Alaska's 2013 Air Monitoring Network Plan

Chapter 2
Anchorage

Air Quality Division

Air Monitoring
&
Quality Assurance
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2 ANCHORAGE MONITORING SITE DESCRIPTIONS

2.1 *General Information*

The Municipality of Anchorage (MOA) has a population[1] of 291,826 making it the largest municipality 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 and 52 ºF, respectively. 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.

Eagle River is a suburb of Anchorage located within the Anchorage Municipal Borough, and approximately ten miles northeast of city limits, commonly referred to as the Anchorage bowl. The last time Eagle River violated the PM_{10} NAAQS was in 1988 and it is currently designated as a non-attainment area. The MOA undertook an ambitious paving and road surfacing program in the late1980s that effectively controlled the PM_{10} problem. The MOA has prepared a PM_{10} Maintenance Plan for Eagle River that is currently under review by EPA. If EPA approves this Plan, 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 continues to work 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

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[1] Population data from http://2010.census.gov/news/releases/operations/cb11-cn83.html .
[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.

Monitoring Site (SLAMS) and as Special Purpose Monitors (SPM). The MOA SLAMS 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 ozone monitoring at the Garden site in east Anchorage and at the Parkgate site in Eagle River. The Parkgate site is located approximately 15 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 ozone formed from precursors generated in the city core. In 2010, concentrations and diurnal variation of ozone in Eagle River were remarkably similar to that measured in Anchorage. The ozone sampling season for Alaska is from April 1 through October 30.

In April 2011, the ozone monitor at the Parkgate site was relocated to the city of Wasilla located 45 km (28 mi) northeast of Anchorage (outside of Anchorage municipal limits) to further evaluate communities which could be potential receptors of ozone originating in Anchorage. All ozone sites will be listed as SPM until the data can be evaluated for determination of the appropriate SLAMS site.

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	Nov, 1998 [1]	neighborhood
DHHS	Anchorage	02-020-0052	SPM	Jan, 2009	middle
Parkgate	Eagle River	02-020-1004	SLAMS	Jan, 2009	neighborhood
PM_{10}					
Site Name	**Location**	**AQS ID**	**Designation**	**Install Date**	**Scale**
Garden	Anchorage	02-020-0018	SLAMS	Nov, 1998	neighborhood
DHHS	Anchorage	02-020-0052	SPM	Jan, 2009	middle
Tudor	Anchorage	02-020-0044	SPM	Oct, 1996 [2]	microscale
Parkgate	Eagle River	02-020-1004	SLAMS	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	SLAMS	Dec,2005	neighborhood
Turnagain [3]	Anchorage	02-020-0048	SLAMS	Oct, 1998	neighborhood

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

O_3					
Site Name	**Location**	**AQS ID**	**Designation**	**Install Date**	**Scale**
Garden	Anchorage	02-020-0018	SLAMS	April, 2010	neighborhood

<u>Figure 2.1:1</u>: 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' 28.6" west (-149.824602), 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.

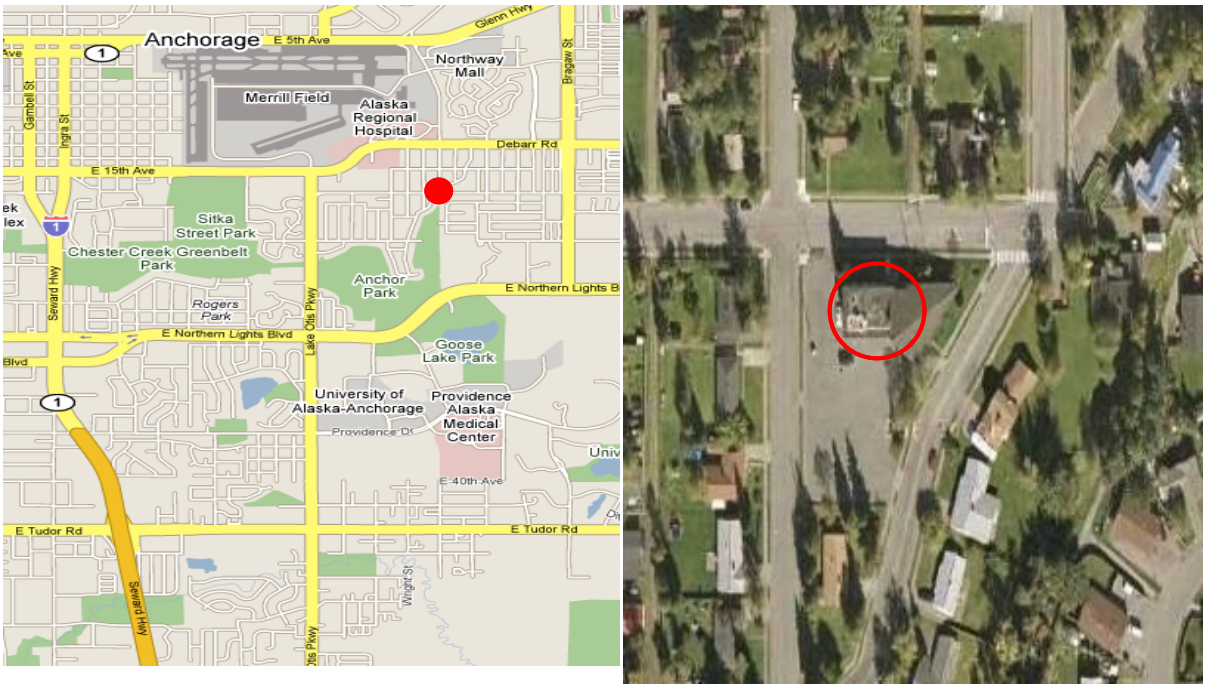


Figure 2.2:1: Street map and satellite image of the Garden monitoring site. The red circles indicate the site's location.

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 turbines (90 and 250 megawatt gas turbines – 5 km west), Chugach Electric turbine (48 MW gas turbine – 6 km southeast), Fort Richardson turbine (18 MW gas turbine – 8 km northeast), and Elmendorf Air Force Base turbine (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_{10} (SLAMS) – One General Metal Works high-volume sampler operates on a 1-in-6 day sampling schedule.
- PM_{10} / $PM_{2.5}$ /PM_{Coarse} (SLAMS) – Dual Met-One Inc., BAM 1020X FEM continuous samplers which include one continuous sampler for PM_{10} and one continuous sampler for $PM_{2.5}$. PM_{Coarse} is calculated by subtracting the $PM_{2.5}$ value from the PM_{10} value. DEC uses the data to calculate an Air Quality Index for forecasting local air quality conditions and for reporting to the EPA Air Quality System (AQS) data base. Two Met One BAM 1020 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 January 2009.
- CO (SLAMS) – A single Thermo Electron 48i-TLE CO monitor operates seasonally (October – March).
- O_3 (SLAMS) – A single Teledyne API 400E O_3 analyzer was installed in March 2010 and is operated seasonally (April through October).

2.2.4 Siting

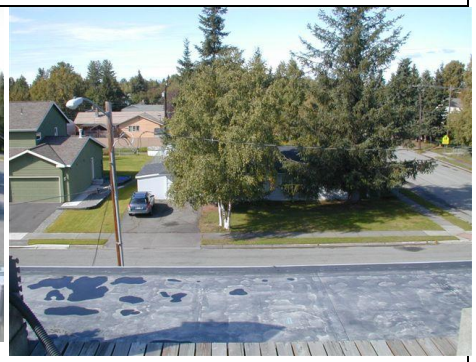
The particulate matter samplers are located on the roof at the south end of the Trinity Christian Reformed Church. Access to the site is by use of a window from a split level section of the church. This split level area is several meters from the monitoring site. The roof height is six meters (19 feet), 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 16th 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 16th Avenue. Between the inlet and 16th 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 47,000 vehicles. All roads are paved; alleys are usually gravel surface.

<u>Figure 2.2:2</u>: 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			

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

2.3 *TUDOR SITE - ANCHORAGE*

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

2.3.1 Site Information

The Tudor monitoring site is located at 3335 East Tudor at latitude 61°10' 51.9" north (61.181083), longitude 149°49' 2.6" 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, source-oriented PM_{10} site.

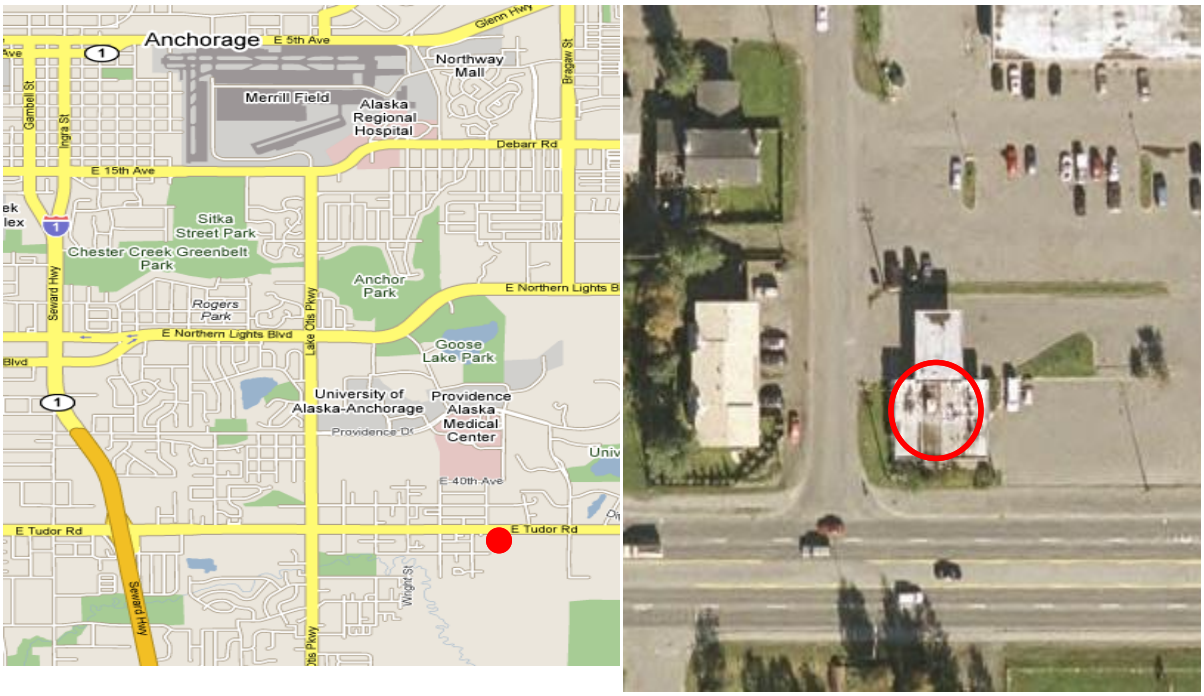


Figure 2.3:1: Street map and satellite image of the Tudor monitoring site. The red circle indicates the sites location.

2.3.2 Sources

The primary source of PM_{10} at this site is from automobile activity. This site is located approximately seven meters from Tudor Road. This section of Tudor Road carries an average daily traffic volume of 41,999 vehicles (2009). 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.

2.3.3 Monitors

The Tudor Site is currently equipped with:

- PM_{10} (SPM) – A single Met One BAM1020X FEM monitor was installed in July 2010 to provide continuous PM_{10} measurements for fulfillment of the provision in 40 CFR, Part 50, Appendix. K, Section 3.1 (f) for counting the number of expected PM_{10} exceedances due to periodic sampling. Data from this monitor are also used for calculating the Air Quality Index.

2.3.4 Siting

The BAM 1020 PM_{10} monitor is located on the roof near the southeast edge. The roof height is 3.3 meters (10.5 feet), and there are no other nearby structures. The 6 meter (20 feet) tall mountain ash trees between the sampler and the roadway do not significantly exceed the height of the sampler. The airflow to the sampler is unobstructed. The sampler is approximately 7 meters north of the nearest traffic lane of Tudor Road.

2.3.5 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.

<u>Figure 2.3:2</u> : Pictures of the Tudor Site

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

2.4 *TURNAGAIN SITE - ANCHORAGE*

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

2.4.1 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 (61.191514), longitude 149° 56' 5.7" west (-149.934930), and an elevation of 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.

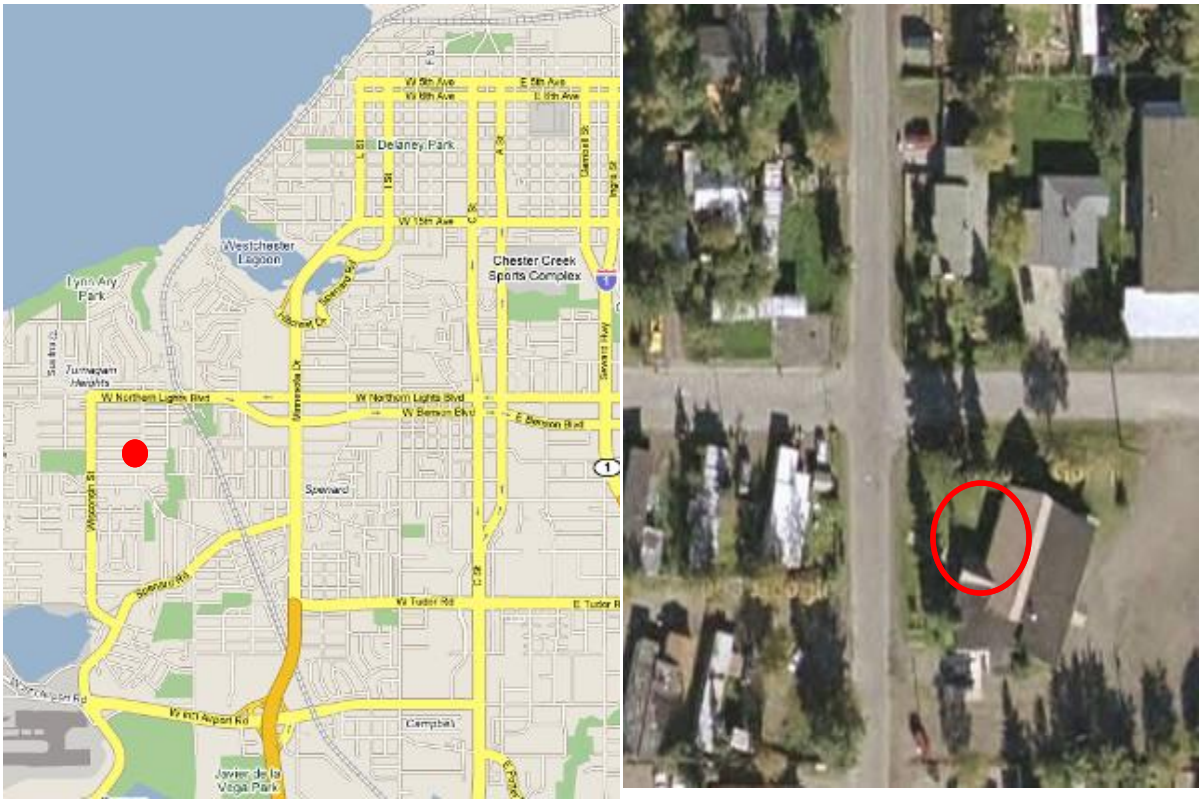


Figure 2.4:1: Street map and satellite image of the Turnagain monitoring site. The red circles indicate the sites location.

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

2.4.3 Monitors

The Turnagain Site is currently equipped with:

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

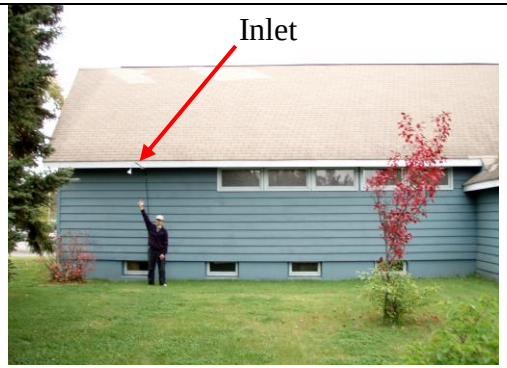
2.4.4 Siting

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.

2.4.5 Traffic

There are five major roadways within 3 kilometers having approximate average daily traffic ranging from 15,000 to 45,000 vehicles. There are residential streets and alleys in the vicinity.

<u>Figure 2.4:2</u>: Pictures of the Turnagain Site

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

2.5 *DHHS - ANCHORAGE*

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

2.5.1 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 an elevation of 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.

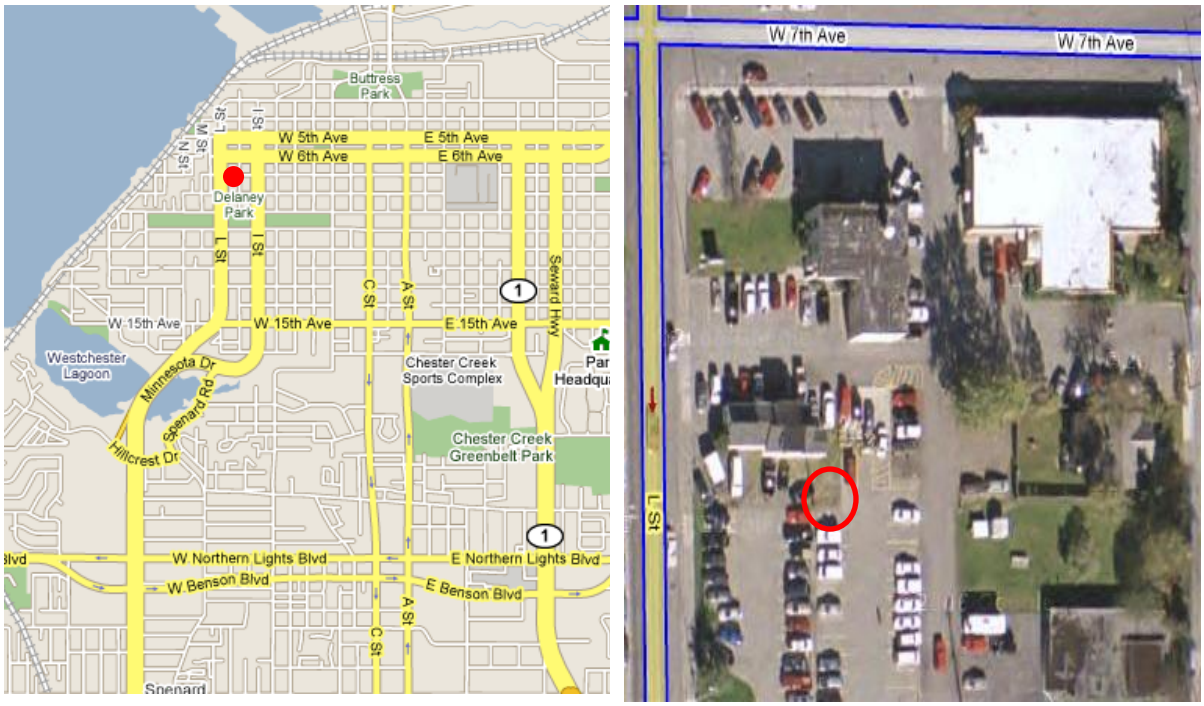


Figure 2.5:1: Street map and satellite image of the DHHS monitoring site. The red circles indicate the sites location.

2.5.2 Sources

This site is located approximately 28 meters east of L Street with an average daily traffic volume of 12,960 (2009). There are numerous streets within a one kilometer radius with daily traffic volumes exceeding 5,000 vehicles. 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.

2.5.3 Monitors

The DHHS Site is equipped with:

- CO (SPM) – A single Thermo Electron 48C CO monitor which operates seasonally (October – March).
- PM_{10} / $PM_{2.5}$ /PM_{Coarse} (SLAMS) – Dual Met-One Inc., BAM 1020X FEM continuous samplers which include one continuous sampler for PM_{10} and one continuous sampler for $PM_{2.5}$. PM_{Coarse} is calculated by subtracting the $PM_{2.5}$ value from the PM_{10} value. DEC uses the data to calculate an Air Quality Index for forecasting local air quality conditions and for reporting to the EPA Air Quality System (AQS) data base. Two Met One BAM1020 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.

2.5.4 Siting

The monitors are installed in a small shed 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.

2.5.5 Traffic

There are four major roadways within 1.6 km with average daily traffic counts ranging from 12,000 to 16,000 vehicles.

Figure 2.5:2: 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			

2.6 *PARKGATE, EAGLE RIVER- ANCHORAGE*

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

2.6.1 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' 36.1" north (61.326700), longitude 149° 34' 10.9" west (-149.569707), and an elevation of100 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. The site is 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 non-attainment 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}.

Ozone monitoring was performed at the Parkgate site during the 2010 ozone monitoring season (April through September). Upon review of the seasonal results, the program was discontinued at the Parkgate site and the equipment moved to Wasilla site in the Mat-Su Valley starting with the 2011 monitoring season, and continuing in 2012 and 2013.

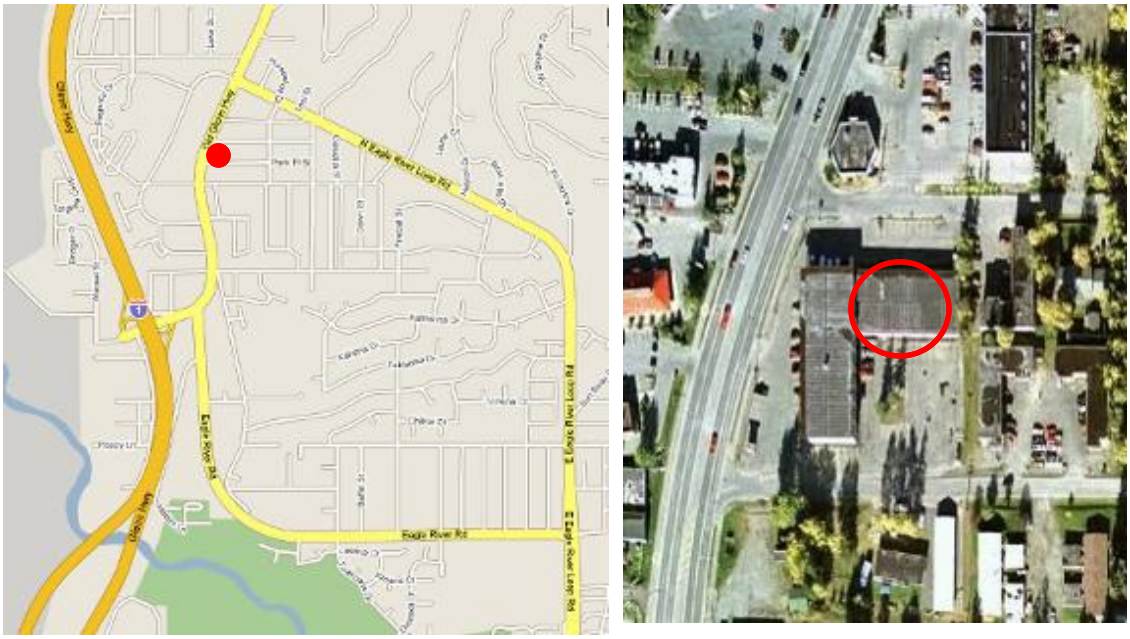


Figure 2.6:1: Street map and satellite image of the Eagle River monitoring site. The red circle indicates the sites location.

2.6.2 Sources

This site is located approximately 44 meters east of the Old Glenn Highway which carries an average daily traffic volume of 17,437 vehicles (2009). Re-entrained roadway dust from this road is a significant source of PM_{10} and the vehicle emissions are a major source of carbon monoxide. There are a number of retail and employee parking areas nearby, 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.

2.6.3 Monitors

The Eagle River Site is currently equipped with:

- CO (SLAMS) – A single Thermo Electron 48C CO monitor is operated seasonally (October – March).
- PM_{10} / $PM_{2.5}$ /PM_{Coarse} (SLAMS) – Dual Met-One Inc., BAM 1020X FEM continuous samplers which include one continuous sampler for PM_{10} and one continuous sampler for $PM_{2.5}$. PM_{Coarse} is calculated by subtracting the $PM_{2.5}$ value from the PM_{10} value. DEC uses the data to calculate an Air Quality Index for forecasting local air quality conditions and for reporting to the EPA Air Quality System (AQS) data base. Two Met One BAM 1020 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.

2.6.4 Siting

The particulate monitors are located on the roof of the one-story Parkgate Business Center. The roof height is 5 meters (16 feet). There is another section of the building 10 meters (30 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.

2.6.5 Traffic

There are two major roadways within 3 kilometers with average traffic counts ranging from 13,500 to 29,550 vehicles per day. There are typical residential and commercial streets and alleys in the vicinity. All roads are paved and alleys are gravel surface.

<u>Figure 2.6:2</u>: 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			