George Wuerch, Mayor

Anchorage Street Sweepings Management Plan

Document No. WMP CPp02001

MUNICIPALITY OF ANCHORAGE
WATERSHED MANAGEMENT PROGRAM

AUGUST 2002

WATERSHED MANAGEMENT

Office of Planning, Development & Public Works

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Prepared by: MWH Americas, Inc.
4100 Spenard Road
Anchorage, AK 99517

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Contents

Acronyms and Abbreviations

ADEC	Alaska Department of Environmental Conservation
CFR	Code of Federal Regulations
DOT&PF	Department of Transportation and Public Facilities
DRO	diesel range organics
EPA	Environmental Protection Agency
$MgCl_2$	magnesium chloride
MOA	Municipality of Anchorage
NaCl	sodium chloride
NPDES	National Pollutant Discharge Elimination System
OGS	oil and gas separator
PAH	polynuclear aromatic hydrocarbon
SOP	standard operating procedure

1 Introduction

The Municipality of Anchorage (MOA) and the State of Alaska Department of Transportation and Public Facilities (DOT&PF) currently collect about 20,000 tons of sand and gravel from Anchorage streets annually. This volume is expected to increase over time.

MOA and DOT&PF maintenance groups sweep the streets during a comprehensive spring event and then periodically throughout the summer. Smaller volumes of street sweepings are removed as sediments from storm drain pipes and treatment devices. Due to the high moisture content in these wastes, vacuum trucks ("Vactors") collect both liquids and solids. Liquids are typically discharged to the sanitary sewer system while sediments are combined with other street sweepings.

The National Pollution Discharge Elimination System (NPDES) obtained by MOA to discharge storm water in the Anchorage Area requires a program to manage sediment and debris such as street sweepings.

1.1 Objective

The objective of the Street Sweepings Management Plan is to develop and document a standardized, Alaska Department of Environmental Conservation (ADEC)-approved approach to managing street sweepings collected from Anchorage streets by MOA and DOT&PF.

A number of viable options for managing street sweepings will be included in the plan so that MOA and DOT&PF will retain maximum flexibility in managing street sweepings in a cost-effective manner that also is fully protective of human health and the environment.

1.2 Scope

This plan applies to street sweepings collected by MOA, DOT&PF, and their contractors. It does not include materials impacted by spills, unsuitable excavation, oil and grit separator (OGS), sludge, and materials collected in catch basins/sedimentation basins.

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2 Chemical and Physical Characteristics of the Street Sweepings

Collected street sweepings are predominantly composed of the following:

- Sand and gravel used to sand Anchorage streets
- Salts (sodium chloride [NaCl] and magnesium chloride [$MgCl_2$]), which are added to treat street surfaces for ice and snow traffic hazards
- Other materials such as soil, rock, leaves, or other naturally-occurring organics and animal wastes collected incidentally in street sweeping operations,

The salts are very water-soluble and typically are washed from street sweepings by the percolation of natural precipitation (e.g., rain, melting snow).

Numerous studies were performed to document chemical and physical characteristics of street sweepings, including total and leachable levels of metals, petroleum hydrocarbons, and individual hydrocarbon constituents such as benzene and polynuclear aromatic hydrocarbons (PAH), and pathogens. Results are summarized and documented in Appendix A.

Each year an inventory of street maintenance materials applied to MOA streets is prepared and submitted to the Environmental Protection Agency (EPA) as part of an annual report required under the NPDES permit.

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3 Regulatory Status

Management of street sweepings is potentially regulated by the following:

- MOA NPDES permit (AKS05255-8) to discharge storm water
- Federal solid and hazardous waste regulations (40 CFR 257- 282)
- State solid and hazardous waste regulations (18 AAC 60 and 62)

Each of these potential regulatory authorities is discussed below.

3.1 MOA NPDES Permit

Street maintenance and inspection of the municipal separate storm water system (MS4) and any storm water structural and source controls are required by EPA Region 10 under Part II.A.1.a.(1) of NPDES permit number AKS05255-8, granted to MOA. This part of the permit requires MOA to establish definitive inspection and maintenance schedules for structural controls and specifically requires establishing guidelines, criteria, and descriptions for maintenance activities. The permit specifically names "disposal of sediment and removal of debris" as an example of maintenance activities for which maintenance and inspection are needed.

Inspection and maintenance record keeping, evaluations, and source control effectiveness assessments and analyses (including reporting requirements) are required under Part II.A.1.a.(2)-(4) of the NPDES. In general, reporting and program refinements are required to be documented in the annual reports required under the permit. The annual report includes a tally of the quantities of sand and deicers applied to streets during the reporting period; as well as the quantity of materials removed from streets during sweeping.

As a potential source of contamination and environmental impacts, sand and deicers applied to streets have been studied extensively and the studies provided to EPA and ADEC in the annual reports. In summary, studies have not identified any adverse impacts to public health or the environment and EPA has found it acceptable to continue using these materials on the streets.

The permit does not specify specific requirements for managing street sweepings. In the absence of specific permit requirements, state and federal laws and regulations pertaining to the identification of solid and hazardous wastes were used to determine if street sweepings meet the definition of either a solid and/or hazardous waste and require management in accordance with either of these programs. These analyses are described below.

3.2 Federal Solid and Hazardous Waste Regulations

Upon collection of street sweepings with the intent to discard or reuse them, the street sweepings are, by definition in federal regulations (40 CFR 261.2), a solid waste. If street sweepings are used or reused as an effective substitute for a commercial product, they no longer are defined as a solid waste (40 CFR 261.2(e)(1)(ii)), provided the generator (e.g., MOA, DOT&PF) can demonstrate the following:

- There is a known market or disposition for the material and documentation, is provided such as contracts showing that a second party uses the material (40 CFR 261.2(f))
- The materials are not "accumulated speculatively" before recycling. This is demonstrated by showing that the material is recyclable and has a feasible means for being recycled, and that during the calendar year (January 1 to December 31), the amount of material that is recycled or transferred to a different site for recycling equals at least 75 percent of the amount of material accumulated at the beginning of the period (40 CFR 261.1(b)(8) and 40 CFR 261.2(b)(4)).

Based on these criteria, street sweepings could meet the definition of a solid waste if they were not used in place of a commercial product, such as clean fill. Use of street sweepings as fill is subject to approval by ADEC. For purposes of this evaluation, and to avoid creating a circular argument, street sweepings will be evaluated under the conservative assumption that they meet the federal definition of a solid waste, to show that they would not meet the definition of a hazardous waste, even if they were deemed to be a solid waste.

For this evaluation, street sweepings are considered a solid waste under the federal definition. To determine whether the street sweepings are a hazardous waste, the following questions were evaluated:

a. Are street sweepings a <u>listed</u> hazardous waste identified in 40 CFR 261, Subpart D?

b. Are street sweepings <u>derived from</u> a listed hazardous waste identified in 40 CFR 261, Subpart D?

c. Do street sweepings <u>contain</u> a listed hazardous waste?

d. Do street sweepings exhibit the hazardous waste characteristics of ignitability, corrosivity, reactivity, or toxicity?

e. Are street sweepings <u>mixed with</u> a listed or characteristic hazardous waste?

a. ***Are street sweepings a listed hazardous waste identified in 40 CFR 261, Subpart D?***

Evaluation: Street sweepings are not listed as a hazardous waste under 40 CFR 261, Subpart D.

b. ***Are street sweepings derived from a listed hazardous waste identified in 40 CFR 261, Subpart D?***

Evaluation: Street sweepings are derived from purchased sand and other materials applied to streets for street maintenance and are not derived from one of the listed wastes.

c. ***Do street sweepings contain a listed hazardous waste?***

Evaluation: Under normal conditions, none of the listed hazardous wastes are added intentionally or unintentionally to street sweepings. In a very rare, non-routine instance, it is conceivable that a hazardous waste may be unintentionally released or mixed into street sweepings (e.g., an unintentional spill of a listed chlorinated solvent, or mixing of spill-impacted street sweepings with non-impacted street sweepings). This non-routine waste must be characterized and would likely meet the definition of a hazardous waste. Therefore, non-routine street sweepings must be segregated from and managed separately from other street sweepings to avoid the requirement of designating the non-impacted street sweepings as hazardous waste.

In summary, it appears that street sweepings generated under normal conditions are not a listed hazardous waste by virtue of containing a listed hazardous waste. However, street sweepings subject to non-routine activities (e.g., spills, mixing with contaminated materials) could meet the definition of a hazardous waste.

d. ***Do street sweepings exhibit the hazardous waste characteristics of ignitability, corrosivity, reactivity, or toxicity?***

Evaluation: Each characteristic is evaluated below separately.

Ignitability (40 CFR 261.21) – Materials in street sweepings (e.g., sand, gravel, NaCl, $MgCl_2$) do not ignite, even when exposed to an ignition source. Therefore, based on generator knowledge, street sweepings do not appear to exhibit the characteristic of ignitability.

Corrosivity (40 CFR 261.22) – Materials in street sweepings (e.g., sand, gravel, NaCl, $MgCl_2$) are not liquid, nor are they corrosive. Therefore, based on generator knowledge, street sweepings do not exhibit the characteristic of corrosivity.

Reactivity (40 CFR 261.23) – Materials in street sweepings (e.g., sand, gravel, NaCl, $MgCl_2$) are stable and do not react violently with air or water, nor do they generate

hydrogen sulfide or cyanide. Therefore, based on generator knowledge, street sweepings do not exhibit the characteristic of reactivity.

Toxicity (40 CFR 261.24) – Based on generator knowledge, street sweepings do not contain any of the 40 compounds identified in 40 CFR 261.24, except the 8 metals. To evaluate potential for levels of metals to result in characterization of street sweepings as a hazardous waste, the maximum quantity of leachable metals was calculated based on all metal in the street sweepings leaching. Calculations and comparison with the toxicity characteristic limit are shown in Table A1 of Appendix A. In all cases, the calculated maximum level of leachable metal was below the toxicity characteristic limit. Therefore, it appears that street sweepings do not meet the characteristic of toxicity.

Therefore, based on this data, street sweepings do not appear to be a characteristic hazardous waste.

e. ***Are street sweepings mixed with a listed or characteristic hazardous waste?***

Evaluation: Under routine conditions, street sweepings are not mixed with other materials or hazardous wastes and therefore would not meet the definition of a hazardous waste. To continue to meet this definition, it is critical that non-routine materials and wastes are not mixed with routine street sweepings.

Summary: If street sweepings are considered to meet the federal definition of a solid waste, it appears they would not meet the definition of a hazardous waste providing:

- Contaminated street sweepings or street sweepings impacted by releases of petroleum or other hazardous materials or wastes are segregated from routine street sweepings. Contaminated street sweepings are characterized and managed in accordance with federal and state solid and hazardous waste regulations, as applicable.
- Street sweepings are not mixed with other hazardous materials or hazardous wastes.

Therefore, even if street sweepings were considered a solid waste under the federal definition of a solid waste, they do not appear to meet the definition of a hazardous waste. In this case, street sweepings would be regulated under the State of Alaska solid waste regulations, since the State of Alaska has primacy in the regulation of solid waste. The definition of a solid waste under state legislation and regulation varies from the federal definition and is described and discussed in the following section.

3.3 State of Alaska Regulations

In Alaska, solid waste is regulated under 18 AAC 60. Hazardous waste is identified and regulated under 18 AAC 62. State of Alaska hazardous waste regulations mirror federal

regulations in identifying hazardous waste. Therefore, street sweepings do not appear to meet the definition of hazardous waste under State of Alaska regulations (18 AAC 62).

As defined by the State of Alaska in 18 AAC 60.990 and AS 46.03.900, "solid waste means all unwanted, abandoned, or discarded solid or semi-solid material whether or not subject to decomposition originating from any source."

As stated in 18 AAC 60.005(c):

> The following wastes and materials, if disposed of or used as described in this subsection, are exempt from the requirements of this chapter unless mixed with nonexempt waste, there is a public health, safety or welfare threat or environmental problem associated with management of the waste or material, or the waste or material is being managed in a manner that causes or contributes to a nuisance.
>
> (1) Land clearing waste, including excavated dirt, rock, soil, butt ends, stumps, and other similar waste;
>
> (2) Tree limbs and other foliage or woody debris, sometimes referred to as "slash," in a timber harvest area;
>
> :
>
> :
>
> (15) Soil containing a hazardous substance that does not meet the definition of polluted soil in 18 AAC 60.990.

Under this definition, street sweepings are considered by MOA and DOT&PF to be an exempt waste because they meet the following criteria:

a. They are comprised of materials that are typically exempt (e.g., dirt, rock, soil, foliage, woody debris, other similar materials)

b. Do not meet the definition of a polluted soil in 18 AAC 60.990

c. <u>Are not</u> mixed with nonexempt waste

d. <u>Do not</u> create a public health, safety, or welfare threat or environmental problem

e. <u>Do not</u> cause or contribute to a nuisance

Each of these points is discussed below.

a. Street sweepings are comprised of materials that are typically exempt. As described in Section 4, street sweepings are comprised of dirt, rock, soil, foliage and woody debris, and other similar materials. These materials are typically exempt wastes under 18 AAC 60.005(c) (1) and (2). Sodium and magnesium salts originally added to the mix are no longer contained in the street sweepings, as shown by the chloride content (Appendix A).

b. **Street sweepings do not meet the definition of a polluted soil in 18 AAC 60.990.** Analysis of street sweepings shows they do not met the ADEC definition of polluted soil. Supporting documentation is attached as Appendix A.

c. **Street sweepings are not mixed with nonexempt waste.** As currently managed, street sweepings are not mixed with non-exempt waste. To standardize and enforce this practice, MOA and DOT&PF are proposing a Street Sweeping Management Standard Operating Procedure (SOP) that would preclude mixing of street sweepings with non-exempt waste.

d. **Street sweepings do not create a public health, safety, or welfare threat or environmental problem.** MOA has conducted numerous studies to characterize the content and impacts of street sweepings. These studies have been submitted to EPA and ADEC in annual reports required under the MOA NPDES permit. Typically, these programs include studies of water quality, ecology and bioassessment, pollutant sources and controls, and pesticide and pathogen management. To date, these studies demonstrate that street sweepings do not create a public health or welfare threat or environmental problem.

e. **Street sweepings do not cause or contribute to a nuisance.** Street sweepings are currently collected and stored at snow disposal sites in Anchorage. Once approved for use, materials can be used immediately to grade snow disposal sites and improve site drainage. This would improve the visual appeal, drainage, and operation of the sites rather than causing or creating a nuisance.

   On an ongoing basis, additional street sweepings could be used to further improve snow disposal sites and on other MOA projects.

Based on this analysis, street sweepings appear to be an exempt waste and as such are exempt from the remaining requirements of 18 AAC 60. MOA and DOT&PF are committed to ensuring that street sweepings continue to be managed in a manner that defines them as an exempt waste and enables the highest and best reuse of these materials. MOA and DOT&PF are proposing a Street Sweeping Management SOP that would meet these goals.

4 Proposed Street Sweeping Management Standard Operating Procedure

The Proposed Street Sweeping Management SOP consists of standard procedures established for these areas:

- Administrative controls
- Processing and storage
- Use and disposition of street sweepings

These controls would be applicable to MOA, DOT&PF, and their contractors.

4.1 Administrative Controls

The following administrative controls will be enacted:

- MOA and DOT&PF will include a reference to this SOP in all street-sweeping contracts and require street sweeping contractors to manage street sweepings in accordance with these procedures.
- If the identity or composition of materials applied to streets changes, this SOP will be reviewed, updated and resubmitted to ADEC for review and approval.
- Annual testing for 3 years of a composite sample of street sweepings for total DRO, aromatic diesel range organics, aliphatic DRO, arsenic, chromium VI, and lead to confirm that the composition of street sweepings remains within the anticipated ranges shown in this document.
- Record keeping on quantities and ultimate use (i.e., fate/location) of sweepings

4.2 Processing and Storage

Street sweepings will be processed, stored, and used in accordance with good management practices identified as follows:

Processing

- Segregate any contaminated street sweepings from routine street sweeping and manage them under a separate program.
- Prohibit mixing street sweepings with nonexempt waste.

- If occasional litter is visible in street sweepings, handpick the litter (e.g., plastic bags, plastic bottles) and dispose of them as solid waste. Keep area free of windblown litter.

Storage

- Street sweepings collected from streets can be used immediately or transferred to storage prior to use.
- If stored, street sweepings will be temporarily stored at snow disposal sites or at another staging area where they will be used.
- Use street sweepings as soon as possible to avoid excess materials at snow disposal sites.

4.3 Use and Disposition of Street Sweepings

The following uses are identified for street sweepings:

- Provide material to regrade Anchorage snow disposal sites.
- For use in place of purchased fill or subgrade in Anchorage street maintenance and/or other construction or projects, which has the added benefit of reducing street maintenance costs.
- Immediate use by street sweeping contractors on public works and other projects.

The MOA or DOT&PF maintenance departments can add other uses upon review by their respective environmental departments and close coordination and concurrence between the two agencies.

5 Approach to Ensuring Environmentally Sound Management of Street Sweepings

In summary, street sweepings have been analyzed and studied extensively. Data support designation of street sweepings as an exempt waste under 18 AAC 60. This would allow street sweepings to be used in place of purchased fill on public works and other projects.

The MOA and DOT&PF approach to ensuring environmentally sound management of street sweepings consists of the following elements:

- Prepare and maintain a Street Sweepings SOP (as presented in this document)
- Perform periodic laboratory analysis as described in the SOP
- Review and revise the SOP prior to changing materials applied to streets
- Perform vigilant surveillance of environmental quality via programs and reporting procedures required under the NPDES permit. Typically, these programs include water quality, ecology and bioassessment, pollutant sources and controls, and pesticide and pathogen management.

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6 References

Characterization and Assessment for Options for Managing Materials Generated During Street Cleaning Activities in Anchorage, Alaska. Hart Crowser. May 2000.

Addendum to Characterization and Assessment for Options for Managing Materials Generated During Street Cleaning Activities in Anchorage, Alaska. Hart Crowser. June 28, 2000.

Fecal Coliform in Street Sediments: 2001 Data Report. Document No. WMP Apr01005. Municipality of Anchorage Watershed Management Section. October 2001.

Appendix A
Summary and Documentation of the Chemical and Physical Characteristics of Anchorage Street Sweepings

This appendix summarizes the chemical and physical characteristics of Anchorage street sweepings. Visually, the Anchorage street sweepings look like a mixture of sand and pea gravel with some leaves and small rocks. A photograph of an existing pile of street sweepings is shown below. As demonstrated in the photograph, the street sweepings resemble natural materials and are virtually free of litter. Therefore, it does not appear that the visual appearance of the Anchorage street sweepings would cause or contribute to a nuisance.

Additionally, the Anchorage street sweepings were analyzed and evaluated for diesel range organics (DRO), residual range organics (RRO), and individual petroleum constituents such as benzene and polynuclear aromatic hydrocarbons (PAH), metals, leachable levels of metals, and pathogens.

The detected range and the range with a 95 percent confidence level are presented in Table A1 and compared to the following benchmark criteria:

- ADEC Soil Cleanup Criteria, Method 2, under 40-inches of precipitation zone (18 AAC 75)
- ADEC Soil Cleanup Criteria, Method 2, over 40-inches of precipitation zone (18 AAC 75)
- Resource Conservation and Recovery Act (RCRA) toxicity characteristic level

The ADEC Soil Cleanup Criteria, Method 2, under 40-inches of precipitation zone ("under 40-inch zone") in 18 AAC 75 was selected because these are the criteria used to judge whether

contaminated soil in Anchorage can be used or left in place without concern for adverse impacts on public health or the environment. The "under 40-inch zone" criteria were selected because Anchorage receives less than 40-inches per year of precipitation.

The ADEC Soil Cleanup Criteria, Method 2, over 40-inches of precipitation zone ("over 40-inch zone") in 18 AAC 75 was selected because thers are the criteria specified in 18 AAC 60.005 (c) and 18 AAC 60.990 to judge whether soil is "polluted." Soil with levels of hazardous substances below these criteria are deemed, by definition, not to be polluted and under 18 AAC 60.005 (c) (15) is an exempt waste. Because of wording in the regulatory definition, the "over 40-inch zone" criteria are applicable to determining whether an Anchorage soil is deemed "polluted," even though Anchorage receives under 40-inches of precipitation annually.

By definition in 40 CFR 261.24, the RCRA toxicity characteristic is the criterion for levels of 40 specific leachable contaminants in a waste material.

Based on the data presented in Table A1, Anchorage street sweepings were below selected criteria in all cases except the following:

- One sample of soil DRO exceeded the Contaminated Soil Criteria for both the "under 40-inch zone" and the "over 40-inch zone." The remaining samples were within the criteria, and within a 95 percent confidence level, the DRO criteria is met.
- Total arsenic exceeded the Contaminated Soil Criteria for both the "under 40-inch zone" and the "over 40-inch zone."
- Total chromium exceeded the Contaminated Soil Criteria for both the "under 40-inch zone" and the "over 40-inch zone."
- Benzo(a)pyrene exceeded the Contaminated Soil Criteria for the "under 40-inch zone," but was within the criteria for the "over 40-inch zone."

Further evaluation of these cases was performed to determine whether levels of these constituents in the Anchorage street sweepings were of concern. Discussion, rationale, and conclusions are presented below.

DRO – Within the 95 percent confidence level, DRO meets both the "under 40-inch zone" and "over 40-inch zone" criteria. Additionally, as allowed under the regulation, DRO can be evaluated as its constituent parts, aliphatic DRO, and aromatic DRO, to obtain a more in-depth understanding of the potential effects of DRO in soil. Upon performing this analysis, it was found that both aromatic DRO and aliphatic DRO were within criteria. Therefore, it was concluded that Anchorage street sweepings meet the soil criteria for DRO.

Total arsenic – Total arsenic (As) in street sweepings exceeded soil criteria; however, no significant source of arsenic contamination was identified. Total arsenic in Anchorage street sweepings of 1.89 to 5.0 mg/kg is comparable to or below the background concentration in Alaska soils, which is reported as ranging from 10 mg/kg to 750 mg/kg with an arithmetic mean of 9.6 mg/kg of total arsenic. Therefore, it was concluded that total arsenic in the Anchorage street sweepings was attributable to background levels of arsenic in the sand and gravel used to sand Anchorage streets and would not restrict Anchorage street sweepings from being designated an exempt waste.

Total chromium –Total chromium (Cr) in street sweepings exceeded the soil criteria, based on the assumption that all chromium is present as Cr VI. As allowed under the regulation, chromium can be evaluated as its constituent parts, CrIII and CrVI, to obtain a more in-depth understanding of the potential effects of chromium in soil. Upon analysis and evaluation, it was determined that most chromium in Anchorage street sweepings is present in the relatively non-toxic Cr III form. The concentration of Cr VI was found to be below soil criteria. Therefore, it was concluded that Anchorage street sweepings meet the criteria for total chromium.

Benzo (a) pyrene – The detected range of benzo(a) pyrene concentrations slightly exceeded the "under 40-inch zone criteria. However, within a 95 percent confidence level, the range of benzo (a) pyrene concentrations meets criteria for both the "over 40-inch zone" and "under 40-inch zone." Therefore, it was concluded that Anchorage street sweepings meet the criteria for benzo (a) pyrene.

Thus, Anchorage street sweepings were deemed to meet the criteria in 18 AAC 60.005(c)(15) for excluded waste.

Table A-1 Chemical and Physical Characteristics of Anchorage Street Sweepings

Parameter (Method Number)	Units	Detected Range	Range (95 Percent Confidence Level)	Contaminated Soil Criteria (Under 40-inch zone)	Contaminated Soil Criteria (MTGW Over 40-inch zone)	RCRA Toxicity Characteristic	Analytical Data Source Document
PETROLEUM HYDROCARBONS							
DRO[1] (AK 102)	mg/kg	140-270	165-230	250	230	--	a
DRO Aromatic	mg/kg	31.9-71.0	37-56	100	90	--	b
DRO Aliphatic	mg/kg	134-608	148-368	7,200	6,400	--	b
RRO[1] (AK 103)	mg/kg	1,300-2,200	1,604-2,096	10,000	9,700	--	a
Benzene	mg/kg	ND (0.02)	ND (0.02)	0.02	0.02	--	b
TOTAL METALS							
Chloride	mg/kg	13-330	0-255	NA	NA	--	a
Arsenic (total)	mg/kg	1.89-5	3.1-4.0	2.0	1.8	--	a, b
Barium (total)	mg/kg	20.6-56	37-52	1,100	982	--	a
Cadmium (total)	mg/kg	0.142-0.31	0.2-0.3	5	4.5	--	a
Chromium (total)	mg/kg	17-36	22-26.3	26	23	--	a, b
Chromium VI (total)	mg/kg	ND(0.6)-1.6	ND(0.5)-1.0	26	23	--	b
Copper (total)	mg/kg	21-56	22-39	NA	NA	--	a
Lead (total)	mg/kg	8.5-34	13-24	400	400	--	a
Mercury (total)	mg/kg	0.025-0.12	0.1-0.1	1.4	1.24	--	a
Selenium (total)	mg/kg	0.209-0.58	0.2-0.4	3.5	3.0	--	a
Silver (total)	mg/kg	0.0854-1.2	0.6-1.1	21	19	--	a
Zinc (total)	mg/kg	60-140	66-109	9,100	8,100	--	a
LEACHABLE METALS (Calculated Maximum[2])							
Arsenic (leachable)	mg/l	0.25[2]	--	--	--	5.0	a, b
Barium (leachable)	mg/l	2.8[2]	--	--	--	100.0	a
Cadmium (leachable)	mg/l	0.016[2]	--	--	--	1.0	a
Chromium (leachable)	mg/l	1.3[2]	--	--	--	5.0	a, b
Lead (leachable)	mg/l	1.7[2]	--	--	--	5.0	a
Mercury (leachable)	mg/l	0.006[2]	--	--	--	0.2	a
Selenium (leachable)	mg/l	0.029[2]	--	--	--	1.0	a
Silver (leachable)	mg/l	0.06[2]	--	--	--	5.0	a

Table A-1 (cont.) Chemical and Physical Characteristics of Anchorage Street Sweepings

Parameter (Method Number)	Units	Detected Range	Range (95 Percent Confidence Level)	Contaminated Soil Criteria (Under 40-inch zone)	Contaminated Soil Criteria (MTGW Over 40-inch zone)	RCRA Toxicity Characteristic	Analytical Data Source Document
POLYNUCLEAR AROMATIC HYDROCARBONS (PAH)							
Naphthalene	mg/kg	ND(0.170)-ND(0.390)	ND(0.198)-ND(0.386)	43	38	--	a
Acenaphthene	mg/kg	0.045-0.180	0.078-0.172	210	190	--	a
Fluorene	mg/kg	0.044-0.230	0.074-0.196	270	240	--	a
Anthracene	mg/kg	0.016-0.420	0.000-0.283	4,300	3,900	--	a
Fluoranthene	mg/kg	0.120-3.200	0.000-2.092	2,100	1,900	--	a
Pyrene	mg/kg	0.140-2.000	0.000-1.347	1,500	1,400	--	a
Benzo(a)anthracene	mg/kg	0.050-1.200	0.000-0.791	6	5.5	--	a
Chrysene	mg/kg	0.150-1.400	0.033-0.955	620	550	--	a
Benzo(b)fluoranthene	mg/kg	0.072-2.600	0.000-1.709	11	17	--	a
Benzo(k)fluoranthene	mg/kg	0.038-2.600	0.000-1.708	110	170	--	a
Benzo(a)pyrene	mg/kg	0.044-1.100	0.000-0.735	1	2.4	--	a
Indeno(1,2,3-CD)pyrene	mg/kg	0.030-0.390	0.008-0.266	11	50	--	a
Dibenzo(a,h)anthracene	mg/kg	0.016-0.190	0.003-0.128	1	5	--	a
PATHOGENS							
Fecal coliform	MPN/g	ND(<2)-150[3]	--	--	--	--	c

Key:
1. DRO and RRO results obtained using obsolete EPA 8000 series methods are not included in this table.
2. Calculated maximum level of leachable metals is calculated as the maximum total metal concentration divided by 20, the quantity of extraction fluid used to leach the solid sample via EPA Method 1311. This value reflects 100 percent leaching of metal into the extraction fluid.
3. Data qualified as an estimate because it did not meet the established quality control criteria is not included. In the absence of directly applicable criteria, the sewage sludge criteria for pathogens (40 CFR 503.32) were used as a relevant benchmark for fecal coliform criteria in street sweepings. Sewage sludge criteria are: 1,000 MPN/g for unrestricted use and 2,000,000 MPN/G for restricted use.

DRO – diesel range organics
mg/kg – milligram per kilogram
mg/l – milligram per liter
MPN/g – most probable number per gram
MTGW – Migration to groundwater
-- – not applicable
ND(_) – not detected at the detection limit identified in the parentheses.
RCRA – Resource Conservation and Recovery Act
RRO – residual range organics

Analytical Data Source Documents:
a. – "Characterization and Assessment for Options for Managing Materials Generated During Street Cleaning Activities in Anchorage, Alaska," Hart Crowser, May 2000.
b. – "Addendum to Characterization and Assessment for Options for Managing Materials Generated During Street Cleaning Activities in Anchorage, Alaska," Hart Crowser, June 28, 2000.
c. – "Fecal Coliform in Street Sediments: 2001 Data Report," Document No. WMP APr01005, Municipality of Anchorage Watershed Management Section, October 2001.

Table 1 - September 1999 Analytical Results

Sample No.	Location	Type	DRO (AK 102)	RRO (AK 103)	SPLP DRO** (mg/L) (EPA 1312/AK102)	Chloride (EPA 300.0)	Percent Moisture (CLP SOW ILM04.0)
ADOT-1-9/99	Tudor Rd.	Storm Drain	130	1,000	0.24 U	42	7.7
ADOT-2-9/99	Tudor Rd.	Street Sweep	140	1,300	0.24 U	330 D3	3.4
MOA-1-9/99	Klatt	Street Sweep	150 J	1,300			8.4
MOA-2A-9/99	Northwood	Street Sweep	170 J	1,900	0.24 U	67	7.7
MOA-2B-9/99	Northwood	Street Sweep	230	2,100			14
MOA-3-9/99	Northwood	Vactor	270	2,100			7.8
MOA-4-9/99	Northwood	Oil Separator	180 J.	1,500	0.25 U	4.0	7.1
MOA-5-9/99	Tudor Snow	Street Sweep & Vactor	220	1,900	0.24 U	18	11
MOA-7-9/99	Sitka	Street Sweep	210 J	2,200			12
MOA-8-9/99	Commercial	Street Sweep	210 J	2,000	0.24 U	13	8.5

Sample No.	Location	Type	Total Arsenic (EPA 7060)	Total Barium (EPA 6010)	Total Cadmium (EPA 6010)	Total Chromium (EPA 6010)	Total Copper (EPA 6010)	Total Lead (EPA 6010)	Total Mercury (EPA 7471A)	Total Selenium (EPA 7740)	Total Silver (EPA 6010)	Total Zinc (EPA 6010)
ADOT-1-9/99	Tudor Rd.	Storm Drain	2.70	49.6	0.259	23.4	25 E	35.4	0.162	2.01 U	0.0403 U	240 E
ADOT-2-9/99	Tudor Rd.	Street Sweep	1.89	20.6	0.142	21.9	29 E	24.7	0.0252	0.209 U	0.0854	74 E
MOA-1-9/99	Klatt	Street Sweep	3.7	49	0.27 U	20	21	8.5 E	0.11 U	0.29 U	1.1 U	60 E
MOA-2A-9/99	Northwood	Street Sweep	2.8	56	0.28 U	26	26	15 E	0.11 U	0.28 U	1.1 U	65 E
MOA-2B-9/99	Northwood	Street Sweep	4.1	47	0.31 U	23	22	34 E	0.12 U	0.31 U	1.2 U	140 E
MOA-3-9/99	Northwood	Vactor	3.8	40	0.28 U	17	56	16 E	0.11 U	0.28 U	1.1 U	110 E
MOA-4-9/99	Northwood	Oil Separator	14	54	0.27 U	19	21	20 E	0.11 U	0.27 U	0.54 U	430 E
MOA-5-9/99	Tudor Snow	Street Sweep & Vactor	4.4	44	0.28 U	22	41	12 E	0.11 U	0.58 U	1.1 U	120 E
MOA-7-9/99	Sitka	Street Sweep	2.5 S	43	0.30 U	20	23	17 E	0.11 U	0.28 U	0.60 U	66 E
MOA-8-9/99	Commercial	Street Sweep	3.5	54	0.26 U	21	24	19 E	0.11 U	0.26 U	0.53 U	67 E

Notes: All results in mg/kg except where noted.

D3 = Value from a 5-fold dilution analysis

E = Serial dilution outside of required control limits

J = Estimated value

S = Value determined from Method of Standard Additions (MSA)

U = Undetected at the reported concentration

** = The laboratory also evaluated the RRO in the leachate and determined that it was undetectable at the reporting limit of 0.75 mg/L

DRO = Diesel range organics

RRO = Residual range organics

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Source: "Characterization and Assessment for Options for Managing Materials Generated During Street Cleaning Activities in Anchorage, Alaska" HartCrowser, May 2000.

Note: Sample No. ADOT-1-9/99 and MOA-4-9/99 are not included as Street Sweepings.

Table 2: September 1999 Polynuclear Aromatic Hydrocarbon Analytical Results

Sample #	Location	Type	Naphthalene		Acenaphthylene		Acenaphthene		Fluorene	
ADOT-1-9/99	Tudor Rd.	Storm Drain	0.180	U	0.180	U	0.045	J	0.044	J
ADOT-2-9/99	Tudor Rd.	Street Sweep	0.170	U	0.170	U	0.170	U	0.170	U
MOA-2A-9/99	Northwood	Street Sweep	0.360	U	0.360	U	0.110	J	0.110	J
MOA-4-9/99	Northwood	Oil Separator	0.360	U	0.360	U	0.110	J	0.120	J
MOA-5-9/99	Tudor Snow	Street Sweep & Vactor	0.390	U	0.390	U	0.180	J	0.230	J
MOA-8-9/99	Commercial	Street Sweep	0.360	U	0.360	U	0.120	J	0.120	J

Sample #	Location	Type	Phenanthrene		Anthracene		Fluoranthene		Pyrene	
ADOT-1-9/99	Tudor Rd.	Storm Drain	0.140	J	0.034	J	0.190		0.190	
ADOT-2-9/99	Tudor Rd.	Street Sweep	0.070	J	0.016	J	0.120	J	0.140	J
MOA-2A-9/99	Northwood	Street Sweep	0.390		0.100	J	0.460		0.370	
MOA-4-9/99	Northwood	Oil Separator	0.860		0.170	J	1.300		0.930	
MOA-5-9/99	Tudor Snow	Street Sweep & Vactor	2.200		0.420		3.200		2.000	
MOA-8-9/99	Commercial	Street Sweep	0.630		0.130	J	0.870		0.660	

Sample #	Location	Type	Benzo(a)anthracene		Chrysene		Benzo(b)fluoranthene		Benzo(k)fluoranthene	
ADOT-1-9/99	Tudor Rd.	Storm Drain	0.080	J	0.160	J	0.180	JT	0.180	JT
ADOT-2-9/99	Tudor Rd.	Street Sweep	0.050	J	0.150	J	0.072	J	0.038	J
MOA-2A-9/99	Northwood	Street Sweep	0.180	J	0.260	J	0.330	TJ	0.330	TJ
MOA-4-9/99	Northwood	Oil Separator	0.520		0.650		0.510		0.440	
MOA-5-9/99	Tudor Snow	Street Sweep & Vactor	1.200		1.400		2.600	T	2.600	T
MOA-8-9/99	Commercial	Street Sweep	0.350	J	0.500		0.780	T	0.780	T

Sample #	Location	Type	Benzo(a)pyrene		Indeno(1,2,3-CD)pyrene		Dibenzo(a,h) anthracene		Benzo(g,h,i)perylene	
ADOT-1-9/99	Tudor Rd.	Storm Drain	0.085	J	0.042	J	0.016	J	0.065	J
ADOT-2-9/99	Tudor Rd.	Street Sweep	0.044	J	0.030	J	0.026	J	0.045	J
MOA-2A-9/99	Northwood	Street Sweep	0.180	J	0.092	J	0.040	J	0.097	J
MOA-4-9/99	Northwood	Oil Separator	0.470		0.190	J	0.360	U	0.180	J
MOA-5-9/99	Tudor Snow	Street Sweep & Vactor	1.100		0.390	J	0.190	J	0.360	J
MOA-8-9/99	Commercial	Street Sweep	0.360	J	0.130	J	0.055	J	0.120	J

Notes: All results in mg/kg
J = Estimated value
U = Undetected at the reported concentration
T = Sum of benzo (b) and benzo (k) fluoranthene

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Source: "Characterization and Assessment for Options for Managing Materials Generated During Street Cleaning Activities in Anchorage, Alaska" HartCrowser, May 2000.
Note: Sample No. ADOT-1-9/99 and MOA-4-9/99 are not included as Street Sweepings.

Table 1 - April 2000 SCM Sampling Results

Sample	DRO Aromatic (AK 102AA)	DRO Aliphatic (AK 102AA)	Benzene (EPA 8021B)	Total Chromium (EPA 6010B)	Hexavalent Chromium (EPA 7196A)	Total Arsenic (EPA 7060A)
IN SITU						
Fireweed	71.0	608	NA	23.4	0.8	NA
Glenn	51.5	300	NA	26.4	0.9	NA
Collected SCM						
00CM-01	37.7	145	0.02 U	25	0.6 U	4
00CM-02	49.1	216	0.02 U	28	0.6 U	3
00CM-03 (duplicate)	40.9	185	0.02 U	24	0.6 U	5
00NW-01	32.4	134	0.02 U	29	0.6 U	5
00NW-02	31.9	152	0.02 U	24	0.6 U	3
00TR-01	56.5	324	0.02 U	36	1.6	3
ADEC Method Two Cleanup Level (1)	**100**	**7,200**	**0.02**	**26 ****	**26**	**2**

Notes: All values in mg/kg
00CM-03 is a duplicate of 00CM-02
NA - not analyzed
U - Not detected at the detection limit indicated
(1) Most conservative value listed in the Under 40 Inch Zone
** - This cleanup level is based on hexavalent chromium.

Source: "Addendum to Characterization and Assessment of Options for Managing Materials Generated During Street Cleaning Activities in Anchorage, Alaska" , Hart Crowser, June 28, 2000.

Table A-2 Field Duplicate and Associated Primary Samples

Sample Number	Sample Type	Fecal Coliform Concentration (MPN/g)
20-Scoop Duplicates		
A-5a	Primary	ND (<2)
A-5b	A-5a Duplicate (20)	ND (<2)
A-15a	Primary	ND (<2)
A-15b	A-15a Duplicate (20)	2
L-2a	Primary	ND (<2)
L-2b	L-2a Duplicate (20)	ND (<3)
L-12a	Primary	2
L-12b	L-12a Duplicate (20)	2
L-19a	Primary	ND (<2)
L-19b	L-19a Duplicate (20)	ND (<2)
H-3a	Primary	ND (<2)
H-3b	H-3a Duplicate (20)	ND (<2)
H-15a	Primary	ND (<2)
H-15b	H-15a Duplicate (20)	2
H-19a	Primary	14
H-19b	H-19a Duplicate (20)	15
TS-2a	Primary	ND (<2)
TS-2b	TS-2a Duplicate (20)	2
60-Scoop Duplicates		
A-11a	Primary	ND (<2)
A-11b	A-11a Duplicate (60)	150
A-16a	Primary	ND (<2)
A-16b	A-16a Duplicate (60)	ND (<2)
L-14a	Primary	740 J
L-14b	L-14a Duplicate (60)	9700 J
H-16a	Primary	ND (<2)
H-16b	H-16a Duplicate (60)	ND (<2)
15- and 30-Day Hold Duplicates		
A-13a	Primary	2
A-13b	A-13a 15-day hold	ND (<2)
A-13c	A-13a 30-day hold	ND (<2.2)
H-11a	Primary	6
H-11b	H-11a 15-day hold	9.5
H-11c	H-11a 30-day hold	2.3

Key:
MPN/g – most probable number per gram
ND – not detected above practical quantitation limit, which is listed in parentheses.
Numbers in “Sample Type” in parentheses indicate the number of scoops used to make the bulk field sample.

Source: “Fecal Coliform in Street Sediments: 2001 Data Report”, Document No. WMP Apr01005, MOA Watershed Management Section, October 2001.