Anchorage MS4 Street Sweeping Report for 2019

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MUNICIPALITY OF ANCHORAGE
WATERSHED MANAGEMENT SERVICES SECTION

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Project Management & Engineering Division
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ANCHORAGE MS4 STREET SWEEPING REPORT FOR 2019

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1. Purpose

Alaska Pollutant Discharge Elimination System (APDES) Permit No. AKS-052558, Part 3.4.5.4 requires the permittees, the Municipality of Anchorage (MOA) and the State of Alaska Department of Transportation and Public Facilities (ADOT&PF, submitted in a separate report) to inventory and designate arterial and residential streets and large public parking lots within the Anchorage Municipal Separate Storm Sewer System (MS4) for sweeping maintenance; to record and report sweeping performed along these systems on an annual basis; and to annually assess these sweeping practices relative to minimization of pollutant discharges from these systems into receiving waters. Specifically, permittees are required to submit:

- Sweeping maps: Each year permittees must submit maps of the streets and parking lots that have been designated for sweeping that year and their proposed sweeping frequency relative to the frequencies specified in this permit. Permittees must also designate those streets that they deem 'technically infeasible' for sweeping.

- Sweeping records: Permittees must submit annual records of the sweeping practices used, and the curb miles and volumes of materials swept, and other relevant qualitative information such as 'visually clean' evaluation, for streets and large public parking lots organized by sweeping event, and sweeping frequency class. Analyses of particle size distributions for samples representative of swept materials must also be submitted.

- Sweeping assessment: Permittees must annually prepare an assessment on the basis of submitted sweeping records of the effectiveness of MS4 sweeping completed that year in minimizing pollutant discharges to storm drains and receiving waters.

The permittees have completed and compiled these inventories, records and assessments and submit summaries of these data and findings in this report in compliance with this permit part. The report is organized into five major sections. Section 1.0 summarizes the purpose of this report. Section 2.0 identifies 2019 swept streets and large public parking lots as well as those streets designated infeasible for sweeping. Section 3.0 summarizes sweeping records for 2019. Section 4.0 summarizes an assessment of the permittees' sweeping effectiveness for this year. Section 5.0 includes maps and additional summary tables described in Sections 2.0 through 4.0.

2. Streets and Parking Lots Designated for Sweeping

Permit Part 3.4.5.1 requires permittees to map all streets and large public parking lots to be swept in the coming year and designate their assigned sweeping frequency relative to permit requirements. Additionally, Part 3.4.5.3 requires that permittees designate streets that are technically infeasible for sweeping, specify why, and document other trash/litter control techniques to minimize pollutant discharges to the MS4 and receiving waters. Finally, Part 3.4.5.4.1 requires that permittees annually "identify any significant changes" in mapping of "residential, arterial, and public parking lots" subject to regular sweeping under the permit. The following section summarizes this information. Section 2.1 identifies types of streets deemed technically infeasible for sweeping by the permittees. Section 2.2 identifies streets designated for sweeping within each of the permittees' jurisdictions. Section 2.3 identifies the public parking lots designated as large and swept by the permittees. Any changes in swept features and the basis for those changes are summarized in Sections 2.2 and 5.2.4.

2.1. Technical Feasibility for Sweeping

The permittees specify the technical infeasibility of regularly sweeping a street based on two factors: surface type and cases where the combined character of speed, access and drainage type make regular sweeping unnecessary, disruptive, and/or dangerous.

Unpaved road surfaces are not technically feasible for sweeping. Such surfaces include dirt and gravel roads and also the roads that have been treated with applications of chemicals, asphaltic, or other mixtures to create a smooth, temporarily hardened surface. Treatment typically results in only a short-term hardening of the road surface with a primary intent of smoothing the road surface for traffic over the summer season. However, the treatment also serves to temporarily bind particles to reduce dust and erosion. Sweeping can speed deterioration of these surfaces and increase mobilization of fines during runoff. Therefore, these roads are not swept but may be periodically re-graded or re-treated to reduce erosion and dust generation.

High-speed, high-traffic roadways (freeways and expressways), where access is limited and drainage is provided by open channels on both sides of the road, are also not regularly swept. Regular sweeping along these street segments is considered both technically infeasible and unnecessary. Regular sweeping is technically infeasible along these roadway segments because of the speed and volume of the traffic. Regular sweeping activity along these segments would present unpredictable danger to traffic as a slow-speed obstruction. It would also limit, for prolonged periods of time, the utility of these roadways as high-speed throughways. From a more practical standpoint, regular sweeping along these segments is also generally unnecessary. Winter traction sand applications along these segments is less frequently done, significantly reducing sediment loading on the roadway. The sediment that does accumulate is rapidly removed by high-speed traffic along these segments. Wind and wheel energy generated by traffic very effectively move particulates off the paved surface and onto vegetated shoulder and median areas where these materials are collected on a seasonal or as-needed basis during shoulder maintenance.

2.2. Designated Streets for 2019 Sweeping

Permittees are required to identify and map all streets designated for sweeping and provide maps of streets swept in an annual report of these activities (3.4.5.4.1). Any changes in swept features and the basis for those changes must also be summarized. Sweeping for different parts of the Anchorage MS4 is performed by different operators, based on the jurisdictions of the MS4 owners (ADOT&PF and MOA) and the maintenance authorities assigned to different operators by the owners. Initial maps of Anchorage MS4 streets and large public parking were compiled and submitted in the permittees' document 'Street Sweeping Management Plan: Anchorage MS4, May 2016', Appendix A (hereinafter, MS4 Sweeping Plan or Sweeping Management Plan).

Through various means, MOA and ADOT&PF assign maintenance administrative authorities for the Anchorage MS4 to different agencies. Each maintenance administrative agency is assigned a specific geographic area covering different portions of the Anchorage MS4. ADOT&PF assigns maintenance authority for its entire Anchorage MS4 jurisdiction to its Maintenance & Operations Division, Central Region (ADOT&PF). MOA assigns maintenance authorities for various portions of its MS4 jurisdiction to different roads and drainage 'service areas', or to particular segments of streets and roads, through Municipal administrative and Assembly-codified authorizations. The primary maintenance administrative authorities (maintenance operators) for the Anchorage MS4 facilities regulated under 3.4.5 include:

- The MOA Public Works Maintenance & Operations Division (ARDSA)
- The MOA Chugiak Eagle River Rural Road Service Area (CBERRRSA)
- The MOA Public Works Administration Division (PWA)
- The MOA Anchorage School District (ASD)
- The MOA Parks and Recreation Department (Parks).

Individual maintenance administrative authorities may further divide their assigned regions into smaller operational areas. Each maintenance authority also designates streets within its region for sweeping (based on guidelines provided by the MS4 owners and as required by the MS4 storm water permit). Operational areas are shown in Figure 5-1 and streets that were designated for sweeping in 2019 are shown in Figures 5-2 through 5-9 in Section 5.1 for each of the primary maintenance administrative agencies for the Anchorage MS4.

Changes in mapping of streets designated for sweeping have been made during the 2019 reporting period reflecting changes in features swept. Changes in streets swept are tabulated in Table 5-8 in Section 5.2.4 and are summarized below.

In 2019 ARDSA reported no changes to their inventory of streets designated for sweeping from the 2018 reporting period.

CBERRRSA reported adding 16 new street segments to their street inventory in 2019, all of which were of the open channel drainage type and were swept using mechanical kick broom sweepers in 2019. These newly added street segments will remain on CBERRRSA's sweep inventory for future years.

Any changes to ADOT&PF management practices or streets designated for sweeping for the 2019 reporting period will be addressed in a separate ADOT&PF sweeping report (Appendix E-2).

2.3. Designated Large Public Parking Lots

Section 3.4.5 specifies that permittees must identify and designate large parking lots for sweeping that serve schools, cultural facilities, plazas, sports and event venues and similar facilities. The permittees have interpreted a large public parking lot to be any such lot that has a total exposed parking footprint of 2 acres or larger within a single parcel or a complex of closely associated parcels (see the Anchorage MS4 Sweeping Plan, p. 5).

MOA identified 62 large public lots meeting these criteria. Maps showing location of these lots are included as Appendix C in the MS4 Sweeping Plan. The designated MOA large public parking lots serve 51 schools, 9 parks, one cultural facility and one events venue. The median size of all 62 designated MOA large public parking lots is 2.5 acres. The largest lot is approximately 13.3 acres in size, with only four lots 10 acres or larger in size. Four of the designated lots are between 5 and 10 acres in size, 15 lots are 3 to 5 acres in size, and 39 lots are 2 to 3 acres in size. No changes were made to the large parking lot sweeping list for 2019. Table 2-1 below lists all large public parking lots currently identified by the permittees.

Table 2-1 Large Public Parking Lots (MOA)

Name	Type	Area, ft^2
Hilltop Ski Area	Park	88000
Ravenwood Elementary	School	89075
Girdwood K-8 School	School	89969
Davis Park	Park	90000
Muldoon Elementary	School	92049
Turnagain Elementary	School	93900
Susitna Elementary	School	94200
Harry J. McDonald Memorial Center	Park	95000
Mountain View Elementary	School	95101
Huffman Elementary	School	95228
Ruth Arcand Park	Park	96000
Rogers Park Elementary	School	96305
Polaris K-12 School	School	97293
Wonder Park Elementary	School	97567
Williwaw Elementary	School	97956
O'Malley Elementary	School	98189
Bear Valley Elementary	School	98474
Rabbit Creek Elementary	School	99865
Far North Bicentennial/ Hillside Park	Park	100500
Mears Middle School	School	102000
Alpenglow Elementary	School	102825
Trailside Elementary	School	103834
Campbell Elementary	School	104000
Eagle River Lion's Club	Park	104000

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Name	Type	Area, ft^2
Gladys Wood Elementary	School	104344
Bowman Elementary	School	106000
Spring Hill Elementary	School	106000
Lake Otis Elementary	School	106173
North Star Elementary	School	106780
Bayshore Elementary	School	106792
Northern Lights ABC School	School	108974
Albrecht Field	Park	113300
Lake Hood Elementary	School	114600
Central Middle School/Chugach Optional Elementary	School	116792
Northwood ABC Elementary	School	118491
Birchwood ABC Elementary	School	119236
Kasuun Elementary	School	119441
Tyson Elementary	School	120690
Willow Crest Elementary	School	124285
Russian Jack Elementary	School	128685
South Anchorage Sports Park	Park	140000
Chugiak Elementary	School	140875
Loussac Library	Cultural	141000
King Career Center	School	144663
Kincaid Park	Park	145000
Gruening Middle School	School	150000
Kincaid Elementary	School	152789
Clark Middle School	School	168224
Hanshew Middle School	School	169175
Romig Middle/ West High Schools	School	176826
Begich Middle School	School	177442
Wendler Middle School	School	193293
Goldenview Middle School	School	201993
Mirror Lake Middle School	School	203260
Eagle River High School	School	275595
Chugiak High School	School	325000
South High School	School	340669
Bartlett High School	School	412961
Sullivan/Boeke Arenas	Events	457000
East High School	School	459000
Service High School	School	473795
Dimond High School/Chinook Elementary	School	580883

3. 2019 Sweeping Performance Reports

Permit Part 3.4.5.4 requires permittees to report sweeping performance annually in terms of specific factors and to assess sweeping effectiveness in minimizing discharge of pollutants to storm drains and creeks based on those factors. Sweeping performance reports must at minimum identify and map the actual streets that were swept in the reporting year. In addition, permittees must compile and report specific sweeping performance factors including:

- Sweeping practices used,
- Dates of sweep,
- Volume or weight of swept materials, and
- Particle size distributions of representative swept materials.

The permit specifies that sweeping performance information is to be organized and reported, in some respect, by date and sweeping 'frequency category' (defined in the permit as Arterial or Residential streets, and Parking). However, whatever the exact organizational structure elected by the permittees for the performance report information, all these factors are specifically to be used in assessing the effectiveness of MS4 sweeping on limiting discharge of pollutants to the MS4 and receiving waters. This section summarizes sweeping performance records sorted by maintenance agency for both streets (Subsection 3.1) and parking (Subsection 3.2). Subsection 3.3 describes particle size distributions for swept street materials and residuals collected during and after the 2018 sweep periods. In Section 4, we use these performance records, along with other information, to assess effectiveness of the 2019 MS4 sweeping program.

3.1. Street Sweeping Performance Reports for 2019

The permittees have organized their sweeping performance data to reflect both significant differences in drainage types across the MS4 and variations in street sediment loading between those drainage types to the extent practicable. As described in their MS4 Sweeping Plan, the permittees may use different sweeping practices for streets having curb and gutter (CG) drainage as opposed to those having open channel (OC) or ditch drainage. For streets with curb and gutter drainages, sediments are concentrated along the gutter pan and readily available for mobilization in wash-off events. For these streets, swept materials are always collected during sweeping, and the removed volumes can be readily inventoried. Conversely, sediments from streets with open channel drainages tend to become concentrated onto the adjacent vegetated shoulders where runoff events are much less likely to mobilize them. Along these streets common sweeping practices are ones that 'kick' the sediments left on the street pavement onto the same vegetated shoulder (to be removed later during shoulder maintenance and ditch 'dressing'). As a result, inventories of the volumes of sediment swept from a portion of open channel street segments are usually not available, at least not as part of sweeping performance records.

Given these practices, reporting sweeping information for curb miles alone, is problematic. Reporting only those streets having 'curb miles' (i.e., curb and gutter type streets) as specified in the permit would obviously bias measurement of total Anchorage MS4 sweeping performance. Similarly, using total street miles when assessing the total volume of swept materials will bias loading and efficiency estimates when the only swept

sediment volumes recorded are for curb and gutter streets but open channel street miles are included in the analysis. Finally, potential for biasing analysis is even further compounded considering differences in sediment loading between drainage types (and sweeping frequency categories).

To control for these sweeping practices and characteristics, sweeping performance information for Anchorage MS4 streets is collected and sorted by a number of factors. These include sweeping frequency type, the MS4 maintenance operator, and the sweeping event (determined by the sweeping completion date range; spring, summer, fall). Sweeping frequency types include 'arterial' and 'residential' categories as already described in the permittees MS4 Sweeping Plan.

Sweeping performance information reported for the Anchorage MS4 includes total swept volumes (in cubic yards) referenced to "Street Miles", "Curb Miles", and/or "Pick Up Miles". "Street Miles" for all designated swept streets are included in this performance report and are calculated as the total centerline lengths of swept street segments. Where a "kick" type of sweeping practice is used along open channel roads (i.e., swept sediments are not collected), total swept volume will not be known and Street Miles is the only sweeping information reported. Any estimate of swept volumes for these streets must be calculated using the swept mileage and an estimate of street sediment loading present at the time of the sweeping event for the particular sweeping frequency category (arterial or residential). Because sweep practices that collect swept material (i.e., swept volumes are inventoried) are used on both curb and gutter and open channel drainage type roads, the term "Pick Up Miles" is more appropriate and used in place "Curb Miles" for this report. Pick Up Miles optimally represent the total actual length of road shoulder swept, for the case of open channel road segments, and the actual length of curbed drainage swept, for curb and gutter road segments. Where this is not known, Pick Up Miles are estimated as twice the length of the swept streets centerline along which the sediments are collected. Where possible, the Anchorage MS4 sweeping performance report also includes an estimate of the unit swept volume (cubic yards per Pick Up Mile) for each combination of frequency type and drainage type.

2019 sweeping performance records for the principle Anchorage MS4 street maintenance operators (ARDSA and CBERRRSA) are summarized for all three sweeping events in Table 3-1 below. Note that the two tandem sweeps required for arterial frequency category streets are summarized under the single spring event shown. Operational areas for these maintenance operators are as described in Section 2.2 and shown in Figure 5-1. More detailed sweeping summary tables are included in Section 5.2, including all required permit reporting elements. Note: details specific to ADOT&PF sweeping and performance can be found in Appendix E-2 of the 2019 APDES report.

In general in 2019 all Anchorage MS4 operators completed sweeping of designated streets in accordance with permit requirements using the various practices as described in the previously published MS4 Sweeping Management Plan (see detailed records for each operator in Section 5.2).

Table 3-1 Anchorage MS4 Sweeping Summary, 2019

Spring 2019

	EPA Category	Drainage Type	Street Miles	PickUp Miles	Total Volume* (cyds)	Unit Volume* (cyds/mile)
ARDSA	Arterial	Mixed	45.8	91.6	1382.0	15.1
	Residential	Mixed	580.6	1161.3	1911.0	1.6
CBERRRSA	Residential	OC	117.1	215.0	1311.0	6.1
		CG	40.4	80.8	855.0	10.6
		Mixed	47.9	96.3	390.0	4.1
		Total	205.4	392.0	2556.0	6.5

Summer 2019

	EPA Category	Drainage Type	Street Miles	PickUp Miles	Total Volume* (cyds)	Unit Volume* (cyds/mile)
ARDSA	Arterial	Mixed	45.8	91.6	35.0	0.4
	Residential	Mixed	580.6	*	No Data Reported	*
CBERRRSA	Residential	OC	136.0	7.1	9.0	1.3
		CG	38.4	0.0	0.0	
		Mixed	31.9	5.7	6.0	1.1
		Total	206.3	12.8	15.0	1.2

*ARDSA and CBERRRSA Residential roads were swept on an "as-needed" basis to maintain a "visually clean" standard during the summer sweep period

Fall 2019

	EPA Category	Drainage Type	Street Miles	PickUp Miles	Total Volume* (cyds)	Unit Volume* (cyds/mile)
ARDSA	Arterial	Mixed	45.8	91.6	52.0	0.6
	Residential	Mixed	580.6	1161.3	700.0	0.6
CBERRRSA	Residential	OC	83.8	165.8	198.0	1.2
		CG	12.8	25.5	36.0	1.4
		Mixed	105.3	210.9	159.0	0.8
		Total	201.8	402.2	393.0	1.0

* Volumes represent only swept materials collected along reported/estimated Curb/PickUp Miles
OC = Open Channel Drainage
CG = Curb and Gutter Drainage

For 2019, CBERRRSA reported 100% completeness for the spring and fall sweep periods according to the procedures described in the Street Sweeping Management Plan, with no reported road segments or operational areas falling below permit requirements.

For the 2019 summer sweep period, CBERRRSA reported that roads were swept "as needed" (as prescribed in the MS4 Sweeping Management Plan) and reported collecting a total of 15 cubic yards of swept material for ~12.7 pick up miles of mixed drainage type. CBERRRSA reported their roads typically required 6 passes for those roads swept with kick brooms, and 5 to 6 passes with a tandem sweeper configuration for roads where swept material is collected and disposed of. All roads were swept until they were deemed 'visually clean' by a CBERRRSA supervisor, including additional passes with the sweeper train if necessary to meet the standard. Supervisors took before and after sweeping photos on certain roads to further qualify their 'visually clean' assessment. CBERRRSA also reported conducting additional spot sweeps as necessary after the fall sweep period to deal with fallen leaves and other organics.

ARDSA reported a sweeping completeness of 100% for designated streets within its administrative authority for all sweep periods in 2019. All ARDSA roads were swept according to the procedures described in the Street Sweeping Management Plan and were inspected by ARDSA supervisors to ensure they were deemed "visually clean" before being marked off as "swept" for each sweep period. ARDSA reported an average of 4 passes with two tandem trains for arterial type roads for the spring sweep period and an average of two passes for residential roads in the spring and all roads types for the summer and fall sweep periods. Additional passes were performed as necessary to maintain the "visually clean" standard and were usually focused hills and heavily trafficked intersections were sediment was more heavily applied in the winter. ARDSA also reported doing additional spot sweeps (beyond what is described in the MS4 Sweeping Management Plan) for excess leaves and organics, as necessary, during the fall sweep period. These additional spot sweep efforts were identified in the report "Anchorage Street Sweeping and Storm Water Controls: 2013 Performance Evaluation" (Appendix E-2 of the 2013 APDES report) as a suggested means to accomplish the post-sweep sediment load goals identified in the report, and were incorporated into the permittees most recent MS4 Sweeping Management Plan version.

In 2019, operators for the Girdwood Service Area (GSA) reported a total of 113 cubic yards of sediment collected for all sweeping operations in 2019. GSA sweeps 2.3 miles of curb and gutter drainage type streets and 1.6 miles of open channel drainage streets using a tandem pick up broom configuration consisting of at least one mechanical sweeper and one vacuum sweeper. GSA also sweeps 3 miles of open channel drainage streets and 3.5 miles of bike trails using kick brooms. GSA's sweeping contract requires at least 4 passes per sweep, with additional passes as needed until the road surface is clean. All roads within GSA jurisdiction are of the residential category.

3.2. Parking Lot Sweeping Performance Report for 2019

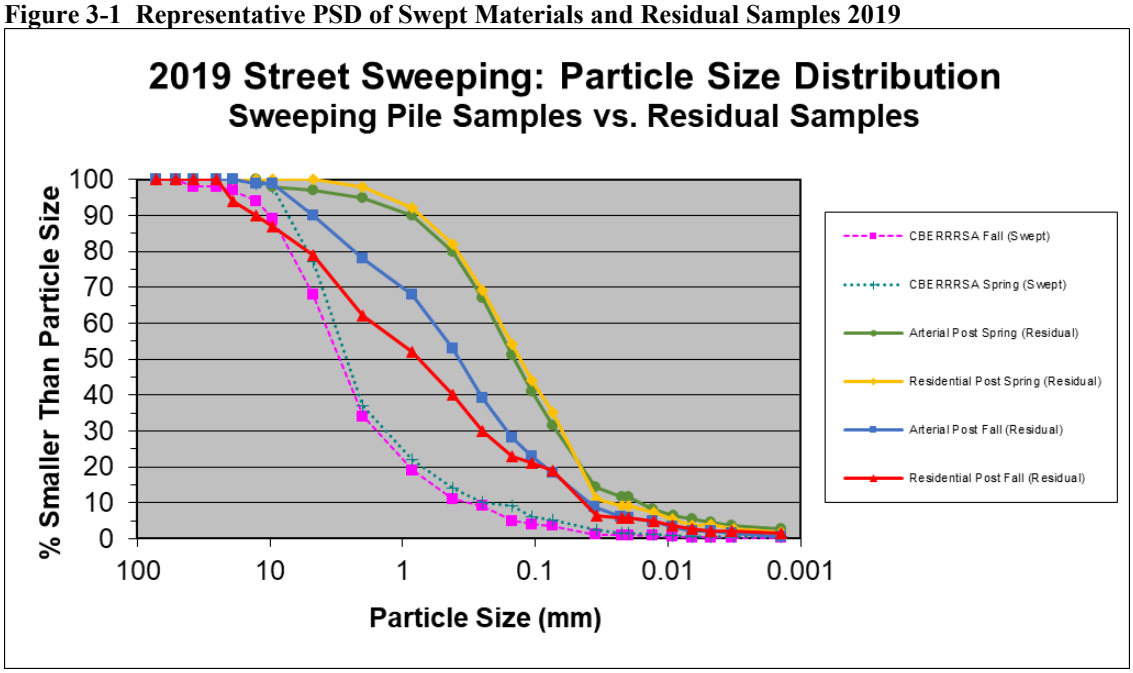
Sweeping performance was reported by the Anchorage School District for all 51 public schools on the large public parking lot list as designated in Section 2.3, for a completion of 100%. No changes in number of swept school parking lots was submitted. Reported total swept volumes for individual parking lots ranged from 4 to 44 cubic yards per lot, for a total of 852 cubic yards collected during 2018 sweeping efforts (roughly 4.5 cubic yards per acre of parking lot area for the year). Detailed sweeping reports for the large

school parking lots are included in Section 5.2. No other reports were submitted for sweeping performed in 2019 for the other large public parking lots as listed in Table 2-1.

3.3. Particle Size Distributions for Swept Materials

Permit requirements in section 3.4.5.4.2 require that particle size distribution be evaluated for a representative sample of swept materials. Representative samples of swept street materials (no samples were available from parking lots) were collected by subsampling temporary sweeping storage piles built up by MS4 operators and the samples were then submitted to a certified laboratory for analysis. Particle size distributions representative of samples collected during 2019 sweeping events are included in Figure 3-1 below.

Figure 3-1 Representative PSD of Swept Materials and Residual Samples 2019



In 2010 and 2011, samples were collected from street surfaces before and after each sweeping event, in order to compare pre- and post-sweep street conditions. In 2013, samples were collected from street surfaces after spring and summer sweeps in order to further analyze and quantify post-sweep residual loading. Analysis of data suggests reduced sweeping practices efficiency in removing the mid-range fine particles—from about 75 to 1000 microns. Available data for estimation of sweeping efficiencies for very fine particles (finer than 75 micron) does suggest that current sweeping practices may have limited competency at removing particles smaller than 75 microns. In 2019, a select number of roads were sampled after they were deemed 'visually clean' for the spring and summer sweep periods, as per the Street Sweep Monitoring Plan, in order to help assess residual dirt amounts and overall sweeping practice efficiency. The results and conclusions of these sampling efforts are contained in Sections 4-1 and 4-3.

Figure 3-1 includes particle size distributions (PSDs) of samples collected from temporary storage piles generated from street sweeping in 2019 (curves labeled as

"Swept") as well as PSDs for post-sweep samples collected from street surfaces in 2019 (curves labeled as "Residual"). Particle size distributions for 2019 swept materials, collected from street sweeping temporary storage piles, show similar data ranges as previously tested samples. In 2019, samples were taken from CBERRRSA's sweeping piles for both the spring and fall sweep periods. Dirt from both piles showed a very similar particle size distribution, with dirt from the fall sweep pile containing a slightly higher proportion of coarse grained materials. Dirt from CBERRRSA's 2019 spring pile had less coarse to very coarse (particle size 1-10mm) content than in 2018, but both samples showed a very similar particle size distribution of medium to fine grained material.

In 2019 post-sweep samples were taken after the spring and fall sweep periods. Post spring sweep sampling showed a similar particle size distribution to past sampling, and again suggests that spring sweeping is very efficient at removing coarse grained (<10% total sample) and very fine grained materials, but not as efficient in removing the mid-range fine particles—from about 75 to 1000 microns. Analysis of the post fall sweep samples was less conclusive due to wind and rain storms that immediately followed the fall sweep causing a delay to post sweep sampling and blowing/washing additional organic material into the sample locations. Particle sizes distributions for the post fall sweep samples showed a higher coarse and medium grained content than both post spring and post summer sweep sampling preformed in previous year, which is likely due to the additional organics present during the 2019 sampling (post fall residential samples contained 30-64% organics by weight).

4. 2019 Sweeping Performance Assessment

Sweeping effectiveness and performance were analyzed in the 2013 report "Anchorage Street Sweeping and Storm Water Controls: 2013 Performance Evaluation", and recommendations to increase effectiveness and performance from the report were incorporated into the permittee's Street Sweeping Management Plan. APDES permit part 3.4.5.4 requires the permittees to "perform annual assessments of street sweeping effectiveness to minimize pollutant discharges to storm drains and creeks" on the basis of the performance factors required to be reported under the permit. To help in this assessment, the permittees completed additional sampling of street sweeping activities in 2010, 2011, 2013, 2016, 2017, 2018, & 2019, and reviewed sampling efforts and studies performed under earlier Anchorage MS4 permit terms and in other areas nationwide. Section 4.1 summarizes these additional efforts relative to the permittee's 2019 street sweeping performance. Section 4.2 provides a comparison of unit loads (cubic yards per pick up mile and pounds per pick up mile) for swept dirt for the past three years (2017-2019). Based on both this additional information and current performance reports, Section 4.3 summarizes the effectiveness of the permittees' 2019 sweeping program as required under Part 3.4.5.4.

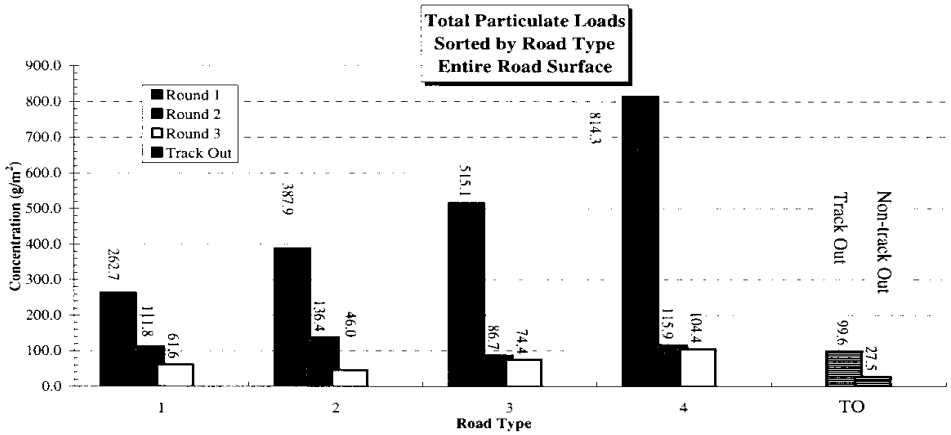
4.1. Summary of Findings from 2019 & Previous Sweeping Assessments

Street sediment loading data collected in 2011, 2013, 2016, 2017, 2019, and 2019, and in previous Anchorage permit terms were used to support assessment of sweeping

effectiveness in 2019 for the Anchorage MS4. These additional data are briefly summarized in this section.

Figure 4-1 Anchorage Street Sediment Loading Data: 1996

Road Type	Sampling Round 1	2	3	TO	All Roads
1	262.7 (7)	111.8 (8)	61.6 (8)		115.9 (23)
2	387.9 (5)	136.4 (6)	46.0 (6)		175.7 (17)
3	515.1 (4)	86.7 (6)	74.4 (5)		136.5 (15)
4	814.3 (4)	115.9 (3)	104.4 (5)		162.3 (12)
Track Out				99.6 (5)	99.6 (5)
Non Track Out				27.5 (5)	27.5 (5)
All Rounds	431.1 (20)	109.5 (23)	65.2 (24)		136.5 (67)



Road type: 1-Residential, 2-Collector, 3-Minor Arterial, 4-Major Arterial; all curb & gutter
Rounds: 1-winter initial load, 2-post spring sweep, 3-mid-summer
From: "MOA Street Sediment Loading Assessment", WMP APr97001, 1997

The permittees have collected significant data characterizing street sediment loading (at similar street strata) and street sweeping performance (at the resolution of overall local practices). Significant street sediment sampling efforts were conducted in 1996 (WMS document WMP APr97001, "MOA Street Sediment Loading Assessment") and again in 2000 (WMS document WMP APr00003, "Street Sediments and Adsorbed Pollutants") during the permittees' first permit term. Later analyses of these data by the permittees specifically addressed street sediment buildup rates and effectiveness of Anchorage street sweeping performance (WMS document WMP APr02002, 2002, "Anchorage OGS and Street Sweeping as Storm Water Controls"). Sampling in all earlier studies was performed only along curb and gutter type drainages and no data was collected for open channel roads. Nevertheless, data for curb and gutter drainage types was thorough and no significant changes have been made in application rates or practices for street sanding since these studies were completed. The sediment loading results reported in the 1996 study is summarized in Figure 4-1. Street sediment loading values in pounds per pick up mile can be approximated by multiplying the gm/m^2 values in Figure 4-1 by 51.2 for residential and collector streets and 77.7 for arterial streets.

The Watershed Management Services section of the Municipality performed additional sampling during 2010 and 2011 to supplement the earlier street sediment loading data and to complement the detailed sweeping performance data collected by the MS4

maintenance operators. Sampling program goals were to approximately quantify sweeping efficiencies and sediment buildup rates between scheduled sweeping events. The sampling strategy applied was to characterize the initial street sediment loading conditions prior to any seasonal sweeping and then estimate sediment loads remaining after each of the seasonal sweeps (relative to each of the major road and drainage type categories).

To achieve this, during the 2010 and 2011 sweeping season, WMS sampled transects across select MS4 streets at a total of 118 stations. The stations were selected to broadly represent street frequency category and drainage types (arterial open channel, arterial curb & gutter, collector open channel, collector curb & gutter, residential open channel and residential curb & gutter) from the jurisdictions of all the Anchorage MS4 maintenance operators.

At each station, WMS swept transects 1.5 feet wide across the paved road and gutter/paved shoulder surfaces from centerline, or median curb, to outside curb or edge of paved shoulder, (i.e., one-half of the full curb-to-curb road width at the station) and collected and bagged the materials for later analysis. A systematic photographic record was also made of conditions at each site. Sampling was scheduled at each station immediately prior to initial spring sweeping (to capture the entire winter sediment load remaining on the street after breakup), and then shortly after each of the spring, summer and fall sweep events to measure the sediment load remaining on the street surfaces after sweeping had been completed (based on volumetric analysis of mineral and organic content).

Sampling was performed under dry conditions, to the extent possible, to minimize water content of the collected transect samples. Street sediment samples collected from each swept transect were analyzed by transferring the sample to a graduated cylinder, consolidating the sample by lightly tapping the cylinder, and measuring the total sample volume, in milliliters. After the initial volumetric measurement was made, samples were gently shaken in the cylinder to promote gravimetric separation of any fibrous organics from mineral constituents. Measurements were then made of the volumes of separated fractions of organic and mineral materials. Select samples and composited samples of collected street sediments were also submitted for laboratory testing for coarse- and fine-grain particle size distribution and organic content (by ignition). All results were tabulated and digitally archived.

Quality control review of all data suggests a reasonably comparable, complete, and representative data set was obtained. However, sample populations were small for some street categories, weakening inferences drawn from analyses of a fraction of the collected data. Specifically, small sample populations for some street and drainage categories resulted from a variation in sample collection protocols for these streets. As a result, some of the total sample counts (‘n’) were significantly reduced for some event/categories (Table 4-1). Specifically, the arterial curb and gutter category for all events is represented by a small sample population count of 7. As a result of the low sample counts, the arterial curb and gutter data may not be adequate to resolve the normal

character of street sediment for this street category. Otherwise, sample populations for all other sweeping event/street categories are considered adequate to provide reasonably representative information at the exploratory level of this investigation.

Summary statistics of the sampling results are tabulated in Table 4-1 below. Original WMS street dirt sampling data is in units of milliliters per 1.5 foot transect sample collected across one-half the curb-to-curb road width at the sample station. However, for ease of comparison to the permittees' street sweeping performance statistics (Section 3) these measurements have been normalized to a 'unit load' in the table in terms of pounds per pick up mile. Normalization was done by assuming a porosity for the samples of 0.26 and a specific gravity for the solid materials of 2.67, and then adjusting for the sampled transect area using the following formulas:

(**mL sample/1.5' transect**)(0.74)(2.67gm/cm^3)(cm^3/ml)(1lb/454gm) = **lbs sample/1.5' transect**

$\triangleright$ (**lbs sample/1.5' transect**)(5280'/pick up mile) $\cong$ **lbs/pick up mile**

Similarly, cubic yards/pick up mile as reported in the performance summary in the preceding section can be approximately converted to pounds per pick up mile, correcting for voids and neglecting the weight of any water content, as follows:

(**cyd/pick up mile**)(27ft^3/1cyd)(2.67)(0.74)(62.4lbs/ft^3) = **lbs/pick up mile**.

Table 4-1 2011 Street Sediment Loading Sampling Results

			Spring Pre-Sweep	Spring Post-Sweep	Summer Post-Sweep	Fall Post-Sweep
		Unit Load	*Lbs/pu mile*	*Lbs/pu mile*	*Lbs/pu mile*	*Lbs/pu mile*
ARTERIAL	**OC**	*Min*	704	168	0	0
		Max	37531	5361	1348	2420
		Median	13021	2022	352	827
		n	23	23	19	23
	C&G	*Min*	2052	337	459	337
		Max	51900	6280	7812	7353
		Median	8885	995	1470	1876
		n	7	8	8	8
		Unit Load	*Lbs/pu mile*	*Lbs/pu mile*	*Lbs/pu mile*	*Lbs/pu mile*
COLLECTOR	**OC**	*Min*	612	0	0	0
		Max	15012	827	1011	1271
		Median	7582	444	260	321
		n	16	16	16	16
	C&G	*Min*	2757	367	0	0
		Max	24510	2634	2144	1041
		Median	9421	1087	467	390
		n	*18*	24	24	24
		Unit Load	*Lbs/pu mile*	*Lbs/pu mile*	*Lbs/pu mile*	*Lbs/pu mile*
RESIDENTIAL	**OC**	*Min*	0	0	0	0
		Max	17463	2022	2236	1654
		Median	2451	781	643	474
		n	*24*	24	24	24
	C&G	*Min*	2068	0	0	122
		Max	16544	3768	3829	1960
		Median	5821	1041	919	643
		n	*21*	21	21	21

Sampling units – ml sediment/(1.5' wide transect)(½ width curb-to-curb); Unit load – pounds/pu mile; n – sample count

Note that the sediment load per pick up miles presented here is generally as described earlier, representing the total sediment present along a road segment, relative to the total length of curb or paved shoulder present along that road segment. For our sampling we make the assumption that the total length of curb or paved shoulder along our sampled roads is twice the length of the road (i.e., only two curbs are present along the road). Also note that the term "pick up mile" in our sampling is used as a generic term to refer to both Curb Miles and Pick Up Miles defined earlier for curb and gutter and open channel drainage types, respectively. Finally note that we have not controlled for pavement width (for example, the number of traffic lanes, parking lanes, turn-out lanes, median lanes, etc.) except for that that is inherent in the sweeping frequency categories used (arterial or residential). However, at the scale of this analysis (area wide and at two levels of traffic load), we believe these data to be usefully representative.

In 2013, sampling of street sediment was again conducted to estimate sediment loading and the character of particulates on Anchorage streets, relative to street sweeping practices. Ten 300-500ft long arterial stations and fifteen 300ft long residential stations were selected from amongst swept streets in the Anchorage Bowl. Stations were divided up into 1ft transect intervals and ten 0.5ft transects along each station were selected at random for sampling. At each transect street sediment samples were collected, from centerline to curb (half the total curb to curb width), using a high velocity backpack mounted vacuum with a custom nozzle modified to collect material from a 0.5ft swath. Sample materials collected were labeled and bagged and transported to a local certified material testing laboratory to be dried and weighed. Using the laboratory data, unit loading (grams/meter^2) and liner loading (pounds/full width curb mile) were then calculated. Arterial stations were sampled 3 times and residential stations were sampled 4 times throughout the 2013 sweep season, with transects selected at random for each event.

Results of the 2013 sampling efforts showed median values for 2013 post-sweep loadings were approximately 2300 lbs/full width curb mile for residential streets and 4100 lbs/full width curb mile for arterial streets (total sediment load across entire curb to curb width for one linear mile of road surface). In terms of the post-sweep loading units more commonly used in this and previous sweeping reports, this equates to 1150 lbs/pick up mile for residential streets and 2050 lbs/pick up mile for arterial streets. Results of the 2013 sampling also suggest that the vast majority of sediment is concentrated along the curb and within the first 4ft of roadway adjacent to the curb. For more information regarding the 2013 sampling program and results please see WMS document WMP Apr14001, “Anchorage Street Sweeping and Storm Water Controls: 2013 Performance Evaluation” (Appendix E-2 of the 2013 APDES report).

In 2016-2019 sampling of post-sweep residual sediment was conducted according to the procedures described in the MS4 Sweeping Monitoring Plan. Four streets (2 arterial and 2 residential) were selected and 10 transects for each sampling event (post-spring and post-summer) were marked, evenly distributed along 200ft of each street. At each transect location residual sediment samples were collected and composited for lab analysis of weight, volume, and particle size distribution. Streets were sampled as soon as was practical after the streets had received their final spring and summer passes and were deemed “visually clean” for the respective sweep period. Samples for each street and sweep period were transported to a local soil lab to be measured for dry weight and uncompacted volume. The samples were then combined for like sweep periods and street categories, and the resulting composite samples were analyzed for particle size distribution utilizing ASTM D422. PSD results from residual samples can be seen plotted with PSD results from swept material samples in Figure 3-1.

Table 4-2 Street Sweep Residual Sampling Averages

Sweep Period and Category	2013 Residual[1] (lbs/pu mile)	2013 Proposed (lbs/pu mile)	2018 Residual[2] (lbs/pu mile)	2019 Residual[2] (lbs/pu mile)
Post Spring Arterial	2238	313	497	257
Post Spring Residential	1189	252	231	520
Post Fall Arterial	791	175	399	216
Post Fall Residential	925	185	145	456*
[1]values from Table 3, *Anchorage Street Sweeping and Strom Water Controls: 2013 Performance Evaluation*				
[2]values from2018 & 2019 residual sampling				
*Post Fall Residential samples contained 30-64% organics by weight				

Results of the 2019 sampling efforts showed average post spring sweep loading rates of 257 lbs/pick up mile for arterial streets and 520 lbs/pick up mile for residential streets. Average post fall sweep loading rates were 216 lbs/pick up mile for arterial streets and 456 lbs/pick up mile for residential streets. Table 4-2 shows post sweep loading rate results from the 2013, 2018, and 2019 sampling efforts, as well as the proposed goals for post sweep loading presented in the Anchorage Street Sweeping and Storm Water Controls: 2013 Performance Evaluation document. 2019 data showed lower residual loads for arterial type streets and higher residual loads for residential type streets than in 2018. All 2019 residual load values were below 2013 values for all categories and one category (Post Spring Residential) loading rates were below target goals proposed in 2013. It should be noted that fall wind and rain storms immediately following the 2019 fall sweep and prior to sampling, likely biased the post fall residual rates higher than would have been reflected had sampling taken place prior to the storms. Lab results showed that the post fall residential samples contained 30-64% organics by weight.

4.2. Unit Load Comparison 2017-2019

Swept volume data, collected over the past three years, have been analyzed and, where possible, have been converted to unit load values (cubic yards/pick up mile), to give a measure of what volume of dirt is being swept up per pick up mile for each different operator, sweep frequency category, and drainage type. Cubic yards per pick up mile can be converted to pounds per pick up mile using the formula described in Section 4.1. Table 4-3 shows unit load in cubic yards per pick up mile for the spring, summer, and fall sweep periods for 2017, 2018, and 2019.

Table 4-3 2017-2019 Unit Load Comparison

Unit Load Comparison 2017-2019 (cubic yards/pickup mile)					
Spring			Spring 2019	Spring 2018	Spring 2017
Operator	EPACategory	DrainageType	UnitVolume(cyds/mile)	UnitVolume(cyds/mile)	UnitVolume(cyds/mile)
ARDSA	Arterial	Mixed	15.1	21.0	19.7
	Residential	Mixed	1.6	1.9	1.6
CBERRRSA	Residential	OC	6.1	6.4	4.7
		C&G	10.6	8.7	7.0
		Mixed	4.1	5.0	2.3
		All	6.5	6.7	4.4
Summer			Summer 2019	Summer 2018	Summer 2017
Operator	EPACategory	DrainageType	UnitVolume(cyds/mile)	UnitVolume(cyds/mile	UnitVolume(cyds/mile)
ARDSA	Arterial	Mixed	0.4	0.4	0.4
	Residential	Mixed	-	-	-
CBERRRSA	Residential	OC	1.3	-	-
		C&G	-	-	-
		Mixed	1.1	-	-
		All	1.2	-	-
Fall			Fall 2019	Fall 2018	Fall 2017
Operator	EPACategory	DrainageType	UnitVolume(cyds/mile)	UnitVolume(cyds/mile	UnitVolume(cyds/mile)
ARDSA	Arterial	Mixed	0.6	0.6	1.1
	Residential	Mixed	0.6	0.6	0.2
CBERRRSA	Residential	OC	1.2	1.2	1.4
		C&G	1.4	1.5	1.3
		Mixed	0.8	0.8	0.6
		All	1	1.0	0.8
Formula: (cyds/pickup mile)*(27ft3/cyd)*(2.67spec.gravity)*(0.74porostiy factor)*(62.4lbs/ft3) = lbs/pickup mile					

For the 2019 spring sweep both ARDSA and CBERRRSA reported lower unit loads for all street types (except CBERRRSA curb & gutter, which was higher) than for the same categories in 2018. ARDSA and CBERRRSA reported unit loads for the summer and fall periods that were nearly the same as in 2018 for all street types and drainage categories, with CBERRRSA fall curb and gutter type unit load falling from 1.5 to 1.4 cubic yards per mile in 2019. Overall variability from year to year and between the different operators and sweep categories is highest for the spring sweep period each year. This is likely due to differences in winter weather from year to year (amount of snow and number of mid-winter freeze/thaw cycles), as well as the different sand and gravel application procedures and products between the different operators. See Appendix E-2 for information regarding DOT sweeping operations and results.

4.3. Sweeping Effectiveness Assessment for 2019

Sweeping effectiveness can be related to potential for receiving water impact by a number of relationships illustrated by this data and other data presented in this report. The spatial relationship of street drainage to receiving waters and to the total sediment load present on those streets is an important factor. Performance records summarized in Section 3.1 along with operation maps included in Section 5 provide insight to the potential for street sediment loads to wash off into Anchorage storm drains and receiving waters based on these spatial relationships. Of the three reporting MS4 operators, ARDSA sweeps the most street miles at approximately 626 miles (~580 miles of residential streets and 46 miles of arterial streets), with CBERRRSA second at 205 street miles (all residential), and ADOT&PF third with about 187 street miles (~100 miles arterial and 86 miles residential). Distribution of these contributing surfaces varies even more significantly between the operators. ADOT&PF and CBERRRSA streets are spread across large geographic areas. For ADOT&PF jurisdiction, streets extend across the entire Municipality and most of its watersheds. Despite its relatively small street inventory, CBERRRSA's operational areas also cross a large number of watersheds. ARDSA's operational area, although including the largest street inventory, is significantly more compact, with the result that ARDSA streets drain across a much smaller number of watersheds than either of the other two primary Anchorage MS4 operators.

Street sweeping operators have instituted new tools and modified existing procedures in order to increase the overall effectiveness of street sweeping operations. Street maintenance supervisors visually inspect the streets after sweeping and certify them as "visually clean" before marking them as done for that sweep period. In some instances, before and after sweeping photos were collected to further qualify the "visually clean" assessment (see Figures 4-2 and 4-3). Both CBERRRSA and ARDSA reported increased "spot" sweeps above and beyond procedures described in the MS4 Sweeping Management Plan in order to meet the "visually clean" standard. These extra sweeps were typically focused on the gutter where the majority of sediment accumulates, and were typically more frequent in the summer and fall sweep periods in order to deal with accumulated organic material. Additional spot sweeps and emphasizing sweeping along the gutter and first 4 feet of street adjacent to the gutter, where the majority of sediment is present, represent changes to sweeping procedures that that were recommended in the report, "Anchorage Street Sweeping and Storm Water Controls: 2013 Performance Evaluation".

Operators also increased public outreach to inform the public of the status of sweeping operations and encourage people to move vehicles parked on the street and other obstructions, in order to maximize the street surfaces available for sweeping. In neighborhoods with less off street parking available, ARDSA increased their use of temporary no parking signs, sweeping east-west oriented streets and north-south oriented streets on different days, which benefitted both sweeping operations and residents. Similarly, both ARDSA and CBERRRSA schedule sweeping operations around trash pickup days to minimize street obstructions. CBERRRSA uses the Eagle River Right of Way department to give notice to residents when sweeping operations are imminent,

encouraging on street parkers to move their vehicles prior to sweeping. ARDSA continues to use and update online mapping to inform residents of day-to-day sweeping operations and track progress, and is continuing to use a program called Nixle to inform residents of sweeping schedules via text message alerts. ARDSA has also started including the 'visually clean' standard into its dealings with construction contractors, requiring that a newly constructed road meet the standard before accepting the road into their inventory. DOT efforts to increase street sweeping effectiveness are detailed in Appendix E-2.

Figure 4-2 2019 'Visually Clean' Photo Example (Post Spring Sweep ARDSA Arterial)

Figure 4-3 2019 'Visually Clean' Photo Example (Post Spring Sweep ARDSA Residential)

Overall, sweeping efficiencies are high for the spring sweep period. These high efficiencies are believed to be due to the high sediment loadings on the street surfaces, representing traction sanding loads accumulated over the entire winter. As a result, spring sweeping efficiencies historically exceed 90 percent. The results of 2013 residual sampling reflected a removal rate of approximately 95% for arterial streets and 70% for residential streets for the 2013 spring sweep period. Results from the 2016 residual sampling reflect a removal rate of approximately 99% for ARDSA arterial roads and 86% for ARDSA residential roads. Results from the 2017 residual sampling reflect a removal rate of approximately 99% for ARDSA arterial roads and 93% for ARDSA residential roads. Results from the 2018 residual sampling reflect a removal rate of approximately 99% for ARDSA arterial roads and 96% for ARDSA residential roads. Results from the 2019 residual sampling reflect a removal rate of 99.5% for ARDSA arterial roads and 90% for ARDSA residential roads. These higher removal rates suggest that changes to sweep practices, including those suggested in the report "Anchorage Street Sweeping and Storm Water Controls: 2013 Performance Evaluation" have increased the overall efficiency of sweeping operations. Residuals loading rates for 2019 were overall much smaller than when they were sampled in 2013, and in one ARDSA category (post spring arterial) was below the goal standards proposed in the "Anchorage Street Sweeping and Storm Water Controls: 2013 Performance Evaluation" (see Table 4-2).

Sweeping efficiencies for later events are somewhat reduced but include sweeping removal rates that still reflect relatively large sediment loads varying from approximately 0.4 to 0.6 cubic yards per pick up mile for arterial streets and 0.6 to 1.4 cubic yards per pick up mile for residential/collector streets for the 2019 summer and fall sweeps. This shows a similar range of variability in late season sediment loads to those in 2018. In fall 2019 ARDSA streets tended to have the lightest concentration sediment on them, producing unit load numbers lower than those of CBERRRSA for all street categories. Previous data showing CBERRRSA to consistently have lowest fall concentrations may be due to differences in the street patterns of the areas maintained by these street maintenance groups. The primary residential area served by CBERRRSA lies in a relatively flat, newer subdivision areas served by lollipop and looped streets linked by a single collector, with adjacent yards having few trees. As a result fewer intersections are present and the need for winter sanding may be significantly reduced. On the other hand, ARDSA and ADOT&PF serve much older and highly urbanized Anchorage areas where streets are laid out on a grid block basis, requiring many more collectors and a larger number of controlled intersections where more sanding may be needed to maintain safe winter trafficking. These older neighborhoods are also well-treed, which may lead to the higher street particulate load typically observed in the fall. Though overall sweeping efficiencies for summer and fall sweep periods are less than those of the spring sweep period, 2019 residual sampling showed a removal rate of approximately 89% for ARDSA arterial streets for the 2019 summer sweep period.

5. 2019 Maps and Data Tables

Section 5 contains maps and detailed data tables supporting summary information and the sweeping assessment presented in Section 2 through 4 above. Section 5.1 contains maps of swept streets and operational areas. Section 5.2 contains detailed sweeping performance records for Anchorage MS4 operators.

5.1. Designated Streets and General Location Maps

This section contains maps of Anchorage MS4 streets designated for sweeping by each of the principle street maintenance operators listed in Section 2.0. The first map in this section, Figure 5-1, provides an overview of all operational areas for all operators. More detailed maps of individual operator's areas and designated streets are presented in the following figures.

Figure 5-1 Anchorage MS4 Sweeping 'General Locations' 2019

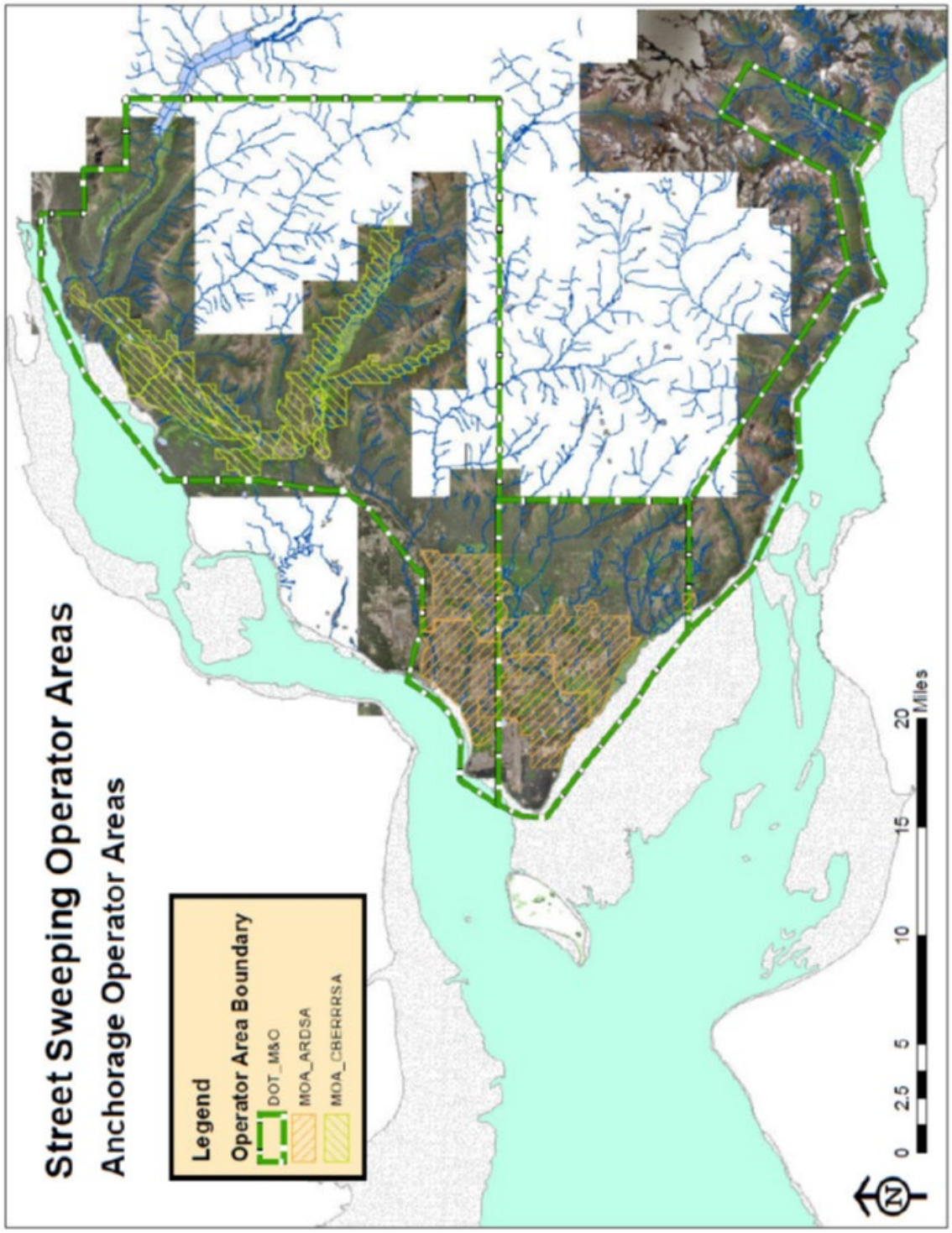


Figure 5-2 MOA_ARDSA, Units 3& 4 (South)—2019 Designated Swept Streets

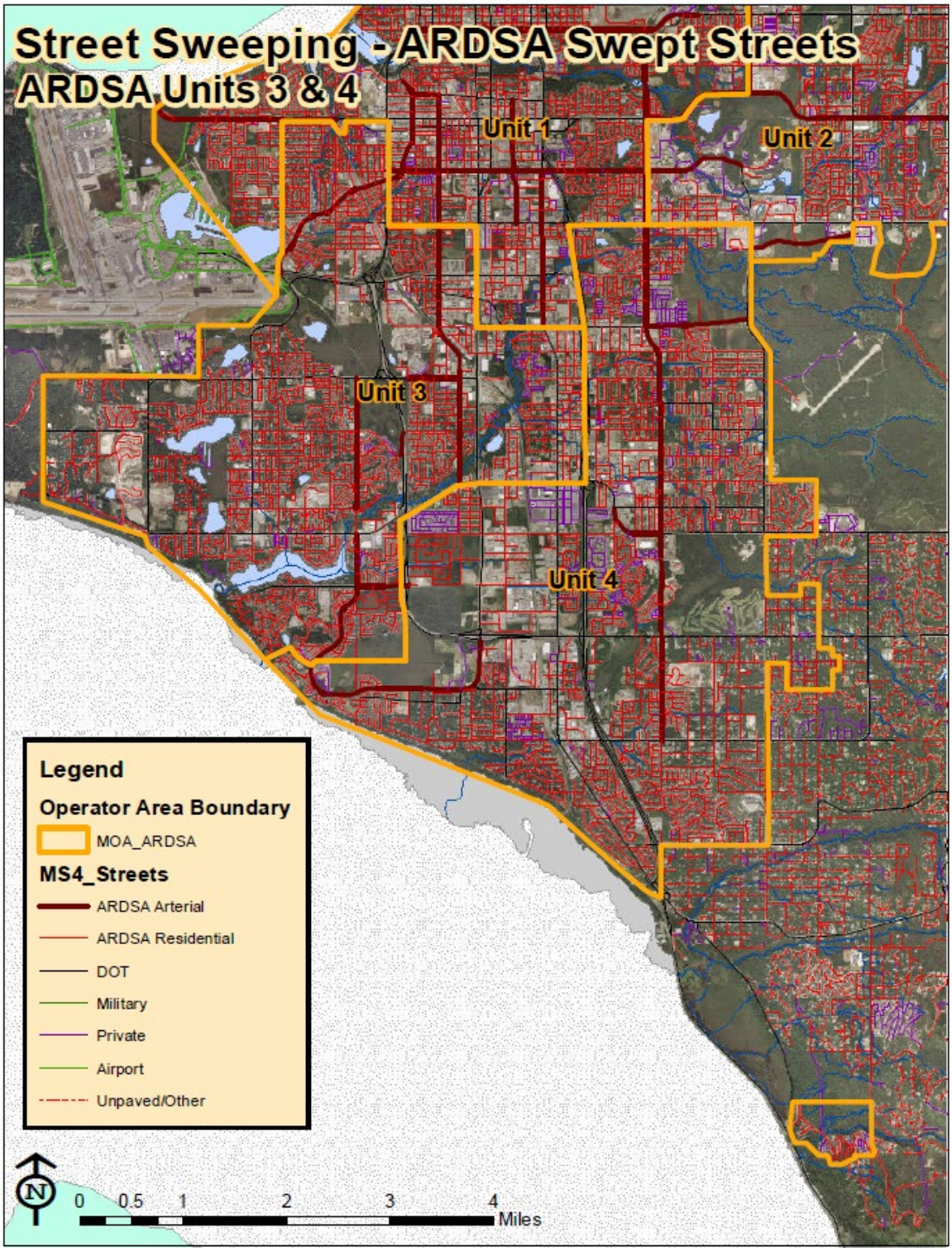


Figure 5-3 MOA_ARDSA, Units 1 & 2 (North)—2019 Designated Swept Streets

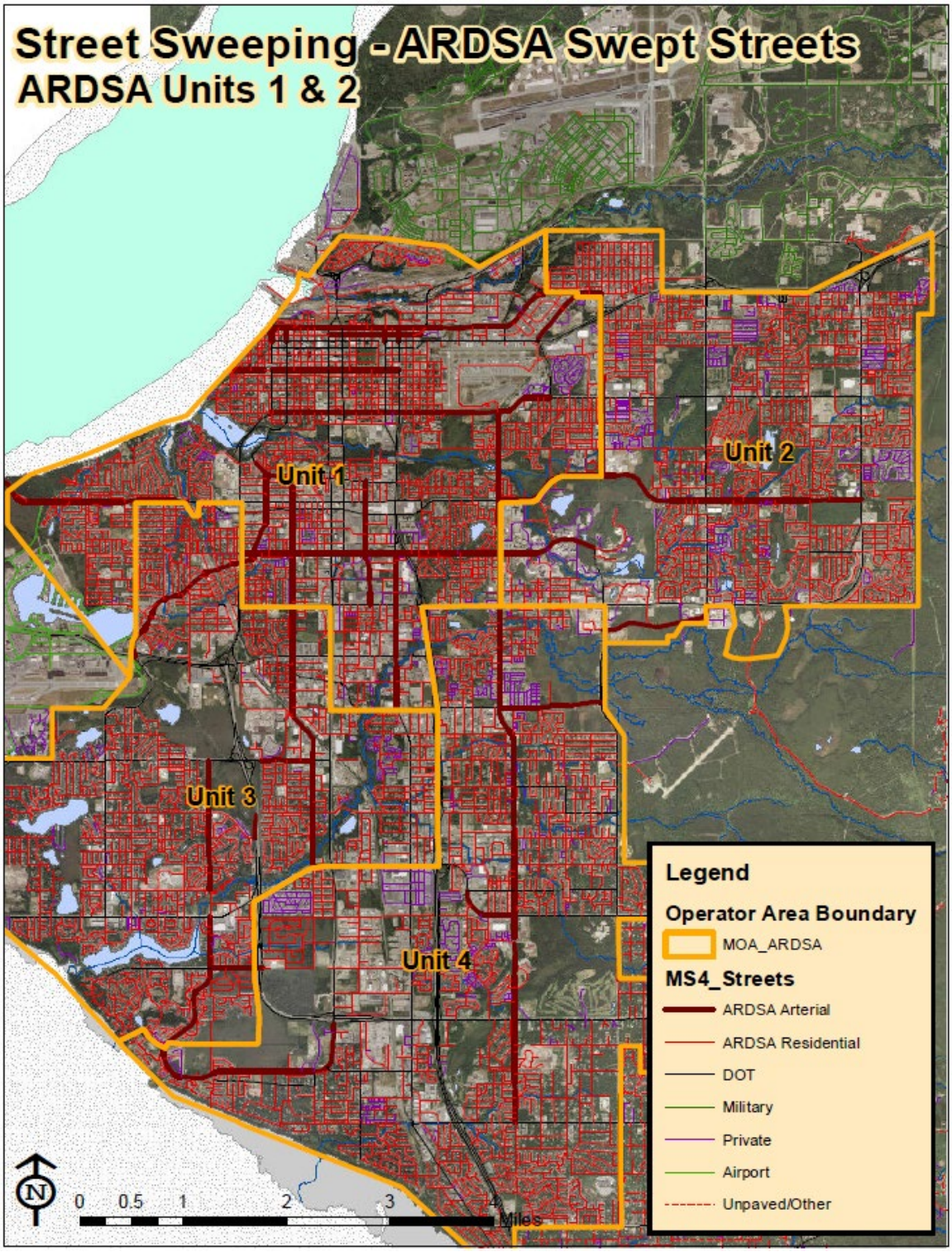


Figure 5-4 CBERRRSA, North—2019 Designated Swept Streets

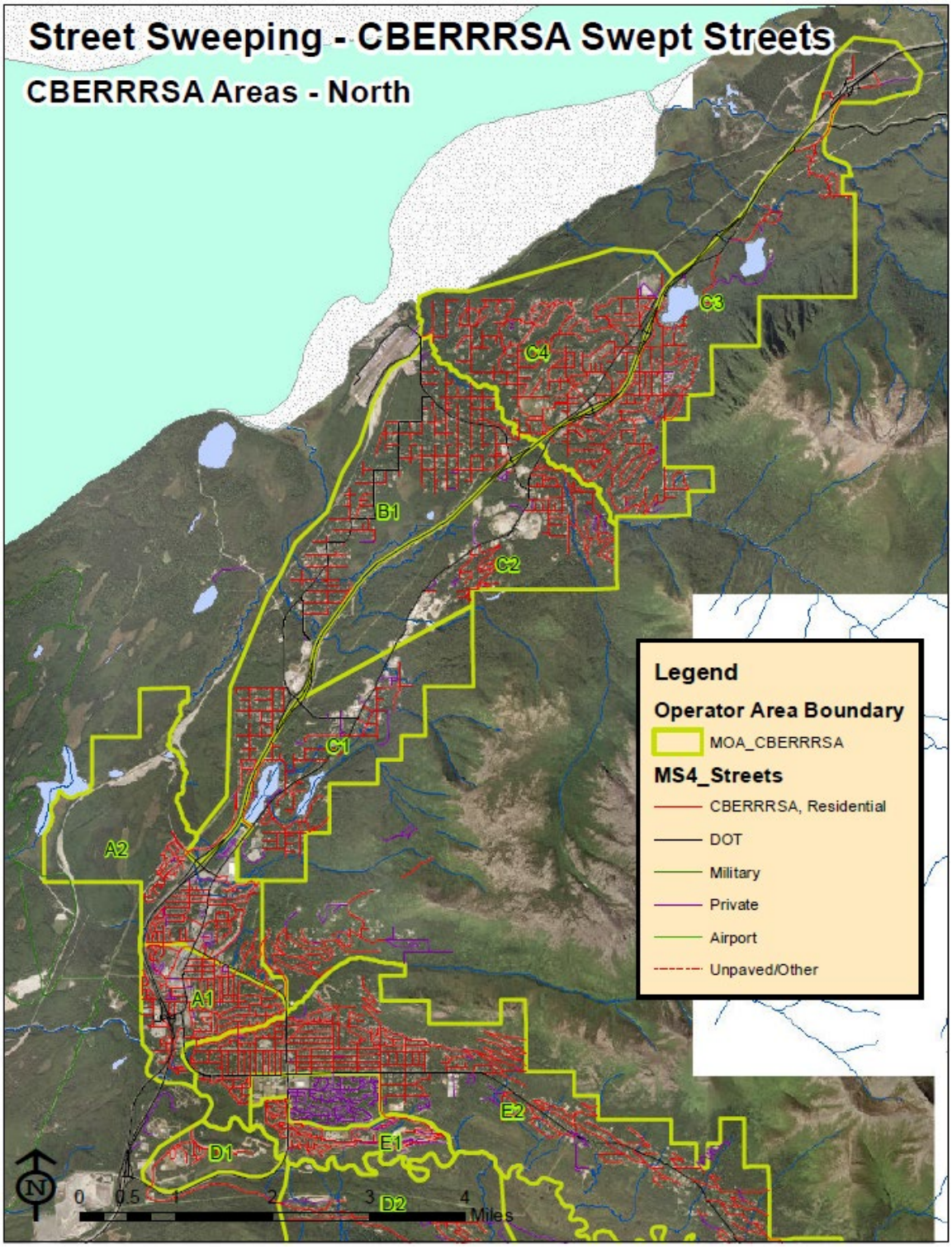


Figure 5-5 CBERRRSA South—2019 Designated Swept Streets

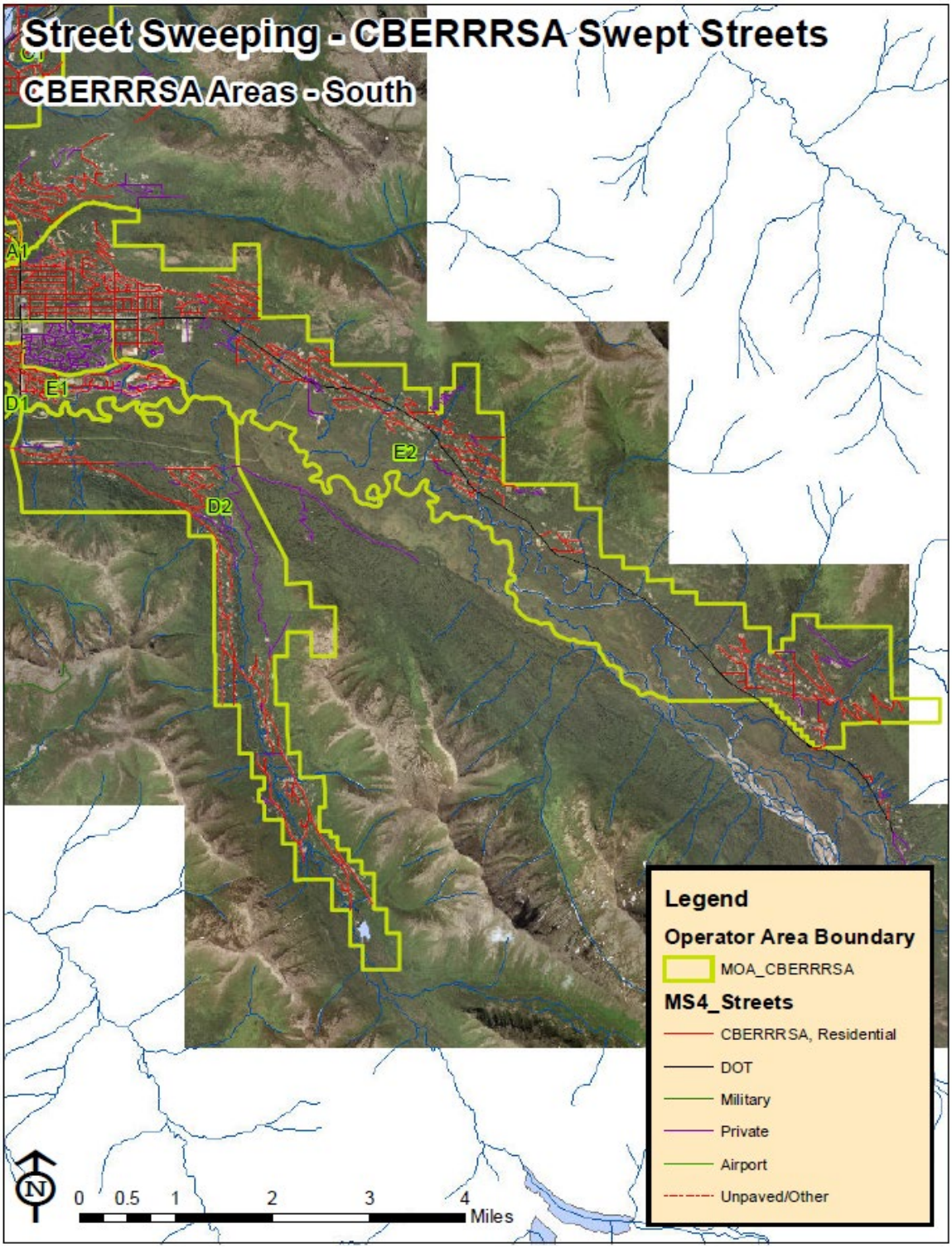


Figure 5-6 ADOT&PF Area A—2019 Designated Swept Streets

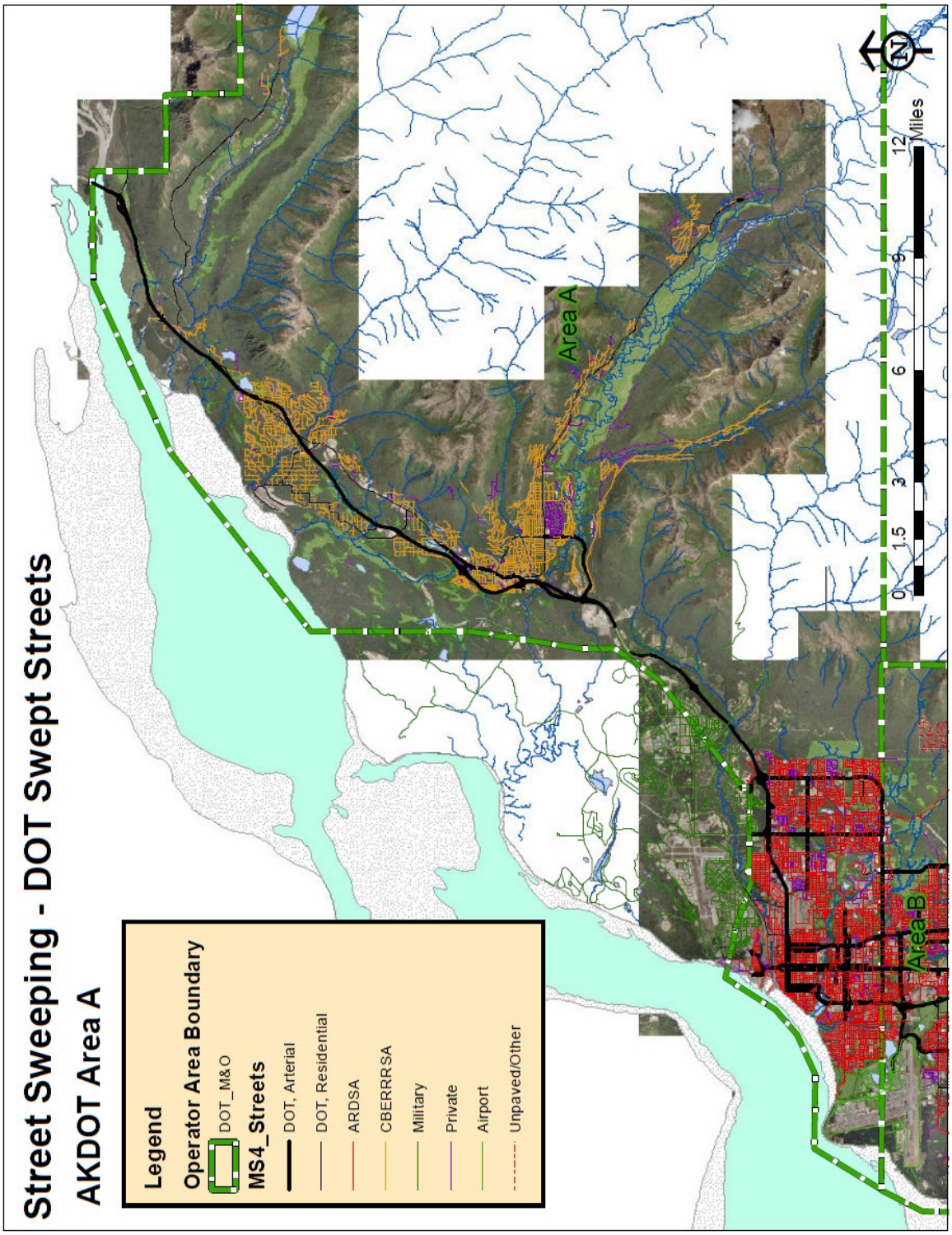


Figure 5-7 ADOT&PF Area B—2019 Designated Swept Streets

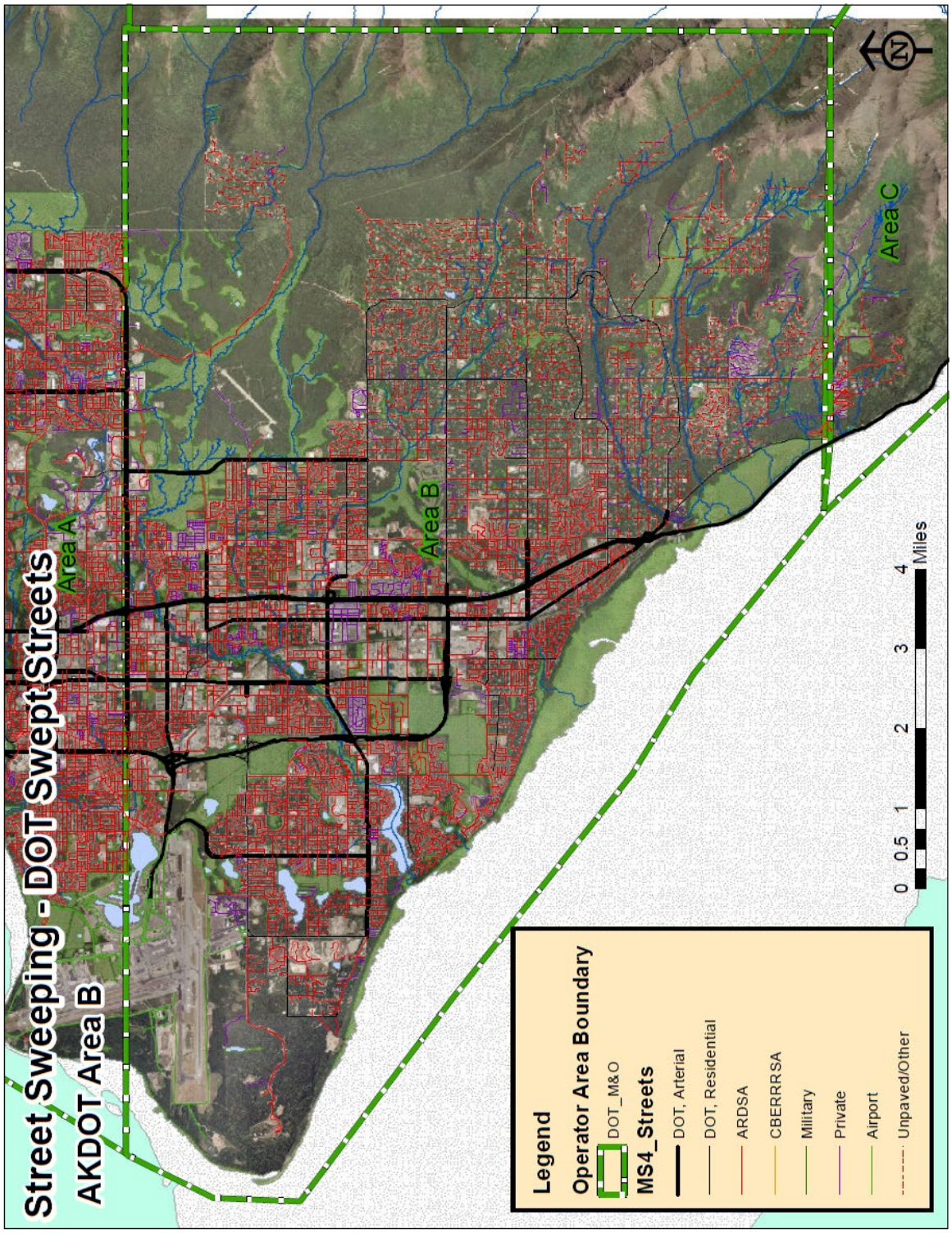


Figure 5-8 ADOT&PF Area C—2019 Designated Swept Streets

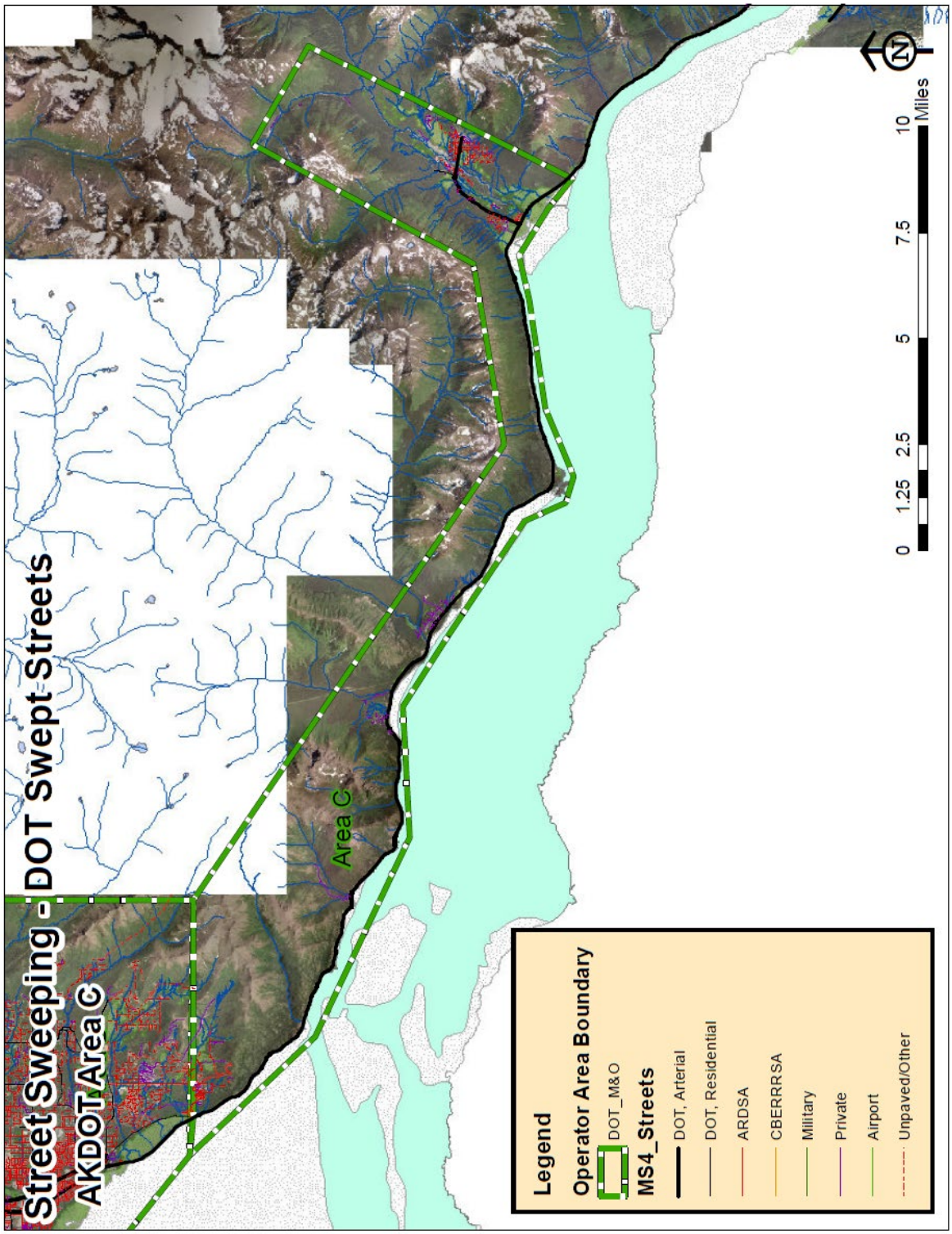
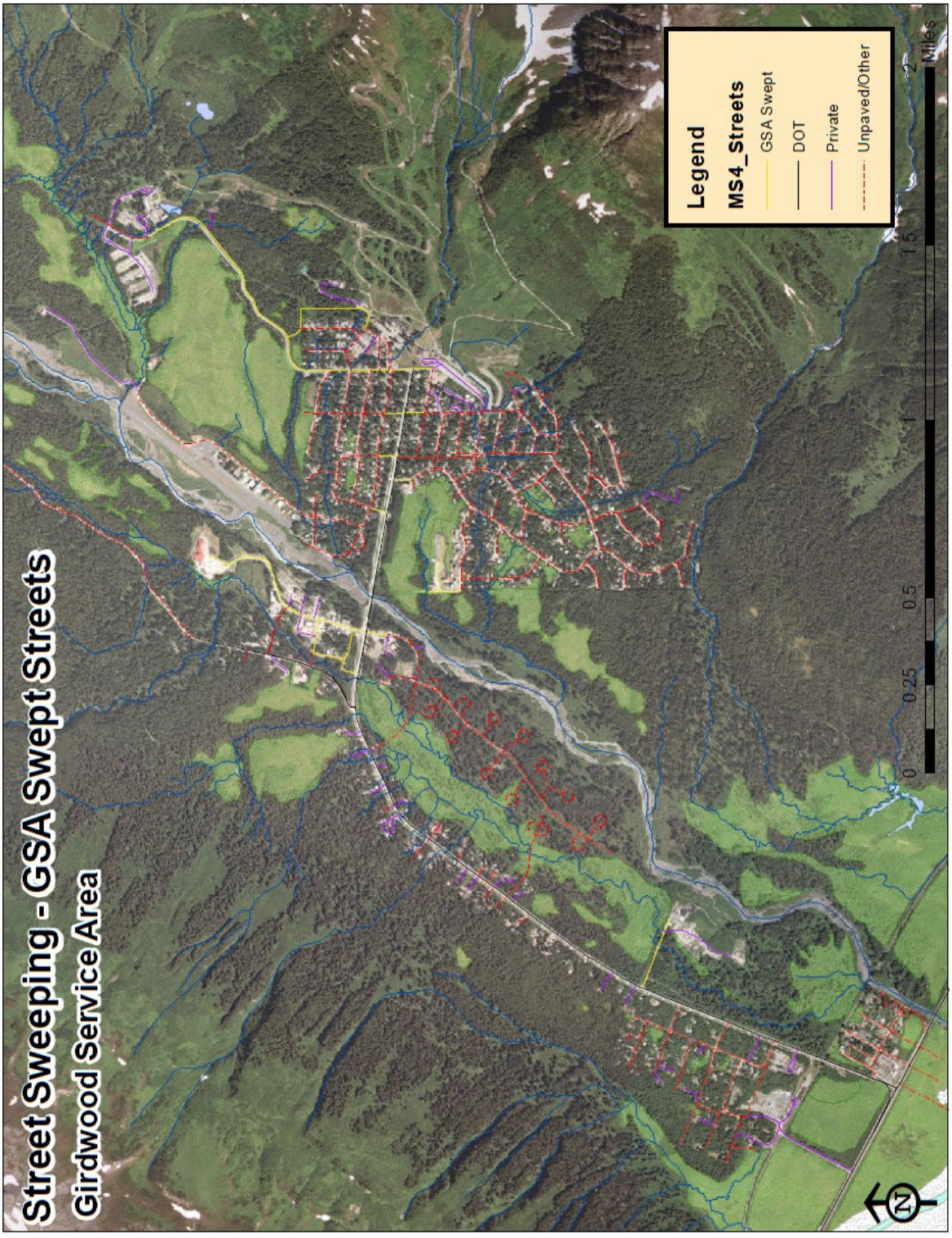


Figure 5-9 Girdwood Service Area (GSA) —2019 Designated Swept Streets



5.2. Anchorage MS4 Detailed Sweeping Records for 2019

Section 5.2 contains detailed sweeping records for 2019 for Anchorage MS4 maintenance agencies. Records for each agency are summarized in a separate subsection. *For more information regarding DOT sweep records for 2019 refer to Appendix E-2.

5.2.1. CBERRRSA 2019 Detailed Sweeping Reports

Table 5-1 CBERRRSA Spring 2019 Sweeping Report

2019 Spring CBERRRSA							
Completion Range 4/17/2019 - 5/16/2019							
Area A	EPA Category*	Drainage	Street Miles	Pickup Miles	Total Pick up (Cubic Yards)	Unit Pick up (Cubic Yds /Mile)	Completeness (%)
	Residential	OC	17.8	35.5	231.0	6.5	100.0
		CG	13.7	27.3	324.0	11.9	100.0
		Mixed	8.4	16.9	111.0	6.6	100.0
Totals			39.9	79.7	666.0	8.4	100.0
Area B	EPA Category	Drainage	Street Miles	Pickup Miles	Total Pick up (Cubic Yards)	Unit Pick up (Cubic Yds /Mile)	Completeness (%)
	Residential	OC	8.4	16.9	90.0	5.3	100.0
		CG	1.8	3.7	15.0	4.1	100.0
		Mixed	9.0	18.0	69.0	3.8	100.0
Totals			19.3	38.5	174.0	4.5	100.0
Area C	EPA Category	Drainage	Street Miles	Pickup Miles	Total Pick up (Cubic Yards)	Unit Pick up (Cubic Yds /Mile)	Completeness (%)
	Residential	OC	43.6	82.5	522.0	6.3	100.0
		CG	4.9	9.8	90.0	9.2	100.0
		Mixed	15.4	31.2	105.0	3.4	100.0
Totals			63.8	123.5	717.0	5.8	100.0
Area D	EPA Category	Drainage	Street Miles	Pickup Miles	Total Pick up (Cubic Yards)	Unit Pick up (Cubic Yds /Mile)	Completeness (%)
	Residential	OC	12.3	15.0	132.0	8.8	100.0
		CG	7.3	14.7	114.0	7.8	100.0
		Mixed	5.2	10.3	21.0	2.0	100.0
Totals			24.8	40.0	267.0	6.7	100.0
Area E	EPA Category	Drainage	Street Miles	Pickup Miles	Total Pick up (Cubic Yards)	Unit Pick up (Cubic Yds /Mile)	Completeness (%)
	Residential	OC	35.0	65.1	336.0	5.2	100.0
		CG	12.7	25.3	312.0	12.3	100.0
		Mixed	9.1	18.2	81.0	4.5	100.0
Totals			56.8	108.6	729.0	6.7	100.0
Mixed Area	EPA Category	Drainage	Street Miles	Pickup Miles	Total Pick up (Cubic Yards)	Unit Pick up (Cubic Yds /Mile)	Completeness (%)
	Residential	OC	0.0	0.0	0.0	-	100.0
		CG	0.0	0.0	0.0	-	100.0
		Mixed	0.8	1.7	3.0	1.8	100.0
Totals			0.8	1.7	3.0	1.8	100.0

*Note: CBERRRSA Operational area Contains no Arterial Street Segments

Table 5-2 CBERRRSA Summer 2019 Sweeping Report

2019 Summer CBERRRSA							
Completion Range 6/15/2019 - 9/4/2019							
Area A	**EPA Category***	**Drainage**	**Street Miles**	**Pickup Miles**	**Total Pick up (Cubic Yards)**	**Unit Pick up (Cubic Yds /Mile)**	**Completeness (%)**
	Residential	**OC**	19.8	38.7	Swept As Needed		
		CG	10.4	20.8	Swept As Needed		
		Mixed	9.7	19.4	Swept As Needed		
Totals			39.9	78.9	No Data Reported		
Area B	**EPA Category**	**Drainage**	**Street Miles**	**Pickup Miles**	**Total Pick up (Cubic Yards)**	**Unit Pick up (Cubic Yds /Mile)**	**Completeness (%)**
	Residential	**OC**	9.9	14.7	Swept As Needed		
		CG	2.0	4.0	Swept As Needed		
		Mixed	6.3	12.6	Swept As Needed		
Totals			18.2	31.2	No Data Reported		
Area C	**EPA Category**	**Drainage**	**Street Miles**	**Pickup Miles**	**Total Pick up (Cubic Yards)**	**Unit Pick up (Cubic Yds /Mile)**	**Completeness (%)**
	Residential	**OC**	49.8	89.6	Swept As Needed		
		CG	4.5	9.0	Swept As Needed		
		Mixed	10.1	20.7	Swept As Needed		
Totals			64.4	119.3	No Data Reported		
Area D	**EPA Category**	**Drainage**	**Street Miles**	**Pickup Miles**	**Total Pick up (Cubic Yards)**	**Unit Pick up (Cubic Yds /Mile)**	**Completeness (%)**
	Residential	**OC**	13.6	15.3	Swept As Needed		
		CG	6.4	12.8	Swept As Needed		
		Mixed	0.0	0.0	Swept As Needed		
Totals			20.0	28.1	No Data Reported		
Area E	**EPA Category**	**Drainage**	**Street Miles**	**Pickup Miles**	**Total Pick up (Cubic Yards)**	**Unit Pick up (Cubic Yds /Mile)**	**Completeness (%)**
	Residential	**OC**	39.4	67.1	Swept As Needed		
		CG	15.1	30.3	Swept As Needed		
		Mixed	3.0	6.0	Swept As Needed		
Totals			57.5	103.3	No Data Reported		
Mixed Area	**EPA Category**	**Drainage**	**Street Miles**	**Pickup Miles**	**Total Pick up (Cubic Yards)**	**Unit Pick up (Cubic Yds /Mile)**	**Completeness (%)**
	Residential	**OC**	3.5	7.1	9.0	1.3	
		CG	0.0	0.0	0.0	-	
		Mixed	2.8	5.7	6.0	1.1	
Totals			6.4	12.7	15.0	1.2	
***Note: CBERRRSA Operational area Contains no Arterial Street Segments**							

*For the 2019 summer sweep period CBERRRSA reported that roads were swept 'as needed' to maintain a visually clean standard (as per the Street Sweeping Management Plan).

Table 5-3 CBERRRSA Fall 2019 Sweeping Report

2019 Fall CBERRRSA							
Completion Range 9/4/2019 - 9/25/2019							
Area A	EPA Category*	Drainage	Street Miles	Pickup Miles	Total Pick up (Cubic Yards)	Unit Pick up (Cubic Yds /Mile)	Completeness (%)
	Residential	OC	4.1	8.1	9.0	1.1	100.0
		CG	6.6	13.1	21.0	1.6	100.0
		Mixed	28.0	56.0	27.0	0.5	100.0
Totals			38.6	77.2	57.0	0.7	100.0
Area B	EPA Category	Drainage	Street Miles	Pickup Miles	Total Pick up (Cubic Yards)	Unit Pick up (Cubic Yds /Mile)	Completeness (%)
	Residential	OC	3.3	6.7	21.0	3.1	100.0
		CG	*See Mixed	*See Mixed	*See Mixed		100.0
		Mixed	15.5	31.3	36.0	1.2	100.0
Totals			18.8	38.0	57.0	1.5	100.0
Area C	EPA Category	Drainage	Street Miles	Pickup Miles	Total Pick up (Cubic Yards)	Unit Pick up (Cubic Yds /Mile)	Completeness (%)
	Residential	OC	34.8	67.9	108.0	1.6	100.0
		CG	*See Mixed	*See Mixed	*See Mixed		100.0
		Mixed	29.5	59.0	66.0	1.1	100.0
Totals			64.3	126.9	174.0	1.4	100.0
Area D	EPA Category	Drainage	Street Miles	Pickup Miles	Total Pick up (Cubic Yards)	Unit Pick up (Cubic Yds /Mile)	Completeness (%)
	Residential	OC	18.0	35.9	9.0	0.3	100.0
		CG	1.4	2.8	9.0	3.2	100.0
		Mixed	0.0	0.0	0.0		100.0
Totals			19.4	38.7	18.0	0.5	100.0
Area E	EPA Category	Drainage	Street Miles	Pickup Miles	Total Pick up (Cubic Yards)	Unit Pick up (Cubic Yds /Mile)	Completeness (%)
	Residential	OC	21.9	43.8	48.0	1.1	100.0
		CG	3.6	7.1	3.0	0.4	100.0
		Mixed	32.3	64.6	30.0	0.5	100.0
Totals			57.8	115.5	81.0	0.7	100.0
Mixed Area	EPA Category	Drainage	Street Miles	Pickup Miles	Total Pick up (Cubic Yards)	Unit Pick up (Cubic Yds /Mile)	Completeness (%)
	Residential	OC	1.7	3.4	3.0	0.9	100.0
		CG	1.2	2.5	3.0	1.2	100.0
		Mixed	0.0	0.0	0.0		100.0
Totals			2.9	5.8	6.0	1.0	100.0

5.2.2. ASD 2019 Detailed Sweeping Reports

Table 5-4 ASD 2019 Sweeping Report

ASD Parking Lot Sweep Summary 2019			
ASD Site Code	Site	Area (sqft)	Swept Total Qty (cyds)
335	Ravenwood Elementary School	89,075	8
220	Girdwood K-8 School	89,969	18
270	Muldoon Elementary School	92,049	14
380	Turnagain Elementary School	93,900	4
364	Susitna Elementary School	94,200	14
260	Mountain View Elementary School	95,101	12
237	Huffman Elementary School	95,228	
340	Rogers Park Elementary School	96,305	8
450	Polaris K-12 School	97,293	12
410	Wonder Park Elementary School	97,567	14
390	Williwaw Elementary School	97,956	18
320	O'Malley Elementary School	98,189	8
118	Bear Valley Elementary School	98,474	
330	Rabbit Creek Elementary School	99,865	12
112	Alpenglow Elementary School	102,825	12
363	Trailside Elementary School	103,834	8
130	Campbell Elementary School	104,000	8
418	Gladys Wood Elementary School	104,344	20
125	Bowman Elementary School	106,000	12
362	Spring Hill Elementary School	106,000	8
250	Lake Otis Elementary School	106,173	8
280	North Star Elementary School	106,780	10
116	Bayshore Elementary School	106,792	12
290	Northern Lights ABC School	108,974	12
248	Lake Hood Elementary School	114,600	12
300	Northwood ABC Elementary School	118,491	16
120	Birchwood ABC Elementary School	119,236	8
242	Kasuun Elementary School	119,441	12
384	William Tyson Elementary School	120,690	20
400	Willow Crest Elementary School	124,285	12
345	Russian Jack Elementary School	128,685	4
170	Chugiak Elementary School	140,875	16
760, 850	West High/ Romig Middle School	176,826	36

ASD Parking Lot Sweep Summary 2019

ASD Site Code	Site	Area (sqft)	Swept Total Qty (cyds)
700, 160	Central Middle/ Chugach Elementary	116,792	32
805	King Tech High	144,663	14
730	Gruening Middle School	150,000	12
246	Kincaid Elementary School	152,789	24
750	Mears Middle School	156,806	20
710	Clark Middle School	168,224	32
740	Hanshew Middle School	169,175	14
785	Begich Middle School	177,442	32
770	Wendler Middle School	193,293	16
780	Goldenview Middle School	201,993	16
755	Mirror Lake Middle School	203,260	24
865	Eagle River High School	275,595	40
810	Chugiak High School	325,000	44
860	South High School	340,669	24
800	Bartlett High School	412,961	44
830	East High School	459,000	28
840	Service High School	473,795	12
820, 150	Dimond High/ Chinook Elementary	580,883	36
	Total	8,256,362	**852**
	Unit Pick Up (cyds/acre)		**4.5**

5.2.3. 2019 Changes to Sweeping and Basis for Changes

Table 5-5 CBERRRSA 2019 Changes to Swept Streets

2019 - SWEEP CHANGES FOR CBERRRSA								
Name _ID	Street From	Street To	Area	Arterial or Residential	Drainage Type	StreetMiles	Sweep Practice	Change Type
HAMANN ROAD	EAGLE RIVER ROAD MI. 5.2	CUL DE SAC END	E	Residential	Open Channel	0.62	Kick Broom	Added to Street Inventory
WILMA CIRCLE	HAMANN ROAD	CUL DE SAC END	E	Residential	Open Channel	0.28	Kick Broom	Added to Street Inventory
JEM CIRCLE	HAMANN ROAD	CUL DE SAC END	E	Residential	Open Channel	0.15	Kick Broom	Added to Street Inventory
ALPENGLOW DRIVE	SUN LOFT DRIVE	HAMANN ROAD	E	Residential	Open Channel	0.35	Kick Broom	Added to Street Inventory
SUN LOFT DRIVE	EAGLE RIVER ROAD MI. 5.1	SUNNY GLENN DRIVE	E	Residential	Open Channel	0.19	Kick Broom	Added to Street Inventory
SUNNY GLENN DRIVE	SUN LOFT DRIVE	THE CLEARING DRIVE	E	Residential	Open Channel	0.24	Kick Broom	Added to Street Inventory
THE CLEARING DRIVE	SUNNY GLENN DRIVE	CUL DE SAC END	E	Residential	Open Channel	0.27	Kick Broom	Added to Street Inventory
LOWER TERRACE STREET	EAGLE RIVER ROAD MI. 5.1	L 1/B 2 VALLEY VIEW TERRC	E	Residential	Open Channel	0.35	Kick Broom	Added to Street Inventory
LAKE VIEW DRIVE	MILE HI AVENUE	LOT 10, SUNNY VALLEY SUB.	E	Residential	Open Channel	0.26	Kick Broom	Added to Street Inventory
FROSTY DRIVE	HOMESTEAD ROAD	COUNTRY VIEW DRIVE	C	Residential	Open Channel	0.25	Kick Broom	Added to Street Inventory
EDWARD CIRCLE	COUNTRY VIEW DRIVE	END OF CUL DE SAC	C	Residential	Open Channel	0.10	Kick Broom	Added to Street Inventory
FERNDALE STREET	COUNTRY VIEW DRIVE	END 21025 FERNDALE ST.	C	Residential	Open Channel	0.14	Kick Broom	Added to Street Inventory
CHEELEY'S LANE	EKLUTNA LAKE ROAD	RAYMOND AVENUE	C	Residential	Open Channel	0.06	Kick Broom	Added to Street Inventory
RAYMOND AVENUE	CHEELEY'S LANE	END OF LOT 6	C	Residential	Open Channel	0.48	Kick Broom	Added to Street Inventory
ROCHELLE AVENUE	TENA STREET	END OF LOT 5	C	Residential	Open Channel	0.24	Kick Broom	Added to Street Inventory
TENA STREET	RAYMOND AVENUE	ROCHELLE AVENUE	C	Residential	Open Channel	0.16	Kick Broom	Added to Street Inventory

ARDSA reported no changes to their list of swept streets for the 2019 sweeping periods. For changes to DOT swept streets in 2019 see Appendix E-2.