also run a PM2.5 Dichot (non-FRM) at the Gambell site to look at PM2.5. These data will be compared with the new PM2.5 (FRM) monitoring results for comparison/correlation purposes. After collecting one year's worth of valid data, the non-FRM monitor will be replaced (in 1999) with an FRM and relocated to a new site.

Speciation sampling is an integral part of the state's monitoring network design. The State will work with Region 10's speciation sampling lead to conduct special studies if necessary. At this time, the state does not see a need to conduct this type of special monitoring at sites outside of the larger population centers. Speciation monitoring will be dependant upon need, available funding and staff time.

a) Gambell Site (1998). The Gambell SPM site will be installed in a microscale configuration adjacent to a major traffic corridor. This site has recorded most of Anchorage's previous PM10 excedances. This site will initially be listed as a SLAMS monitoring site designed to evaluate compliance with the 24-hour NAAQS. If PM2.5 levels are found to be low, the site may be redesignated to SPM and eventually dropped. The existing site contains Grasby PM10 Hi-Vols (FRMs), a Grasby Beta Gauge (FRM) and a dichot (PM-2.5). The site has not recorded a PM10 violation in the past two years and has found non-reference PM2.5 levels to be within the proposed standard.

The State's air monitoring group and the AAPCA both believe that PM10 continues to present a health hazard for Alaskans. For this reason, the AAPCA will continue PM10 monitoring at this site until we are sure that the existing PM control measures work. PM2.5 sampling is also required at this site to evaluate potential microscale impacts and help validate the results of past dichot monitoring. This site's monitoring results will be compared to the 24-hour standard. Site documentation – see attachment C.

b) Rogers Park Elementary School (1998). Anchorage has selected a midtown location for their neighborhood scale, SLAMs, core-monitoring site. This site was chosen with the intent to characterize the highest residential neighborhood-scale PM2.5 concentrations in Anchorage, both on a 24-hour and annual basis. While it is generally felt that Anchorage experiences more site specific than regional type impacts, the location should provide the best "overall" representation of Anchorage's fine particulate levels. This site was selected based on its centralized location and representativeness of neighborhood scale impacts.

The State understands the importance of selecting the "correct" location each PM2.5 CORE monitoring site. We also recognizes that there is insufficient information on PM2.5 sources and concentrations patterns to be able to guarantee that we have selected the best location for the core monitoring site. To help solve this problem, we will perform a site characterization study using a portable nephlometer to verify that this is the best location, and we are proposing to use SPM sites starting in 1999 as well to assist in identifying the best location for Anchorage's CORE site. Site documentation – see attachment B.

c) Garden Monitoring Site (1999). The Municipality will set up an SPM monitor at the existing CO monitoring site to evaluate fine particulate emissions. This site was selected as a maximum impact, neighborhood-scale residential site to evaluate the correlation of PM2.5 to CO concentrations. Site documentation will be provided to EPA by June 1999.

d) Rodger's Park Satellite Site (1999). The Municipality will be operating an SPM monitoring site in Anchorage to evaluate localized sources of PM2.5. The site will also be used to help evaluate the adequacy of the CORE monitoring site. Site documentation will be provided to EPA by June 1999.

e) Eagle River PM Monitoring Site (1999). Eagle River had a PM10 problem in the mid-1980s that was directly related to emissions from unpaved roads and parking lots. This problem was corrected through a highly effective City paving project in the late 1980s. Dust levels have been within the standard ever since. Eagle River has one remaining PM10 site located on top of the Parkgate Building, near the center of town. We are proposing to use this location for the PM2.5 SPM site as it provides a good evaluation of the overall air quality and can double as a transport site for dust heading towards Anchorage. We are considering moving this site to a purely residential location in the future if the Parkgate monitoring site confirms low PM2.5 levels in mid-town. Site documentation will be provided to EPA by June 1999.

Mat-Su Valley Monitoring. The state will be operating two FRM monitoring sites in the Mat-Su Valley. The focus of these sites is to evaluate the levels of fine-fraction, crustal material across the Mat-Su Valley. These monitors will also be used to evaluate wood smoke impacts.

a) Butte Monitoring Site (1998). The focus of the monitoring site is to evaluate urban-scale (over 10 km) PM2.5 levels primarily coming off the Knik Riverbed. This data will be compared to PM10 levels collected at the same site and presently used to call air quality health alerts. This monitoring site will also evaluate wood smoke impacts during the winter months. This monitor will be designated SLAMS and used to assess compliance with the 24-hour and annual PM2.5 standards.

This site was selected to evaluate the magnitude of fine fraction particulates in an extremely dusty environment. The state believes that the fine fraction percentage in glacial silt may greatly exceed normal contributions. In addition, the shear volume of material may make PM2.5 a significant health threat. Site documentation – see attachment D.

b) Colony Monitoring Site (1999). An SPM monitoring site will be established in the vicinity of Colony High School to examine fine dust impacts from the Matanuska River Drainage. The data will be used to define the magnitude and extent of any PM2.5 problem in the eastern Valley. This site may later be relocated to a central Valley location as part of an ongoing PM evaluation process. Site documentation will be provided to EPA by June 1999.

Fairbanks Monitoring. Two monitoring sites will be established in Fairbanks to evaluate the impact of anthropogenic sources. Fairbanks has three coal-fired power plants and woodstove use is prevalent during the winter (October – April) to reduce high heating bills.

a) <u>State Office Building Monitoring Site (1998).</u> The Fairbanks North Star Borough monitoring network will install a SLAMS site on the State Office Building to examine coal fired power plant and home heating emissions. The location of this site meets the requirements for data comparison to the 24-hour and annual standards. This site is the current location of PM10 monitoring which will stop when the PM2.5 monitor is installed. Site documentation – see attachment E.

b) <u>West Park Monitoring Site (1999).</u> An SPM monitoring site will be installed in Fairbanks to evaluate emissions from a purely residential area to determine if wood smoke is a problem. Monitoring for wood smoke impacts was performed in the past, but proved in conclusive at the 150 $\mu g/m^3$ level. Site documentation will be provided to EPA by June 1999.

Juneau Monitoring. The Juneau network will focus on emissions related to their long-standing problem - wood smoke. The Mendenhall Valley will not be able to comply with the new PM2.5 standard without a revision to the City's wood smoke alert program. Lemon Creek may also have a wood smoke problem, but the state has never been able to document high PM10 levels. Monitoring in the Lemon Creek Valley will be required to guarantee compliance with the PM2.5 standard.

a) <u>Floyd Dryden Middle School Site (1998).</u> The existing neighborhood scale-monitoring site on Floyd Dryden Middle School will be used to evaluate compliance of woodstove emissions with the new PM2.5 standard. The State will operate the sequential FRM monitor on an every day sampling frequency in order to increase the size of the data set for the purpose of comparing data between the nephlometer and the FRM. This site will continue to monitor for PM10 over the next year to confirm that crustal impacts no longer exist. PM10 monitoring may be discontinued by the Fall of 1999. The new fine particulate monitoring site will be designated as SLAMS and used to compare compliance with the 24-hour and annual standards. The State is currently operating a non-FRM continuous monitor (nephlometer) at this site for managing the winter woodsmoke alerts. This site will remain operational through 30 June, 1999, becoming seasonal again on 01 October, 1999. Site documentation – see attachment F.

b) <u>Lemon Creek Monitoring Site (1999).</u> This will be an SPM monitoring site installed to evaluate wood smoke levels in Lemon Creek. This valley has been investigated for PM10 wood smoke in the past and warrants further evaluation under the more restrictive PM2.5 program. The state expects that new monitoring will result in a wood smoke control strategy for this area. Site documentation will be provided to EPA by June 1999.

Southeast Alaska Monitoring. Sitka and Ketchikan are the first in a series of small, wood burning communities that need to be evaluated. The Department has received several wood smoke-related complaints from these two communities over the past five - ten years. The department conducted PM10 monitoring in Sitka in the late 1980s and in Ketchikan several years later. Although PM10 concentrations did not exceed the standard, there were several days when wood smoke concentration were elevated making PM2.5 investigations warranted. The problem with PM monitoring in Southeast is that concentrations are largely related to annual precipitation patterns, During a warm year, Southeast gets a lot of rain and may have few cold, clear days, In a cold year the region has more snow and more days with degraded air quality.

a) <u>Sitka Monitoring Site.</u> The State will set up one SPM monitoring site in Sitka to evaluate PM2.5 levels. This site will be installed adjacent to a sector of the residential community and focus on "neighborhood" scale monitoring. This will be a seasonal monitoring program Starting in October and running through the end of March. The sampling period could be lengthened if moniotirng results warrant. PM2.5 concentrations will be compared to the 24-hour standard. Site documentation will be provided to EPA by June 1999.

b) <u>Ketchikan Monitoring Site.</u> The state will install one SPM monitoring site in Ketchikan to evaluate PM2.5 concentration. The initial investigative monitoring will be conducted in Bear Valley, a small residential community located up on the hillside behind town. The site will either be located in the residential area or on top of Bear Valley Elementary School. This will be a seasonal monitoring project running from October through March. The collected data will be evaluated against the 24-hour standard. Site documentation will be provided to EPA by June 1999.

Background, Transport and IMPROVE

Transport Monitoring Site (1999). The state's transport monitoring site (SLAMS) is being tentatively scheduled for installation at the Mirror Lake Elementary School to examine the movement of fine crustal material from the Mat-Su Valley towards Anchorage. This system will be collocated with a Grasby Beta Gauge run in the PM10 configuration. Site documentation will be provided to EPA by June 1999.

Background site (1999). The state is considering three SLAMS sites for examining background PM2.5 levels in Alaska. The first site would be located in the Anchorage Bowl and would be used to identify 24-hour and annual background concentration. This data would be extremely valuable in assessing area-wide, non-anthropogenic source contributions. Site documentation will be provided to EPA by June 1999.

A second consideration would be a site in the western Mat-Su Valley near Willow or Talketna. This site would evaluate non-urban PM2.5 levels and may be useful in examining long-range transport from Anchorage toward Denali National Park.

IMPROVE site (1998). IMPROVE visibility monitoring will be conducted as part of the Federal Land Managers (FLM) IMPROVE monitoring program. There are four class-1 areas in the state: Denali National Park, Simeonof National Wildlife Refuge, Bering Sea National Wildlife Refuge and Tuxedni. These site are operated by the National Prk Service and the Fish and Wildlife Service.

The National Park Service currently operates one IMPROVE monitoring site in Denali National Park. The State is considering setting up a background site collocated with the IMPROVE monitor at Denali to compare between FRM and IMPROVE PM2.5 results.

Fish and Wildlife Service does not plan to monitor at Simeonof or Bering Sea NWRs, but will probably set up a site in Tuxedni witin the next 2-3 years.

PM10 Network Description. Below is the table of the State PM10 monitoring network.

Site Name	AIRS # POC	Site Type	Location (City/Borough)	Schedule	Monitoring Objective	Spatial Scale
Park Gate	020201004 2	SLAMS	Eagle River Anchorage Borough	1:6	2	neighborhood
Gambell	020200026 1	NAMS	Anchorage Anchorage Borough	1:1	1	micro/middle
Oceanview Elementary	020200042 1	SLAMS	Anchorage Anchorage Borough	1:2	1	neighborhood
Muldoon	020200043 1	SPMS	Anchorage Anchorage Borough	1:2		middle
State Office Building	020900010 2	SLAMS	Fairbanks Fbks North Star Borough	1:6	2	neighborhood
	scehduled for discontinuance in October, 1998					
Hertz	020900025 2	SLAMS	Fairbanks Fbks North Star Borough	1:2	2	neighborhood
	discontinued in January, 1998					
Floyd Dryden Middle School	021100004 2	SLAMS	Juneau City and Borough of Juneau	1:2	2	neighborhood
Colony High School	none	SPMS	Palmer Mat-Su Borough	1:3	1	urban
Pioneer Peak	none	SPMS	Butte Mat-Su Borough	1:3	1	urban

PM2.5 Implementation Timeline

The State of Alaska has established the following timeline for the implementation of the new PM2.5 standard. The timeline covers all activities necessary to implement phase I site installations in 1998 and prepare for phase II activities in 1999. A revised timeline will be submitted to EPA in June 1999 if changes in planning are required.

July 1, 1998	Submit final Network Design to EPA Region 10.
July 15, 1998	Receive R&P PM2.5 samplers for distribution to local monitoring agencies.
July 18, 1998	Governor's recommendation on Alaska's PM10 attainment status to EPA Region 10 Administrator.
July 30, 1998	Hire new monitoring personnel to operate PM2.5 sites.
August 1, 1998	Review of Alaska's existing monitoring network (PM10 & CO).
August 1998	Monitoring site preparation- subject to availability of funding. Juneau - August 14 Anchorage - August 31 Mat-Su Valley - August 25 Fairbanks - August 14
August 5, 1998	Commissioner's review of existing 110 SIP. (due: receipt of EPA guidance letter plus 30 days).
August 15, 1998	Initiate process to upgrade air labs in Anchorage and Juneau. (funding may not be adequate to establish two labs. Alaska is not

Site Name	Location	AIRS # POC	Popul-ation	Site Type	Proposed Designation	SLAMS Obj.	Install 1998	Install 1999	Sampler Type	Freq.	Collocated
Rogers Park Elementary School	Anchorage	none	255000	CORE	SLAMS	1	Aug 98		seqential	1/1	yes (98)
Gambell Street	Anchorage	0202000261	255000	non-CORE	SLAMS	2/1	Aug 98		seqential	1/3	
Garden	Anchorage	none	255000	CORE	SPMS	2		Aug 99	single (EMAD)	1/3	
Gambell Street	Anchorage	0202000261	255000	optional (existing)	SPMS	2	existing through 9/99		dichotomous	1/3	
Rogers Park Satellite	Anchorage	none	255000	optional	SPMS	2		Aug 99	sequential	1/3	
Parkgate	Eagle River (Anchorage)	0202010042	255000	optional	SPMS	2		Aug 99	sequential	1/3	
Mirror Lake Elementary School	Chugiak (Anchorage)	none	255000	transport	SLAMS	4		Aug 99	sequential	1/3	
Talkeetna Regional	Talkeetna	none	1000	background	SLAMS	4		Aug 99	sequential	1/3	
Pioneer Peak/ Harrison Court	Butte	none	1500	non-CORE	SLAMS	3	Aug 98		single	1/3	yes (99)
Colony High School	Palmer	none	10000	optional	SPMS	2		Aug 99	single (seasonal)	1/3	

Site Name	Location	AIRS # POC	Popul-ation	Site Type	Proposed Designation	SLAMS Obj.	Install 1998	Install 1999	Sampler Type	Freq.	Collocated
State Office Building	Fairbanks	0209000102	82000	CORE	SLAMS	2	Aug 98		sequential	1/3	yes (99)
West Park	Fairbanks	none	82000	optional	SPMS	2		Aug 99	sequential	1/3	
Floyd Dryden Middle School	Juneau	0211000042	30000	CORE	SLAMS	2/1	Aug 98		seqential	1/1	yes (98)
Floyd Dryden Middle School	Juneau	0211000042	30000	optional (existining)	SPMS	2	existing through 9/99			1/1	
Lemon Creek	Juneau	none	30000	optional	SPMS	2	Aug 99		sequential	1/3 (seasonal)	
Bear Valley	Ketchikan	none	15000	optional	SPMS	2	August 99		single	1/2 (seasonal)	
Swan Lake	Sitka	none	8000	optional	SPMS	2	August 99		single	1/2 (seasonal)	
Denali National Park	Healy	none	500	CORE	SLAMS?	6 (haze monitoring)	existing		IMPROVE sampler	1/3?	?

ATTACHMENT B

SITE DESCRIPTION FOR $PM_{2.5}$ PARTICULATE MONITOR IN THE MUNICIPALITY OF ANCHORAGE

Rogers Park Elementary School Monitoring Site **61° 11′ 41″ North Latitude**
149° 51′ 12″ West Longitude

The State of Alaska Department of Environmental Conservation will install a $PM_{2.5}$ monitor on the roof of Rogers Park Elementary School (Rogers Park) at 1400 E. Northern Lights Boulevard in Anchorage, Alaska. Anchorage is the largest city in Alaska with a population of approximately 255,000. Figure B1 is a topographical map showing the entire Anchorage area and surrounding geographical features. Figure B2 is a street map of the Rogers Park area of Anchorage.

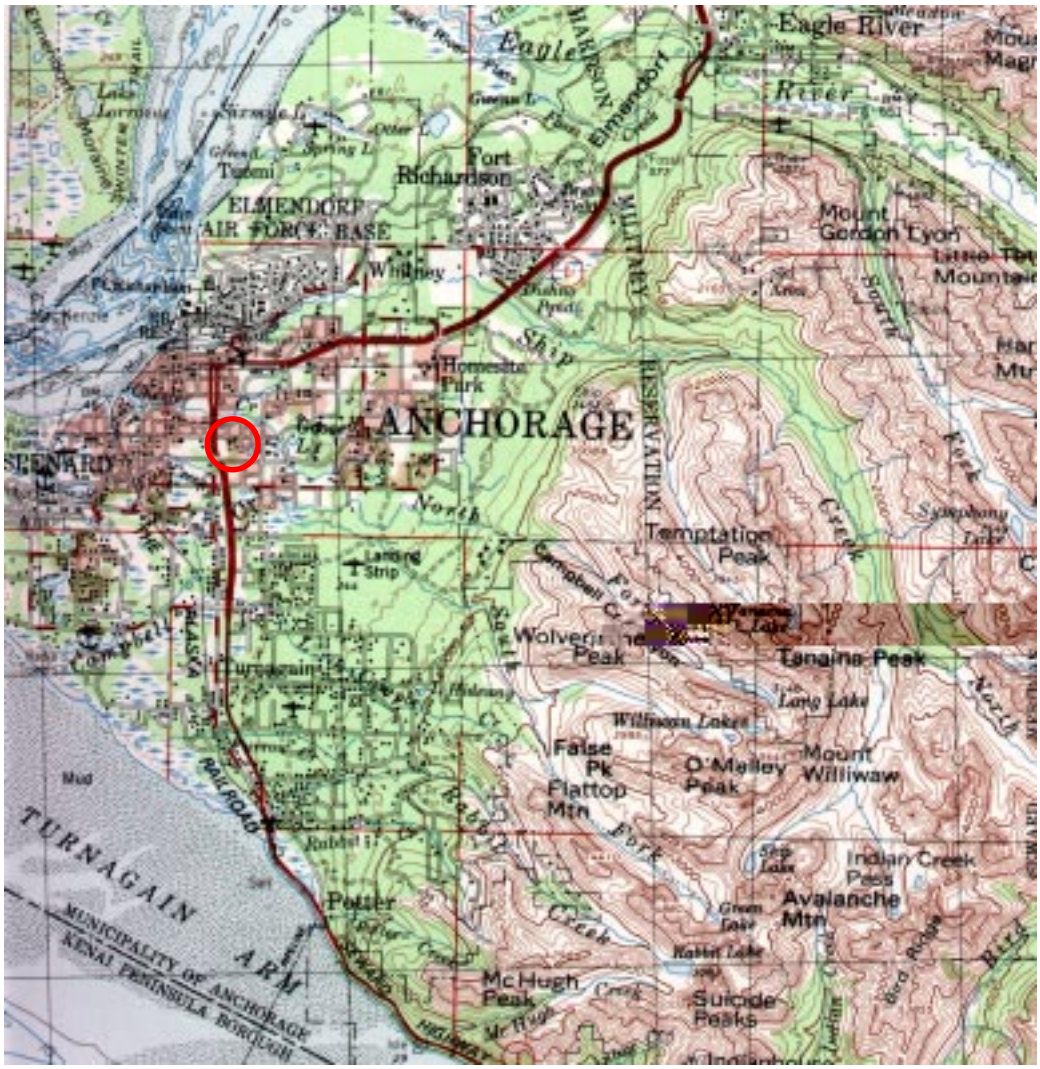


Figure B1 - Topographical map of Anchorage. Scale 1:250,000.

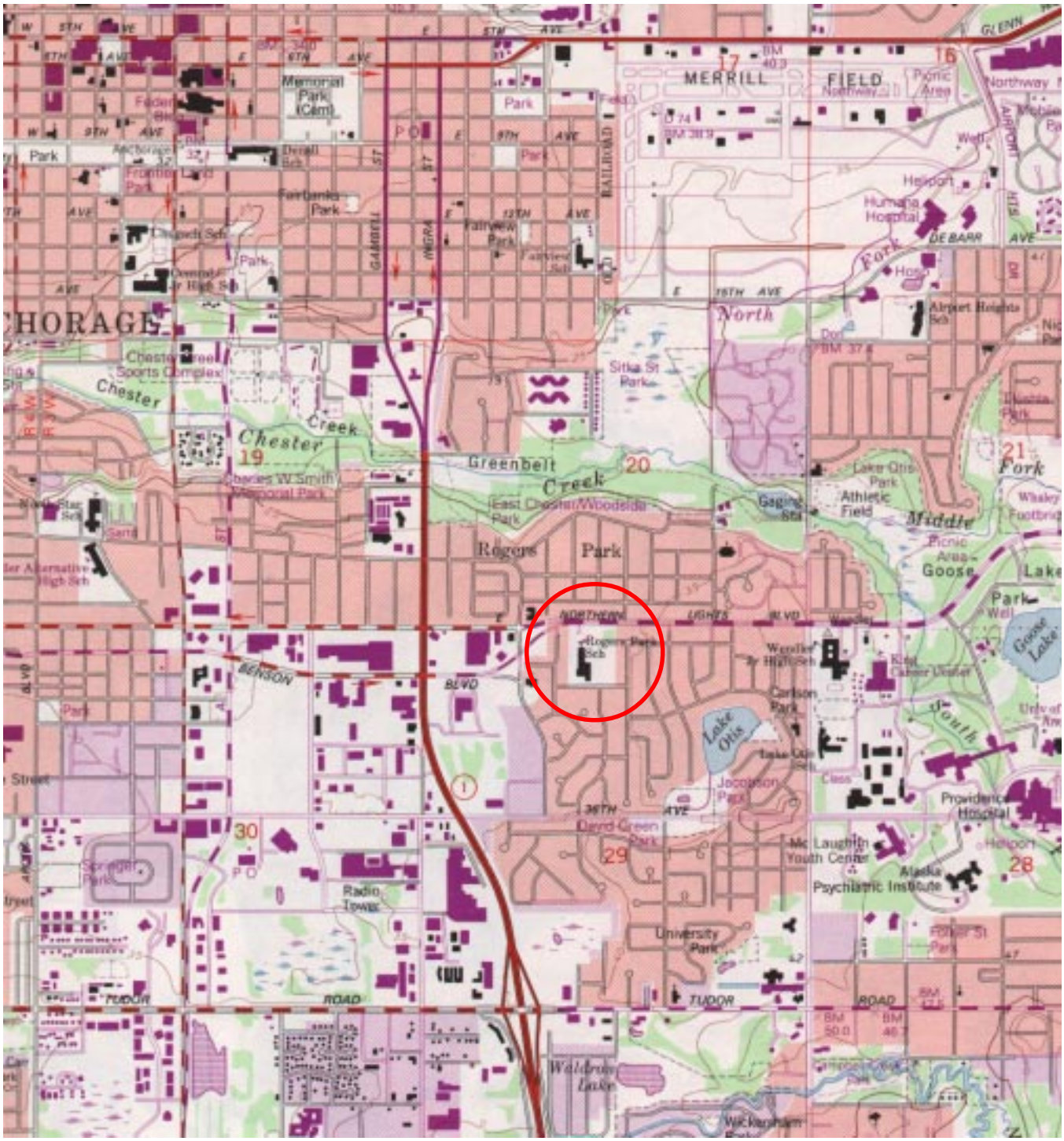


Figure B2 - Street map of north-central Anchorage

Sources

Rogers Park Elementary School is located approixmately in the middle of the Rogers Park Subdivision. The potential sources of air pollution within 1.5 kilometers are paved roadways, paved parking lots, malls, stores, small businesses, and residences.

Most of Anchorage, as well as a significant portion of Elmendorf Air Force and Fort Richardson Army Bases, lies within 8 km of this site. Below are the point and area sources within 8 kilometers:

1) The Anchorage International Airport approx. 7 kilometers west-south-west.
2) The airport at Elmendorf AFB approx. 5.5 kilometers north.
3) Campbell airstrip approx. 6.5 kilometers to the south-east.
4) The Lake Hood Airstrip approx. 5.5 kilometers west-south-west.
5) Anchorage Municipal Light and Power power plant.
6) Chugach Electric power plant approx. 4 kilometers south-west.
7) University of Alaska Anchorage power plant approx. 3 kilometers east.
8) Laidlaw bus barn.approx. 3 kilometers south-east.
9) Crustal material re-entrained from roadways (area wide). The closest major roadways and their average daily traffic (ADT) are:

Northern Lights Blvd.	35,820 vehicles per day (VPD)
New Seward Highway	81,507 VPD

Northern Lights Blvd is a large arterial roadway heading east-west through the midtown region of Anchorage. Rogers Park is located approximately 100 meters south of Northern Lights Blvd and approximately 700 meters east of the New Seward Highway.

Photograph B1 - facing north from Rogers Park Elementary School.

Photograph B2 - facing east from Rogers Park.

Photograph B3 - Facing south from Rogers Park.

Photograph B4 - Facing west from Rogers Park.

Siting

Photographs B1-B4, taken on June 17 1998 by Toivo Luick, show views from the ground at Rogers Park in the four cardinal directions. To the immediate north is a playground and parking lot, and then a barrier of trees and Northern Lights Blvd. Further north is more residential area and then the Chester Creek valley. To the east is more playground and then residential areas. To the south are multiple residential subdivisions. To the west is a small parking lot, some residences. Further west is a large Fred Meyers, the Sears Mall, as well as many small businesses, residences, and woodlands.

Rogers Park Elementary School has never been used for ambient air monitoring before. Electric power and telephone service will be installed at the site. There is no monitoring equipment currently operating at the site.

There are no significant structures within the immediate area in any direction except for the school's partial second floor roof. The roof of Rogers Park is 4 meters tall, single-story, and flat, with a second story approximately 8 meters tall covering the south-east section of the building. The $PM_{2.5}$ monitor will be placed far enough from the second floor roof to eliminate any impact on data quality and achieve acceptable site criteria. There are no other restrictions to airflow around the monitoring site. Photographs B5 and B6 were taken from the ground facing the school from the north and west respectively.

Photograph B5 - facing Rogers Park from the north.

Photograph B6 - facing Rogers Park from the west.

ATTACHMENT C

SITE DESCRIPTION FOR $PM_{2.5}$ PARTICULATE MONITOR IN THE MUNICIPALITY OF ANCHORAGE

Gambell Street Monitoring Site **61° 12′ 20″ North Latitude**
149° 52′ 15″ West Longitude

The State of Alaska Department of Environmental Conservation will install a $PM_{2.5}$ monitor at 1820 Gambell Street in Anchorage, Alaska. Anchorage is the largest city in Alaska with a population[1] of approximately 255,000. Figure C1 is a topographical map showing the entire Anchorage area and surrounding geographical features. Figure C2 is a street map of the central and northern sections of the Anchorage area.

1820 Gambell, Anchorage's only PM_{10} NAMS site, was installed in a micro-scale configuration to evaluate emissions of dust off the Gambell and Ingra roadways. The existing monitoring equipment

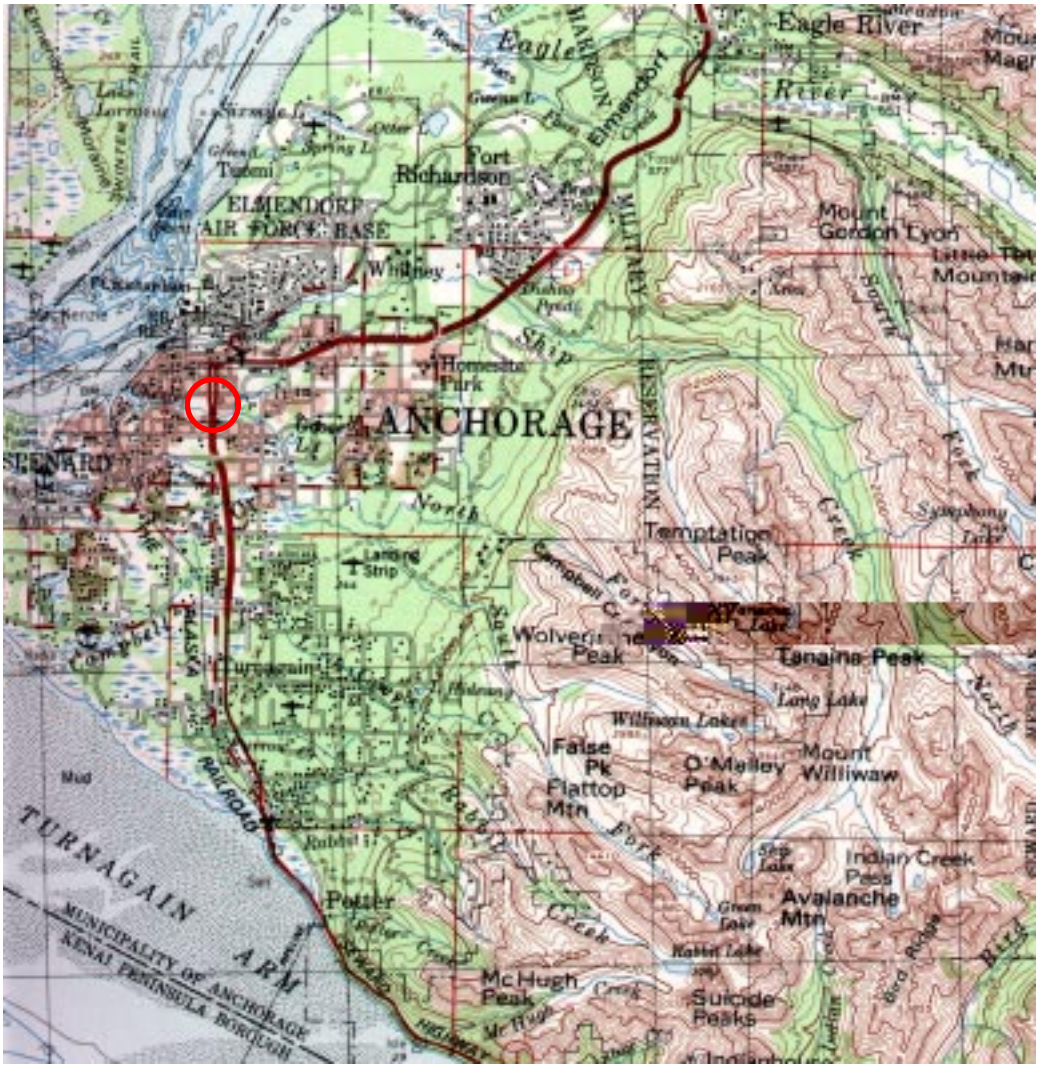


Figure C1 - Topographical map of Anchorage. Scale 1:250,000.

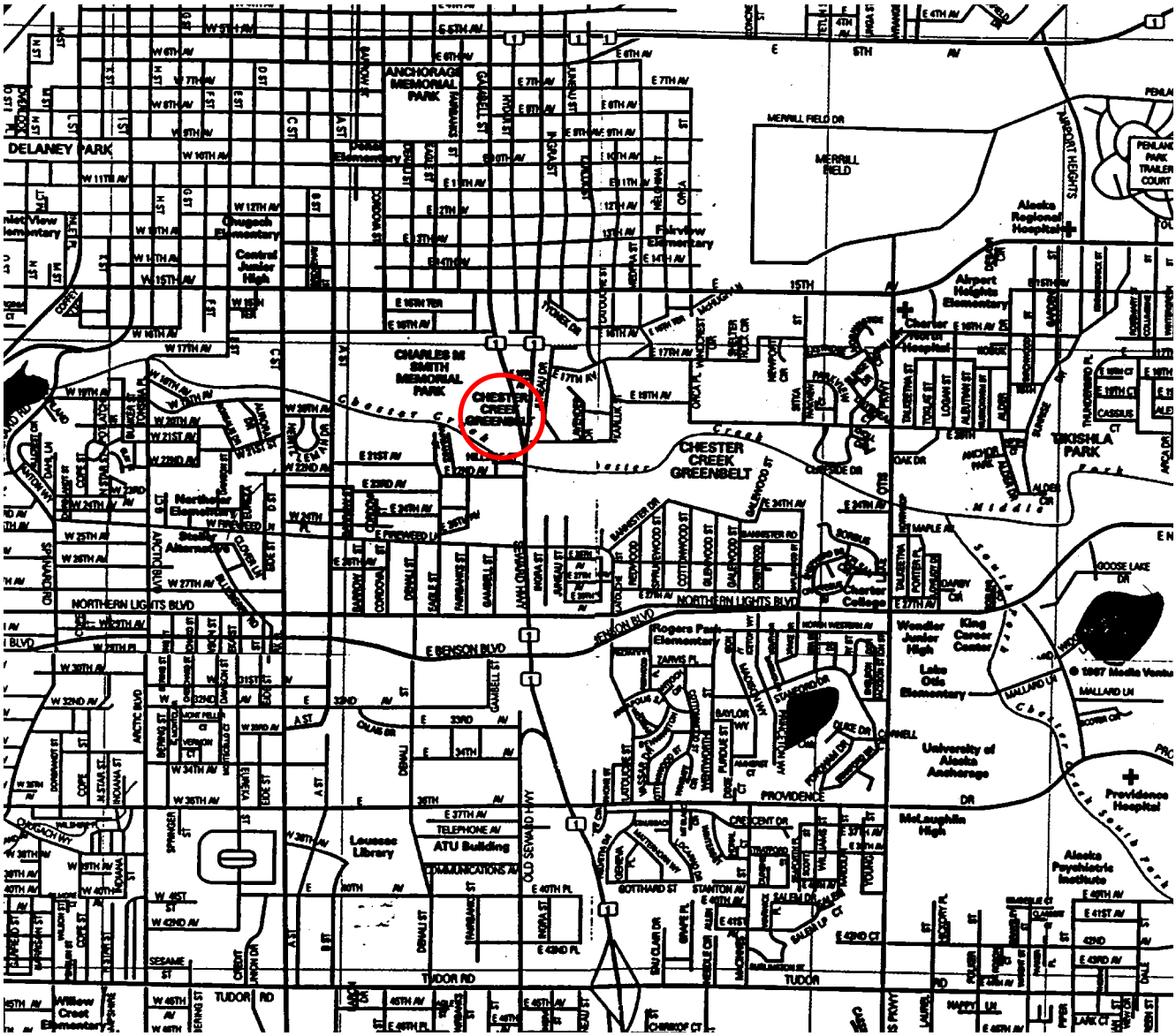


Figure C2 - Street map of north-central Anchorage

lies within 10 meters of the roadway. Typically 90% of the airborne particulates are attributed to crustal material from paved and unpaved roads[2] and parking lots. The combined impact of other sources (industrial sources, wood stoves etc), measured by the technique of chemical mass balance receptor modeling, is less than 10%.

Sources

Gambell St is one of the main arterial roadways heading south, one-way from downtown Anchorage. It runs parallel to Ingra St, its one-way north-bound counterpart. One mile south of the monitoring site, Gambell and Ingra Streets combine to form the New Seward Highway. The monitoring site is adjacent to Gambell Street between the Fireweed Lane and 15th Avenue. The Fireweed/New Seward intersection total daily traffic[3] was 67,321 vehicles on July 27 1995. The 15th Ave/Gambell intersection traffic was 44,874 vehicles on May 14 1997. The majority of this traffic traveled north-south.

The fact that the monitoring site sits in the bottom of the Chester Creek Valley helps to trap air pollution in close proximity to the roadway from which it is derived. The area within 1.5 kilometers is predominantly influenced by Gambell and Ingra Streets alone. The dirt parking lot for the Ben Boeke Ice Arena was paved in 1996. Other potential sources within 1.5 kilometers are other paved roadways, paved parking lots, small businesses, residences, and Merrill Field. Merrill Field is a small airport serving private aircraft located approximately 1 kilometer away to the north-east. Photograph 2 shows the Chester Creek Valley[4] from the top of the north side.

Photograph C1 - aerial photograph of Gambell monitoring station

Most of Anchorage, as well as a significant portion of Elmendorf Air Force and Fort Richardson Army Bases, lies within 8 km of this site. Below are the point and area sources within 8 kilometers:

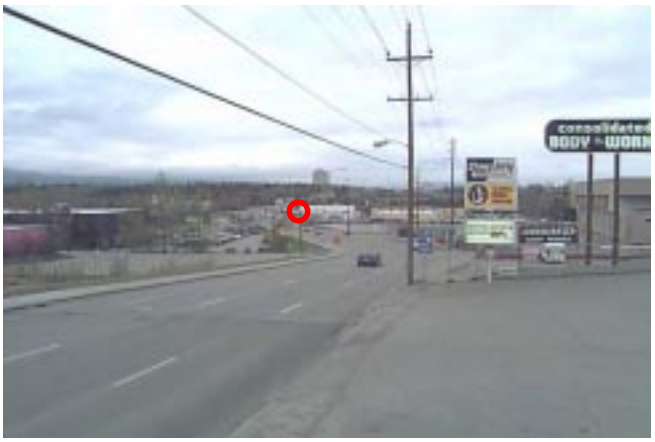
1) The Anchorage International Airport approx. 7 kilometers west-south-west.
2) The airport at Elmendorf AFB approx. 5.5 kilometers north.
3) Campbell airstrip approx. 6.5 kilometers to the south-east.
4) The Lake Hood Airstrip approx. 5.5 kilometers west-south-west.
5) Anchorage Municipal Light and Power power plant.

Siting

Photograph C1 is an aerial photograph of the area. Photograph C2 was taken from the ground on the edge of Gambell St looking south-south-east[5], and shows the distance between the roadway and the existing monitoring equipment, as well as the height above the ground (the inlets are at approximately 4 meters). Photograph C3 was taken from a parking lot looking south into the

Chester Creek Valley.

Photograph C2 - facing SSE towards 1820 Gambell St.



Photograph C3 - facing SSE from the edge of the Chester Creek Valley

Photograph C4 - facing north from the roof of 1820 Gambell St.

Photograph C5 - facing east from the roof of 1820 Gambell St.

Photograph C6 - facing south from the roof of 1820 Gambell St.

Photograph C7 - facing west from the roof of 1820 Gambell St.

Photographs C4 through C7 show views from the roof at 1820 Gambell St[5] in the four cardinal directions. To the immediate north is a small parking lot and Gambell St, and beyond that are a paved parking lots and a small businesses. Further north is a residential area with older homes and appartments as well as some small businesses. To the east are Gambell and Ingra Roads, beyond which lies part of the Chester Creek Greenbelt and residential areas. To the south lies the Cal Worthington Ford, which is a paved automobile sales lot, and a large showroom building. Further south lie woods, small businesses and residences. To the west are parking lots for Cal Worthington Ford and the Ben Boeke Ice Arena, as well as the arena itself. The Chester Creek greenbelt extends east-west along the bottom of the Chester Creek Valley, and is predominantly residential, as well as parkland and forest recreational area.

The building at 1820 Gambell is owned by Cal Worthington Ford. The building has been used for ambient air monitoring for at least ten years. Electric power and telephone service have already been installed at the site. There are several pieces of monitoring equipment currently operating at the site including:

1) Four General Metal Works FRM high-volume PM_{10} samplers.
2) One Anderson beta attenuation monitor for PM_{10}.
3) Two dichotomous samplers for monitoring PM_{10} and $PM_{2.5}$.
4) There is no meteorological monitoring instrumentation at the site.

There are no significant structures within several hundred feet in any direction except for the roof of 1820 Gambell. The roof consists of a flat section upon which the existing monitoring equipment sits, and a higher, sloped, barn-like section which covers a second floor over part of the building. The top of the barn-roof is approximately 10 feet higher than the flat roof. The $PM_{2.5}$ monitor will be placed far enough from the barn-roof and existing high-volume PM_{10} monitors to minimize their impact on data quality and achieve acceptable site criteria. The elevated portion of the building is not considered a problem to the collection of valid data as the structure is down wind of most emission sources.

[1] Population information for 1997. This information was provided courtesy of the Office of Population, Economic, and Statistical Information of the Municipality of Anchorage, Department of Community Planning and Development.

[2] Air Quality in Anchorage, A Summary of Air Monitoring Data and Trends (1980-1996), Air Quality Program, Environmental Services Division, Dept. of Health and Human Services, Municipality of Anchorage, 1997.

[3] These data were provided by the Municipality of Anchorage, Department of Public Works, Traffic Engineering Office.

[4] Photo taken by Toivo Luick on May 13 1998.

[5] Photo taken by Toivo Luick on May 11, 1998.

ATTACHMENT D

SITE DESCRIPTION FOR $PM_{2.5}$ PARTICULATE MONITOR IN THE MATANUSKA-SUSITNA VALLEY

Pioneer Peak/Butte Monitoring Site **61° 32′ 02.986″ North Latitude**
149° 01′ 53.958″ West Longitude

In July of 1997 the Alaska Department of Environmental Conservation installed a Wells-Cargo monitoring shelter at South Harrison Court (3907), Harrison Subdivision (2963), Sec 26, T17N, R2E, SM. The shelter has electric and telephone service, and is sited on the south-west corner of the cul-de-sac on the edge of the right-of-way.

Figure D1 - Topographical map of the eastern Matanuska Valley. Scale 1:250,000.

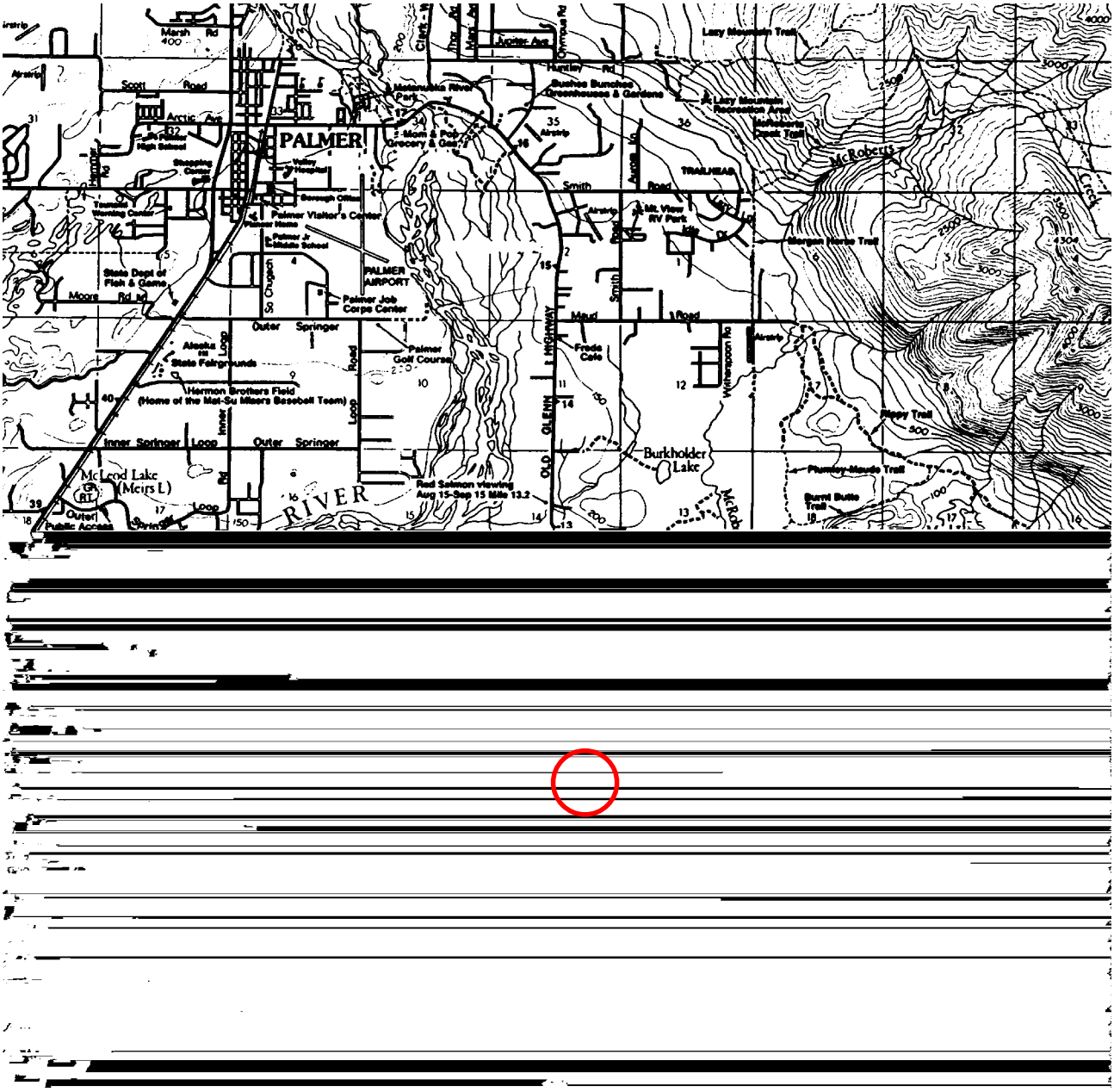


Figure D2 - Street map of Palmer area.

The wind flow in this part of the valley is predominantly east to south-east, coming down the Knik River drainage towards the monitoring site. The town of Palmer is situated 8 kilometers north-north-west at the confluence of the Knik and Matanuska River valleys. Both valleys generate strong winds that raise huge amounts of glacial loess from the meandering river beds, frequently creating an air quality hazard. See Figure D1 for a wide area map of the Matanuska Valley and Figure D2 for a larger scale map of the Palmer area. On both maps the location of the monitoring shelter is indicated.

Sources

The traffic on Harrison Court is very light, especially at the cul-de-sac end, which only serves as access to lot 3. The area within 1.5 km is predominantly residential. On the following page are the point and area sources within 1.5 km:

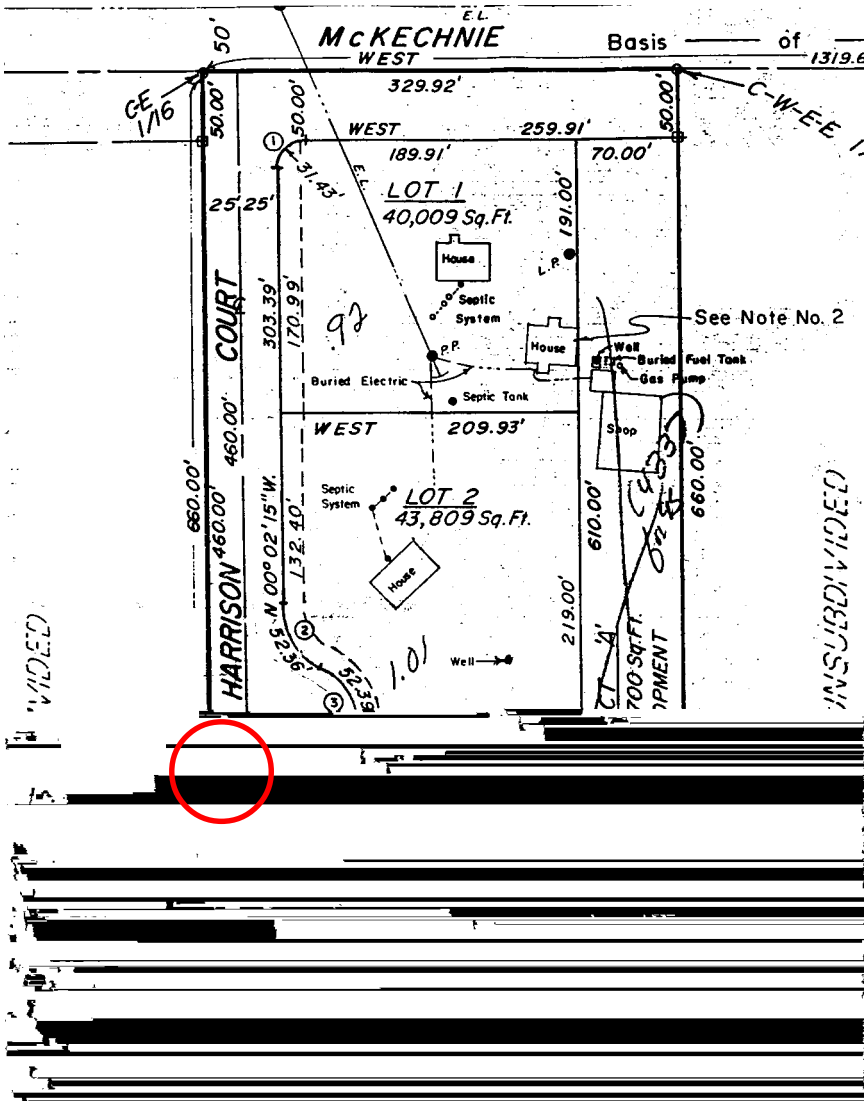


Figure D3 - Harrison Subdivision.

1) Numerous unpaved roadways throughout the area.
2) A private gravel airstrip approximately 1.5 km to the north-east.
3) A private gravel airstrip approximately 1 km to the east-south-east.
4) Pony Wheel Ranch one half kilometer to the north.
5) The Reindeer Farm approximately one kilometer to the west-north-west.
6) Polar Raceway, a dirt-track motor raceway approximately 1 km to the south.

The are no major point sources for airborne particles within 8 km of this site. However, both the Knik and Matanuska Rivers are meandering glacial rivers that deposit large amounts of silt which can be suspended by the prevailing winds. Both of these rivers pass within approximately 3 km of the site. These rivers are the major sources of airborne particulates within the Palmer area.

Photograph D1 - facing north from the top of the monitoring shelter.

Photograph D2 - facing east from the top of the monitoring shelter.

Siting

McKechnie Road lies east-west from where it intersects the Old Glen Highway at approximately mile 11. McKechnie Road is visible on the map in Figure D2. Harrison Subdivision, a rectangle 660 feet north-south and 330 feet east-west, is shown in Figure D3. There are three lots in the Harrison Subdivision, each being between 40-48,000 ft^2 and roughly square in shape. The northernmost is lot 1 and the southernmost is lot 3. The north edge of the Harrison Subdivision (and lot 1) lies along McKechnie Rd. Other lots surrounding the Harrison Subdivision are undeveloped woodlands.

Harrison Court is an unpaved road that lies directly south from McKechnie Rd along the western edge of Harrison Subdivision. The road runs north-south approximately 460 feet with a 50-foot radius gravel cul-de-sac at the southern end. The shelter is located at the south-west corner of the cul-de-sac,

Photographs D5 and D6 show the monitoring shelter from the ground. These photographs were also taken on May 15, 1998 by Ann Lawton. There are no buildings within one hundred feet, and no buildings significantly taller than the probe inlet within 500 feet. The height of the sample intake is approximately ten feet above the ground level. The local tree height is approximately equal to the monitor inlet height, although the land is mostly cleared for approximately 250 feet in the predominant upwind direction.

The Butte site is currently an operating PM_{10} monitoring station. The following instruments are operating at the site:

1) Two General Metal Works FRM high-volume PM_{10} samplers.
2) An Anderson beta attenuation monitor for PM_{10}.
3) There is no meteorological monitoring instrumentation at the site, although one is planned.

ATTACHMENT E

SITE DESCRIPTION FOR $PM_{2.5}$ PARTICULATE MONITOR IN THE CITY OF FAIRBANKS

State Office Building Monitoring Site **64° 50′ 27″ North Latitude**
147° 43′ 30″ West Longitude

The Fairbanks North Star Borough will install a SLAMS $PM_{2.5}$ monitor on the roof of Regional State Office Building (State Building) at 675 7th Avenue in downtown Fairbanks, Alaska. Prevailing winds are from the east to south-east, but Fairbanks experiences many calm days during the winter with inversions nearly every day. Fairbanks has the strongest wintertime inversions measured anywhere in North America.

Fairbanks is Alaska's second largest city, and is located in the upper Tanana Valley. The terrain is very flat in the city of Fairbanks, with hills to the north, east and west. Figure E1 is a topographical

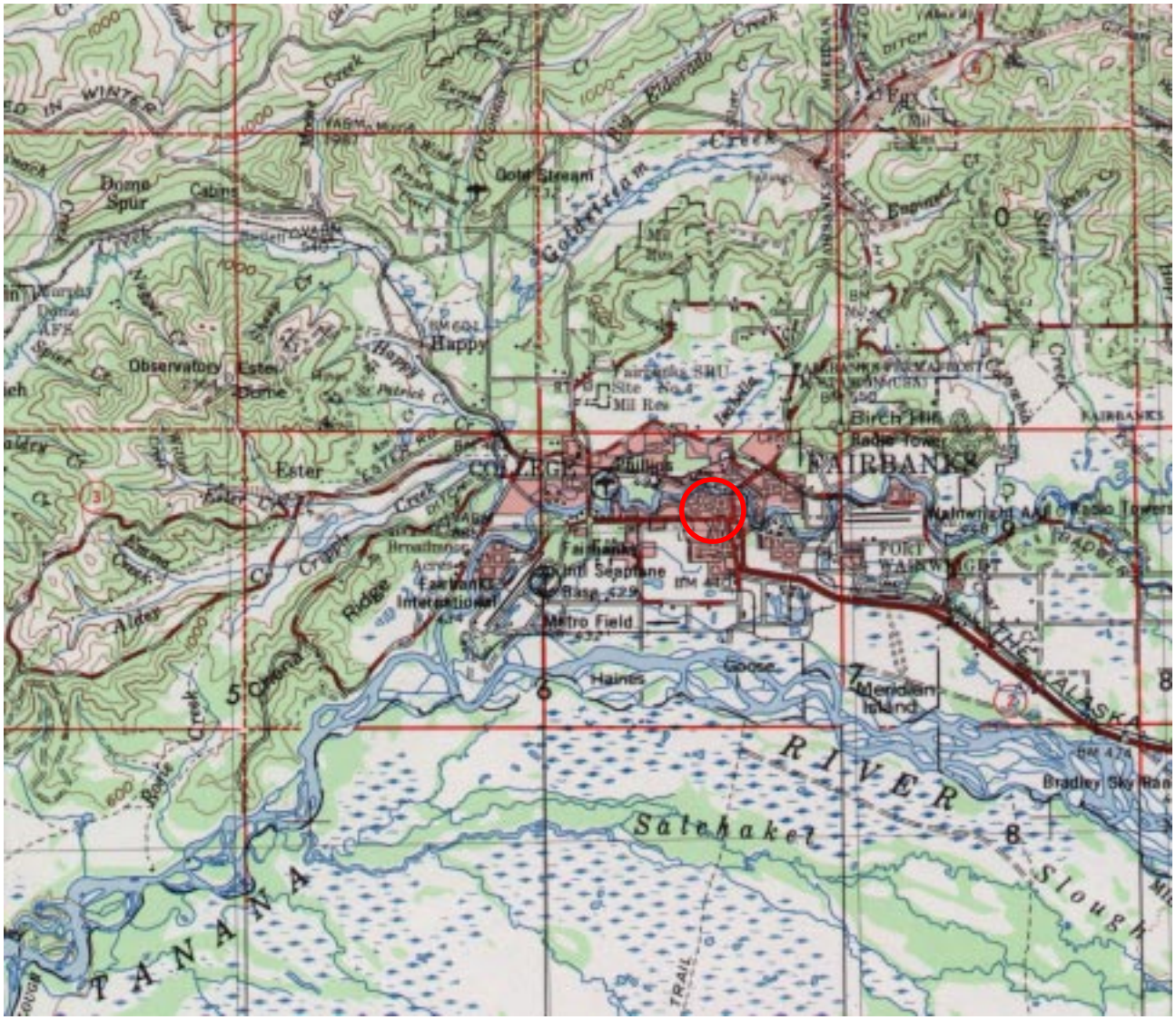


Figure E1 - Topographical map of Fairbanks. Scale 1:250,000.

map of the Fairbanks area. The population of Fairbanks is 82,278 scattered throughout the Fairbanks North Star Borough (FNSB) which includes Fox, Ester, North Pole, Salcha and some other small communities.

Sources

Ten years of monitoring in residential and downtown areas has never documented a PM_{10} problem. Fairbanks does have the following sources of particulate matter:

1) Golden Valley Electric Association (GVEA) coal-burning power plant (1 km to the north-north-west), which burns an average of 118,166 tons of coal per year and provides electricity to the Fairbanks area.
2) Winter wood stove use (seasonal area source).
3) Crustal material re-entrained from roadways (area wide). The closest major roadways are:

Barnette Street	5,900 vehicles per day (VPD)
7th Avenue	2,400 VPD
Cushman Street	7,900 VPD

Figure E2 - Planimetric map of Fairbanks.

Photograph E1 - facing north from the monitoring site.

Photograph E2 - facing east from the monitoring site.

Photograph E3 - facing south from the monitoring site.

4) Fairbanks International Airport (8 km to the west).
5) University of Alaska Fairbanks (UAF) coal burning power plant (5.5 km to the west).
6) Fort Wainwright Army Base coal burning power plant (5 km to the east-south-east).
7) Smoke from wildland fires (seasonal long range transport).

Siting

The State Building lies on 7th Avenue between Barnette and Cushman Streets. Figure E2 is a plannimetric map of downtown Fairbanks near the monitoring site. The sampler will be installed approximately 2 meters from the northern edge of the roof (near 7th Avenue) and 8 meters from western edge (near Barnette Street). The roof of the State Building is 4.25 meters above the ground, and the inlet height is another 2 meters above that. The State Building has a second floor which is 3.75 meters above the roof upon which the sampler will be installed. The nearest second-floor wall is approximately 30 meters from the sampler location. There is unrestricted airflow around the proposed monitoring site.

Other nearby structures include the courthouse at 75 meters to the north-west, a

parking garage 45 meters to the north, residences 45 meters to the south, and a small, unpaved parking lot approximately 50 meters to the west. The Fairbanks downtown area is primarily a mixture of residences and small businesses.

Photograph 4 - facing west from the monitoring site.

The State Building is currently in use as a monitoring site for PM_{10} and carbon monoxide (CO). Currently there are the following pieces of instrumentation operating at the site:

1) One Wedding FRM high-volume PM_{10} sampler, and
2) One Monitor Labs 8830 CO analyzer.

There is also a Climatronics meteorological tower nearby. The meteorological tower measures wind, temperature and pressure, and is located approximately 300 meters to the north-east.

Photographs E1-E4 were taken from the top of the State Building facing in the directions north, east, south and west. The photographs were taken by Kent Monroe on May 26, 1998. Photograph E5 was taken from the street level facing south-east towards the current monitoring site.

Photograph 5 - facing the monitoring site from the street facing south-east.

ATTACHMENT F

SITE DESCRIPTION FOR $PM_{2.5}$ PARTICULATE MONITOR IN THE MENDENHALL VALLEY OF JUNEAU

Floyd Dryden Middle School Site **58° 23′ 30″ North Latitude**
134° 33′ 30″ West Longitude

The State of Alaska Department of Environmental Conservation will install a $PM_{2.5}$ monitor on the roof of Floyd Dryden Middle School in Juneau, Alaska. Juneau is the capital city of Alaska, with a population of slightly over 30,000 people. Figure F1 is a topographical map showing the Mendenhall

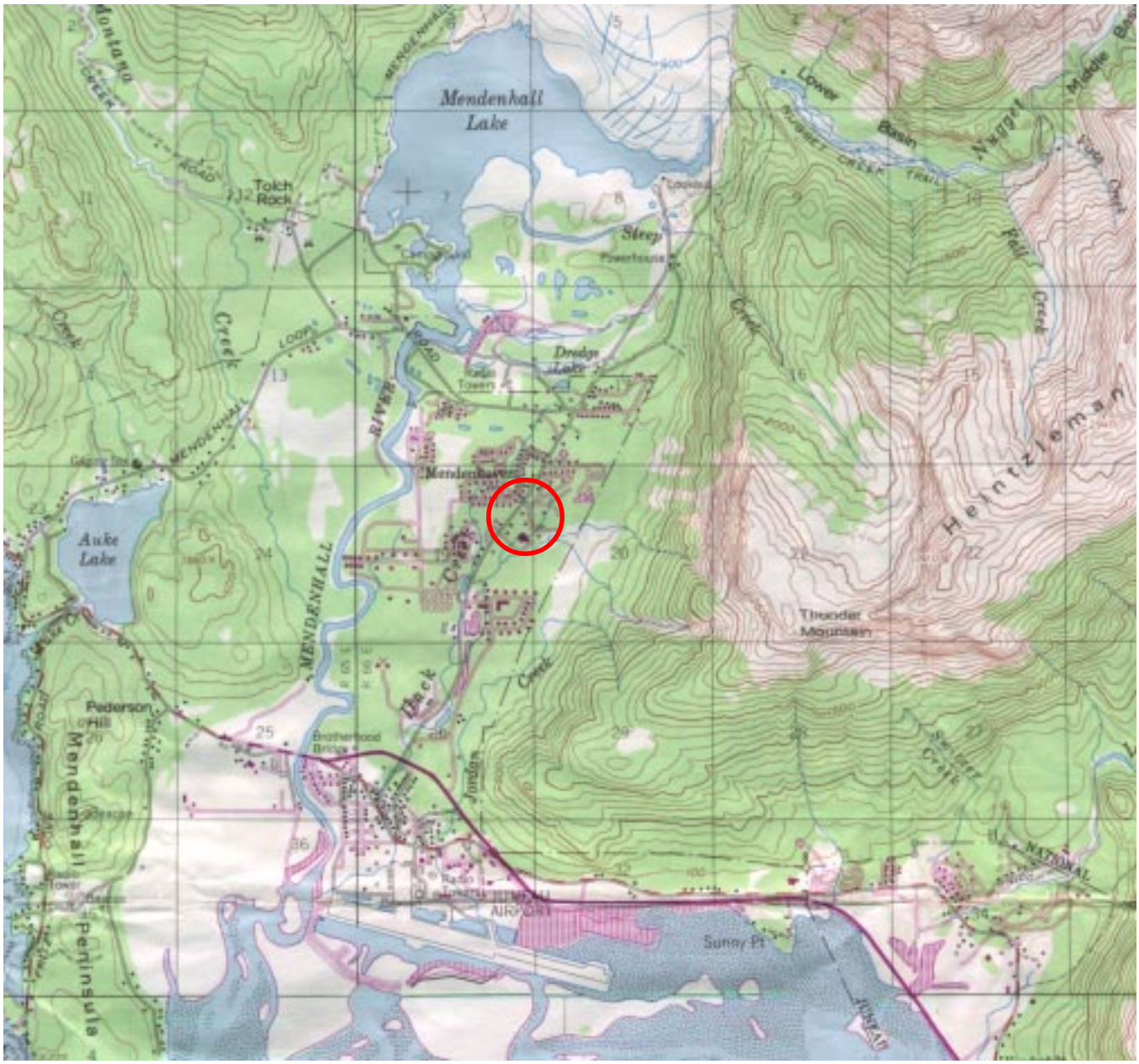


Figure F1 - Topographical map of the Mendenhall Valley. Scale 1:250,000.

Valley. The Mendenhall Valley runs close to north-south between steep mountains, and is approximately 8 kilometers long and 3 kilometers across. To the south is the Gastineau Channel, and to the north is the mountainous Harding Ice Fields from which Mendenhall Glacier feeds Mendenhall Lake.

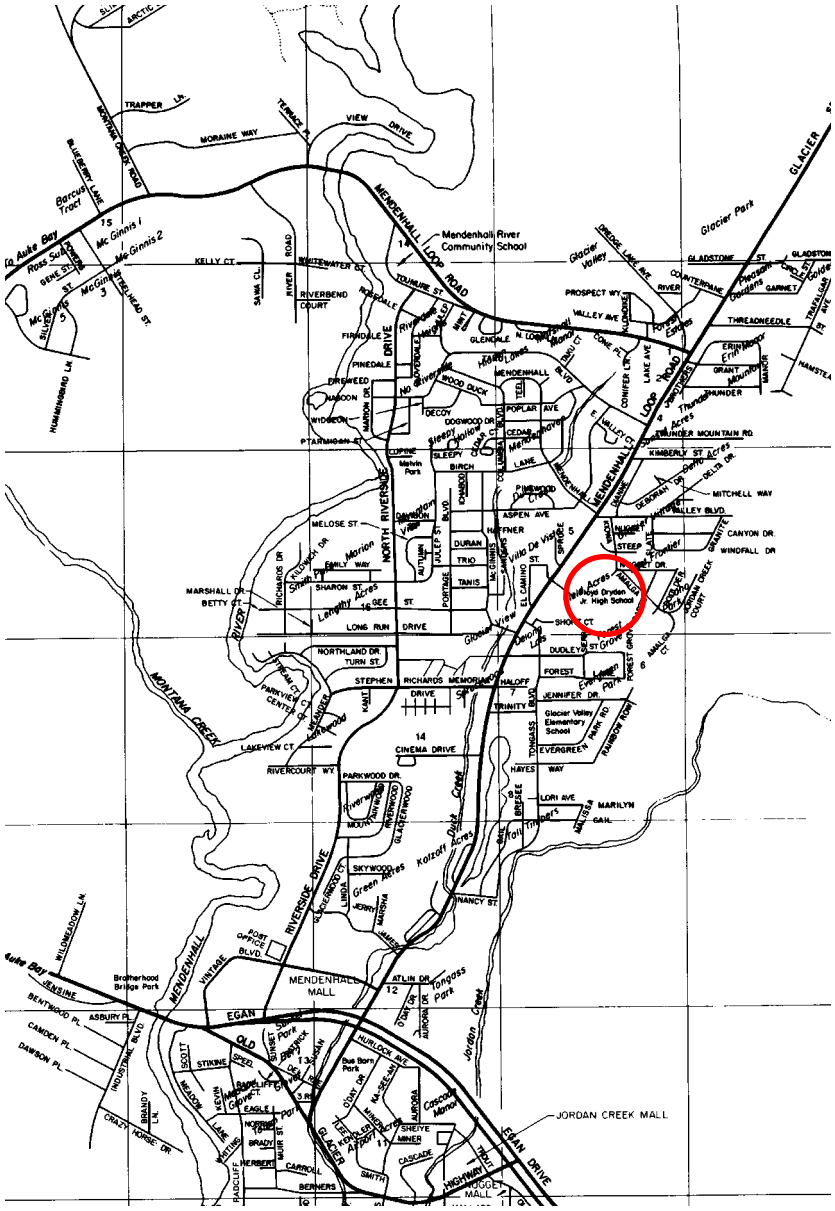


Figure F2 - Street map of Mendenhall Valley.

The eastern half of the Mendenhall Valley is almost exclusively residential, except for the southern end which contains Juneau International Airport and small businesses. The western half is largely undeveloped woodland. Figure F2 is a street map of the Mendenhall Valley and Photograph F1 is an aerial photograph of Floyd Dryden Middle School (Floyd Dryden) respectively. Floyd Dryden is located towards the eastern side of the valley approximately half way between the Mendenhall Lake and Gastineau Channel. All of the land within 1.5 kilometers is either residential or undeveloped wildland.

Sources

Within 1.5 kilometers, the principal point and area sources of particulate matter are crustal material from paved roadways, ball fields and playgrounds, as well as woodstoves used for residential heating.

Mendenhall Loop Road is the nearest main arterial and the major roadway for the Mendenhall Valley. Average daily traffic on the loop road is 12,770 vehicle counts. The roadways are sanded during winter months to improve driving safety. This material is then re-entrained in the winter and early spring during periods of high wind combined with dry weather.

Floyd Dryden has dirt baseball and football fields, and there are more ballfields at Diamond Park and Melvin Park. There are also 3 elementary schools with dirt playground areas. These fields and playgrounds contribute to airborne particulate matter during periods of high winds and dry weather.

Particulate matter from wood smoke has been the primary cause for NAAQS exceedance measured for PM_{10} at Floyd Dryden.

The potential point sources of significance within 8 kilometers including:

1) A gravel pit (3.25 km to the north-west).
2) The Lemon Creek Valley (6 km to the south-east), which has both The Alaskan Brewing Company and a waste incinerator. These are seperated from the Mendenhall Valley by Heintzleman Ridge, which is well over 1000 meters tall and prevents significant transport of airborne pollutants.

Other potential sources of airborne particulate matter are:

1) The Juneau International Airport (3.5 km to the south), which has a paved runway and averages 1050 passengers daily enplanement.
2) The Mendenhall Glacier (3 km to the north) deposites glacial silt in the shore of Mendenhall Lake, which becomes airborne during high wind events.
3) Seasonal wildfire smoke carried by long-range transport from Western Canada.

Siting

The sampler will be installed on the roof of Floyd Dryden Middle School, approximately 6 meters above the ground. There is a furnace flue approximately 20 meters away, and an incinerator vent approximately 70 meters away. 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 4 meters above the roof upon which the sampler will be installed. The nearest penthouse wall is

Photograph FF1 - Aerial photograph of Floyd Dryden Middle School.
The upwards direction is north-east in this photograph.

approximately 15 meters from the current sampler location.

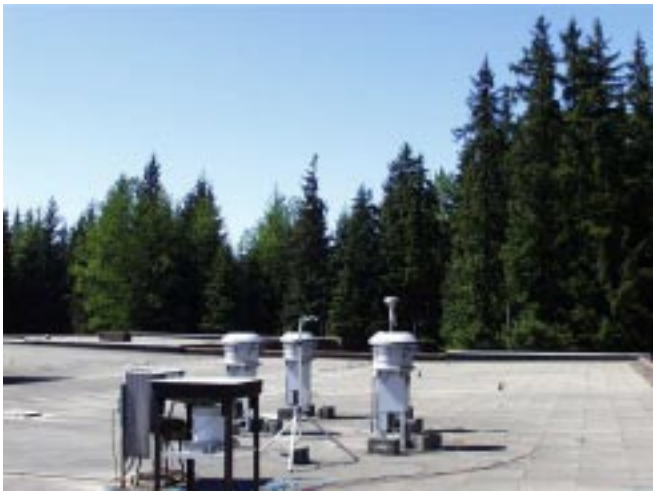
The sampler will be installed approximately 65 meters from the nearest traffic lane, with a barrier of approximately 25 meters of tall trees. The trees are approximately 12 meters tall, and came nearest the monitoring site to the north-east at 25 meters. Airflow is generally uninterrupted with the exception of the trees to the north-east. Because the valley rarely experiences winds out of the north and the main problem is woodsmoke, which causes problems when winds are light, the trees are not considered to cause an impact on the collection of valid data.

Photographs F2-F5 were taken from the roof of Floyd Dryden facing in the directions north, east, south and west. The photographs were taken by Abel Vargas on May 26, 1998. Photographs F6 and F7 show the monitoring site from the ground. Photograph F8 was taken from the roof of the school show-

Photograph F2 - Facing north from the roof of Floyd Dryden.

Photograph F3 - Facing east.

Photograph F4 - Facing south.



Photograph F5 - Facing west.

ing Heintzleman Ridge, which separates the Medenhall and Lemon Creek Valleys.

Floyd Dryden is currently a monitoring site containing the following pieces of instrumentation:

1) Three General Metal Works FRM high-volume PM_{10} samplers.
2) A partisol $PM_{2.5}$ sampler.
3) Meteorological monitoring instrumentation capable of measuring wind speed and direction, pressure, temperature, solar radiation etc., but which is not currently in use.

Photograph F6 - The rear of Floyd Dryden facing north-west.

Photograph F7 - The front of Floyd Dryden facing north-east.

Photograph F8 - Taken facing east and back a distance from the sampling instruments. Heintzleman Ridge is clearly visible in the background separating Mendenhall Valley from Lemon Creek Valley.