Storm Water Pollution Prevention Plan For

CIHA Brewsters Multi-Family Housing
Mountain View Subdivision, Block 1, Lot 1B
Anchorage, AK 99508

Operator(s)

Insert Company or Organization Name
Insert Name
Insert Address
Insert City, State, Zip Code
Insert Telephone Number
Insert Fax/Email

SWPPP Contact(s)

Insert Company or Organization Name
Insert Name
Insert Address
Insert City, State, Zip Code
Insert Telephone Number
Insert Fax/Email

SWPPP Preparation Date

3/8/2023

Estimated Project Dates

Start of Construction	Completion of Construction
MM / DD / YYYY	MM / DD / YYYY

APDES Project or Permit Authorization Number:
Construction General Permit, Permit Number AKR100000

RECORD OF SWPPP AMENDMENTS

Date of Revision	Section	Description

OPERATOR PLAN AUTHORIZATION/CERTIFICATION/DELEGATION

(To be signed by Responsible Corporate Officer)

I state that based on my review this SWPPP meets the minimum requirements of the Construction General Permit and that the **[Insert Operator name]** has day-to-day operational control of the project site**. [Insert Operator name]** is responsible for the maintenance and implementation of the SWPPP including inspections, documentation, and application of the Best Management Practices at the site. **[Insert Operator name]** will notify all subcontractors of the requirement of this SWPPP. **[Insert Operator name]** has operational control over the project specifications, including the ability to make changes to the project specifications.

I hereby designate **[Insert Responsible Person(s) Name]**, SWPPP Administrator as my authorized representative. This designee is responsible for the overall operations of the site and will be responsible for the implementation of the Storm Water Pollution Prevention Plan, compliance with the Construction General Permit, selecting and implementing additional Best Management Practices as conditions warrant, and signing all inspection reports required.

I certify under penalty of law that this document and all attachments were prepared under direction of **[Insert Operator name]** in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Insert Operator name

Signature	Date
Printed Name	Title

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APPENDICES

A. Site Maps and Drawings
B. BMP Details
C. Project Schedule
D. Supporting Documentation:
  - Climate & Storm Data
  - Vegetation Growing Data & Clearing Guidelines
  - Impaired Waters & TMDL
  - Endangered Species & Critical Habitat
  - Other Permits or Requirements

E. Delegation of Authority, Subcontractor Certifications
F. Permit Conditions:
  - Copy of Signed Notice of Intent
  - Copy of 2021 Construction General Permit

G. Grading and Stabilization Records
H. Training Records
I. Corrective Action Log
J. Inspection Records Form
K. Monthly Oil Spill Reporting Log

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1.0 PERMITTEE (5.3.1)

Identify permittee and any subcontractors.

1.1 Operator(s)/Contractor(s)

Operator Information				
Organization: Enter Text		Name: Enter Text		Title: Enter Text
Phone: Enter Text	Fax (optional): Enter Text		Email: Enter Text	
Mailing Address:	Street (PO Box): Enter Text			
	City: Enter Text		State: Enter Text	Zip: Enter Text
Area of Control	Day-to-day operational control of those activities at a site which are necessary to ensure compliance with a SWPPP or other permit conditions.			

Owner/Operator Information				
Organization: Cook Inlet Housing Authority		Name: Enter Text		Title: Enter Text
Phone: (907) 793-3000	Fax (optional): (907) 793-3070		Email: Enter Text	
Anchor	Street (PO Box): 3510 Spenard Road #100			
	City: Anchorage		State: AK	Zip: 99503
Area of Control	Operational control over construction plans and specifications, including the ability to make modifications to those plans and specifications.			

1.2 Subcontractors

Subcontractor Information				
Organization: Enter Text		Name: Enter Text		Title: Enter Text
Phone: Enter Text	Fax (optional): Enter Text		Email: Enter Text	
Mailing Address:	Street (PO Box): Enter Text			
	City: Enter Text		State: Enter Text	Zip: Enter Text
Area of Control	Insert Area of Control (if more than one operator at site)			

Repeat as necessary to include all subcontractors.

2.0 STORM WATER CONTACTS (5.3.2)

Qualified Personnel	Responsibility
Storm Water Lead Company Name Address City, State, Zip Code Telephone # Fax/Email	Authority to stop and/or modify construction activities as necessary to comply with the SWPPP and the terms and conditions of the permit.
SWPPP Preparer R&M Consultants, Inc. Carl Hall, PE, AK-CESCL 9101 Vanguard Drive Anchorage, AK 99507 (907) 646-9635 chall@rmconsult.com	Possess the skills to assess conditions at the construction site that could impact storm water quality. Familiar with Part 5 as a means to implement the permit.
Storm Water Inspector Company Name Address City, State, Zip Code Telephone # Fax/Email	Assess conditions at the construction site that could impact storm water quality. Assess the effectiveness of any erosion and sediment control measures selected to control the quality of storm water discharge, and familiar with Part 6 as a means to ensure compliance with the permit.
Monitoring Person (If Applicable) Company Name Address City, State, Zip Code Telephone # Fax/Email	Knowledgeable in the principles and practices of water quality monitoring who is familiar with Part 7 and the monitoring plan for the site and how to conduct water quality sampling, testing, and reporting.
Active Treatment System Operator (If Applicable) Company Name Address City, State, Zip Code Telephone # Fax/Email	Knowledgeable in the principles and practices of treatment systems that employs chemical coagulation, chemical flocculation or electrocoagulation to aid in the treatment of storm water runoff. Familiar with Part 4.5 as a means to implement and comply with the permit.

3.0 PROJECT INFORMATION (5.3.3)

3.1 Project Information

<table>
<tr><td colspan="5">Project Name:
CIHA Brewsters Multi-Family Housing</td></tr>
<tr><td rowspan="4">Location Address:</td><td colspan="2">Street:
Mountain View Subdivision Block 1, Lot 1B</td><td colspan="2">Borough or similar government subdivision:
Municipality of Anchorage</td></tr>
<tr><td colspan="2">City:
Anchorage</td><td>State:
Alaska</td><td>Zip:
99508</td></tr>
<tr><td>Latitude (decimal degree, 5 places):
61.22461</td><td colspan="3">Longitude (decimal degree, 5 places):
-149.80912</td></tr>
<tr><td colspan="4">Determined By: ☑ GPS ☐ Web Map: Enter Text ☐ USGS Topo Map, Scale: Enter Text ☐ Other: Enter Text</td></tr>
</table>

3.2 Project Site Specific Conditions (5.3.3)

Mean annual precipitation based on nearest weather stations (inches): Based on information from the nearest weather station, Anchorage International Airport (50-0280), Alaska, the mean annual precipitation is approximately 15.97 inches. A summary of data is provided in Appendix D1, D2.

Soil Type(s) and Slopes: Generally, within the footprint of the proposed building, the subgrade conditions consist of approximately 9 to 16 feet of well to poorly graded sand with silt and gravel which is medium dense to dense. Underlying the sand is relatively dense well to poorly graded gravel with silt and sand. An approximately one-foot-thick layer of silt was also encountered at approximately 2 feet bgs.

The soils within the footprint of the proposed paved parking/access road areas appear more variable.
The soils encountered at are similar in composition to the soils encountered in at the proposed building location; however, the soils are relatively loose to approximately 12 feet bgs. The soils encountered at borehole IT1 consisted of well to poorly graded gravel with silt and sand. The gravel is relatively dense. A thin layer of silt was encountered at approximately 6 feet bgs. It is likely that some of the existing soils are fill based on the field blow counts; however, the Geotech was unable to discern the fill from native soils during our subsurface exploration efforts.

The site is relatively flat with slopes less than 4H:1V.

Landscape Topography: The site is relatively flat with slopes less than 4H:1V. The northern portion of the site is crowned in the north/south direction and slopes to the east and west. The southern portion of the site generally slopes from east to west.

Drainage Patterns: At The northern portion of the site drains towards the northern, eastern, and western property lines. The southern portion of the site drains to the western and southern property lines. While the post development drainage patterns will be maintained, the net drainage runoff rates and volumes will decrease as part of this project.

Approximate Growing Season: According to the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Alaska Region (Version 2.0) prepared by the U.S. Army Corps of Engineers (September 2007), the growing season for the Cook Inlet eco-region is approximately May 8th to October 5th. A table presenting the growing seasons and timing recommendation for land disturbance are included in Appendix D3, D4.

Type of Existing Vegetation: The site is surfaced with gravel and asphalt and unvegetated.

Historic site contamination evident from existing site features and known past usage of the site: None

4.0 NATURE OF CONSTRUCTION ACTIVITY (5.3.4)

4.1 Scope of Work

The Proposed Action would:

- Demolish remaining existing pavement.
- Demolish existing fencing.
- Disconnect and demolish existing water and sewer connections to the site.
- Construction of associated underground utilities.
- Install new infiltration systems.
- Excavate and backfill at new foundation and pavement areas.
- Construction of a new three-story multi-unit residential structure.
- Construction of paved parking, sidewalks areas and access road.
- Install new landscaping and fencing.

4.2 Project Function (5.3.4.1)

The purpose of the development is to construct a multi-family housing facility with new hardscapes. Parking, drive lanes and pedestrian walkways will be installed to support new tenant operations.

4.3 Support Activities (As Applicable)

Support activities for this project are:

Support Activity	Location	Dedicated	
		Yes	No
Concrete Batch Plant		☐	☐
Asphalt Batch Plant		☐	☐
Equipment Staging Yards		☐	☐
Material Storage Areas		☐	☐
Excavated Material Disposal Areas		☐	☐
Borrow Areas		☐	☐

4.4 Sequence and Timing of Soil-disturbing Activities (5.3.4.2)

Insert Text: Briefly describe the intended sequence and timing of activities that disturb soils at the site.

4.5 Size of property and total area expected to be disturbed (5.3.4.3)

The following are estimates of the construction site:

Total Project Area:...	0.7	acres
Construction-site area to be disturbed:	0.7	acres
Percentage impervious area BEFORE construction:.............	57	%
Runoff coefficient BEFORE construction:	92.3	
Percentage impervious area AFTER construction:	57	%
Runoff coefficient AFTER construction:...............................	96.4	

4.6 Identification of All Potential Pollutant Sources (5.3.4.5)

Potential sources of sediment to storm water runoff: The main potential source of pollution for this project is sediment generated during ground disturbing activities that include, but are not limited to, the following: installation of drainage features and utilities; excavation of the new hardscape soils section, installation of new subsurface infrastructure; grading the construction areas; paving the parking lots; and landscaping.

Potential pollutants and sources, other than sediment, to storm water runoff: Other potential pollutant sources for this project include vehicle and equipment fluids, sanitary waste, BMP material, and general site litter/waste.

Trade Name Material	Storm Water Pollutants	Location
Gasoline	Benzene, toluene, ethylbenzene, total xylenes, methyl tertiary butyl ether, and other related petroleum compounds	Work Truck(s)
Diesel Fuel	Petroleum distillates, trimethylbenzene isomers, naphthalene, cumene, ethylbenzene, and petroleum-related compounds	Work Truck(s) and Equipment
Motor Oil/Hydraulic Oil/Grease	Refined mineral oil and other petroleum-related compounds	Work Truck(s) and Equipment
Antifreeze	Ethylene glycol, propylene glycol, and metals	Work Truck(s)
Solid Waste/ Construction Debris	Trash and debris/waste	Work Truck(s) and Dumpster
Other		

5.0 SITE MAPS (5.3.5)

General location maps for the project site and project site drawings are included in Appendix A. The site maps and drawings will be maintained throughout the duration of the project to document any modifications to the following information:

- Property boundaries and north arrow;
- Areas of earth-disturbing activities;
- Direction of storm water flow and estimated slopes after grading;
- Locations of BMPs during construction;
- Locations of stabilized soils;
- Locations of post-construction BMPs;
- Locations of support activities;
- Locations where authorized non-storm water will be utilized;
- Locations where final stabilization has been accomplished;
- Locations of staging and material storage areas (construction materials, hazardous materials, fuels, etc.);
- Locations of dumpsters and portable toilets; and,
- Locations of stabilized construction exits.

Project progress, changes in BMP locations and other facilities on the project site, will be maintained on project site maps/drawings, as necessary, which are included in Appendix A.

6.0 DISCHARGES

During soil disturbing activities performed at the project site, there is the potential that storm water will transport sediments off site. The potential for the off-site transport of sediment will be reduced using BMPs, which are discussed below in detail in Section 10.0.

6.1 Locations of Other Industrial Storm Water Discharges (5.3.8)

There are no planned Industrial Storm Water Discharges.

6.2 Allowable Non-Storm Water Discharges (1.4.3; 4.3.7; 5.3.9)

Non-storm water discharges will be minimized or reduced to the extent feasible. The types of non-storm water discharges (combined with storm water discharges associated with construction activity) allowed at the project site include the following:

- Water utilized for dust control;
- Potable water, including uncontaminated water line flushing;
- Waters used to wash vehicles where detergents are not used;
- Routine external site wash down where detergents are not used; and,
- Uncontaminated excavation dewatering (these activities will be conducted in accordance with required permits from the MOA Watershed Management and/or AWWU Field Services).

7.0 DOCUMENTATION OF PERMIT ELIGIBILITY RELATED TO TOTAL MAXIMUM DAILY LOADS (3.2, 5.6)

7.1 Identify Receiving Waters (5.3.3.3)

Description of receiving waters: Chester Creek

Description of storm sewer and/or drainage systems: The site will be graded to convey runoff primarily to on-site infiltration systems. The infiltration basins have no outlet, and are sized for the 100-year, 24-hour storm event.

Other: Insert Text

7.2 Identify TMDLs (5.6.1)

Is an EPA-established or approved TMDL published for the receiving water(s) listed in Section 7.1? ☑ Yes ☐ No.

A search of the current Integrated Water Quality Monitoring and Assessment Report found one impairment in the vicinity of the project. Chester Creek is listed as a Category 4a impaired waterbody. Impaired waterbody categories are included in Appendix D5.

Waterbody: Chester Creek
Assessment Unit ID: AK_R_2040108_003
Water Quality Standard: Bacteria
Pollutant Parameter: Fecal coliform, Pathogens
Pollutant Sources: Highway/road/bridge Runoff. Urban Runoff, Industrial.
Approved TMDL: Yes

TMDL: According to EPA, category 4a waterbodies are considered impaired but not needing a TMDL, TMDL has been completed and included in Appendix D6.

Summary of consultation with state or federal TMDL authorities (5.6.2): N/A

Measures taken to ensure compliance with TMDL (5.6.3): Proper handling and disposal of sanitary waste.

8.0 DOCUMENTATION OF PERMIT ELIGIBILITY RELATED TO ENDANGERED SPECIES (3.3, 5.7)

8.1 Information on Endangered or Threatened Species or Critical Habitat (5.7.1)

Are endangered or threatened species and critical habitats on or near the project area? ☐ Yes ☑ No.

Describe how this determination was made: A summary of the search for endangered and threatened species and critical habitats on or near the project area is included in Appendix D7.

Will species or habitat be adversely affected by storm water discharge? ☐ Yes ☑ No.

Provide summary of necessary measures (5.7.5): N/A`

9.0 APPLICABLE FEDERAL, STATE, TRIBAL, OR LOCAL REQUIREMENTS (4.15)

This SWPPP has been prepared in accordance with requirements in the Alaska Pollutant Discharge Elimination System (APDES) General Permit for Discharges from Large and Small Construction Activities (Construction General Permit [CGP]); Permit Number AKR100000, effective date of February 1, 2021. A copy of the CGP is included in Appendix F4.

The contractor will be responsible for obtaining all necessary permits and clearances for material and disposal sites, and/or equipment storage areas in accordance with the ACGP for storm water discharges from construction activities.

Control Measures

All BMPs will be installed and maintained by Contractor. All BMPs will be inspected as defined below. Considerations for selecting and timing BMP installation include the following:

- Project safety;
- Project conditions and the type of work activity in progress;
- Schedule;
- Current and predicted weather; and,
- Suitability of the BMP for the specific application.

The BMPs listed in this section were selected based on the project activities and the environment, and they may be utilized as Temporary, Post Construction, or Final Stabilization BMPs as described. They should be considered a 'toolbox' of options for the project. For this reason, all the BMPs are not shown on the Site Map with BMPs in Appendix A. The BMPs may or may not be used and will depend on specific project site conditions and demands. The BMPs detailed in the Anchorage Stormwater Manual, Volume 2 (December 2017) will be used for this project and BMP details are provided in Appendix B.

10.0 CONTROL MEASURES/BEST MANAGEMENT PRACTICES (4.0; 5.3.6)

10.1 Minimize Amount of Soil Exposed During Construction Activity (4.2.2)

Areas not to be disturbed during construction activities will be clearly identified by flagging or another method of delineation to minimize the potential of unnecessary disturbance. Examples of effective BMPs can be viewed in Appendix B, which were obtained from the Anchorage Stormwater Manual, Volume 2 (December 2017).

BMP Description: Cover and/or stabilize disturbed areas as soon as possible	
BMP Manual/Publication: Anchorage Stormwater Manual, Vol 2, Page H-7	
☐ **Permanent**	☑ **Temporary**
Installation Schedule:	During earth work activity.
Maintenance and Inspection:	<u>Inspection</u>: Look for damage or improperly installed sheeting or temporary stabilization materials. <u>Maintenance</u>: Make repairs to coverings or stabilization methods if any conditions noted under inspection are found.
Responsible Staff:	SWPPP Manager & Superintendent

10.2 Maintain Natural Buffer Areas (4.2.3)

Are stream crossings or waters of the U.S. located within or immediately adjacent to the property? ☐ Yes ☑ No.

10.3 Control Storm Water Discharges and Flow Rates (4.2.5)

Contractor to determine installation of Wattles/Fiber Roll or Silt Fence as perimeter control.

BMP Description: Wattles / Fiber Roll for Erosion and Sediment Control	
BMP Manual/Publication: Anchorage Stormwater Manual, Vol 2, Page H-30-31	
☐ **Permanent**	☑ **Temporary**
Installation Schedule:	Prior to the start of construction activities
Maintenance and Inspection:	Inspection: Check that roll ends remain tightly abutted. Ensure that the rolls are in contact with the soil and are entrenched. Look for scouring underneath the rolls. Look for split, torn, unraveling, or slumping. Check the amount of sediment behind wattle. Check that equipment has not driven over it. Maintenance: If rolls are crushed, torn, slumping or split, the damaged sections must be replaced. Remove sediment accumulated upslope of the roll when it reaches one-half the distance between the top of the fiber roll and the ground surface.
Responsible Staff:	SWPPP Manager & Superintendent

BMP Description: Silt Fence	
BMP Manual/Publication: Anchorage Stormwater Manual, Vol 2, Page H-19-20	
☐ **Permanent**	☑ **Temporary**
Installation Schedule:	Install silt fence as perimeter control from sediment entering sensitive receiving waters prior to excavation / fill in contributing drainage area.
Maintenance and Inspection:	Inspection: Check for continuity, collapse, undermined areas and damage. Inspect fabric for tears, punctures, fraying, weather, and compromised integrity. Confirm that the fence posts are secure. Ensure the fence is keyed in and that there is no undercutting. Look for evidence of sediment or erosion flow leading off the downhill edge of the fence. Note depth of sediment build up at the fence. Look for signs of inadequate protection of off-site sensitive areas. Check for sediment flowing through fence. Check for holes in fence where wire ties are used to secure geotextile fabric to the support post. Maintenance: Install alternate or additional BMPs as needed to prevent sediment traveling to sensitive areas. Replace damaged fabric. Remedy fence sags as needed. Remove accumulated sediment before it accumulates to one-third of the available storage. Dispose of silt waste in approved manner/location. If there is evidence of excessive sedimentation against the silt fence, provide increased erosion control upslope.
Responsible Staff:	SWPPP Manager & Superintendent

10.3.1 Protect Steep Slopes (4.2.6)

Will steep slopes be present at the site during construction? ☐ Yes ☑ No.

10.4 Storm Water Inlet Protection Measures (4.3.1)

Storm drain catch basins are present on the north side of the project site. The BMPs presented below can be utilized to reduce the risk of transporting sediment into the storm drain system until the disturbed areas around the project site are paved or stabilized with vegetation. Curb inlet protection must not be used in areas open to bicycle and motor vehicle traffic. Use of curb inlet protection is appropriate for construction projects near roadways with curb and gutter drainage systems that are closed to traffic.

BMP Description: Catch Basin Inlet Protection	
BMP Manual/Publication: Anchorage Stormwater Manual, Vol 2, Page H-22	
☐ **Permanent**	☑ **Temporary**
Installation Schedule:	Prior to soil disturbing activities.
Maintenance and Inspection:	Inspection: Confirm that the insert is securely fastened. Look for and replace insert material that is torn or frayed. Look for evidence that the sediment or runoff is traveling around and not entering the catch basin.

	Maintenance: The insert should be cleaned when half full of sediment. It should be replaced if torn or frayed. Remove for winter shutdown.
Responsible Staff:	SWPPP Manager & Superintendent

BMP Description: Curb Inlet Protection	
BMP Manual/Publication: Anchorage Stormwater Manual, Vol 2, Page H-28	
☐ **Permanent**	☑ **Temporary**
Installation Schedule:	Prior to soil disturbing activities.
Maintenance and Inspection:	Inspection: Curb inlet protection should be inspected and cleaned regularly. Check sandbags after each storm. Confirm that sandbags are not packed with sediment. Maintenance: Sediment should be removed from behind sandbags after each significant storm to provide adequate storage volume for the next event, and damaged sandbags should be replaced as necessary. All sediment should be removed immediately from the roadway. Remove sandbags in traveled ways before winter freeze up.
Responsible Staff:	SWPPP Manager & Superintendent

10.5 Water Body Protection Measures (4.3.2)

There are no waterbodies on the project site.

10.6 Down-Slope Sediment Controls (4.3.3)

BMPs will be utilized for controlling and reducing storm water flow velocity to minimize erosion along slopes on the project site and to prevent sediment from exiting the site. Commonly used BMPs for downslope sediment controls include, but are not limited to, silt fence, existing vegetation and straw wattles/fiber rolls.

10.7 Stabilized Construction Vehicle Access and Exit Points (4.3.4)

Stabilized construction exits will be installed at all driveway connections between the project site and adjacent roadways where construction equipment and trucks will enter and exit the site.

BMP Description: Stabilized Construction Exit	
BMP Manual/Publication: Anchorage Stormwater Manual, Vol 2, Page H-53	
☐ **Permanent**	☑ **Temporary**
Installation Schedule:	Before traffic begins to enter and exit the construction site
Maintenance and Inspection:	Inspection: Look for surface voids, amount of sediment deposited on top of the gravel, look for mud and gravel deposited on the paved roadways

	Maintenance: Replace gravel material when surface voids are visible, top dress with 2-inch gravel when the pad becomes laden with sediment. Repair and clean out any structures used to trap sediment
Responsible Staff:	SWPPP Manager & Superintendent

10.8 Dust Generation and Track-Out from Vehicles (4.3.5 and 4.3.6)

Debris including soil and rock will be removed from adjacent roadways. Any material tracked will be swept up daily

BMP Description: Dust Control	
BMP Manual/Publication: Anchorage Stormwater Manual, Vol 2, Page H-51	
☐ **Permanent**	☑ **Temporary**
Installation Schedule:	As needed during construction
Maintenance and Inspection:	Inspection: Look for dust clouds forming either due to vehicle or person movement and/or wind Maintenance: Apply water to area until there is no dust being generated, apply as needed
Responsible Staff:	SWPPP Manager & Superintendent

BMP Description: Sweeping	
BMP Manual/Publication: Anchorage Stormwater Manual, Vol 2, Page H-52	
☐ **Permanent**	☑ **Temporary**
Installation Schedule:	Sweep and vacuum to minimize dust and track-out from vehicles as needed.
Maintenance and Inspection:	Inspect streets and sweep up accumulated sediment as needed. Perform routine maintenance before next storm event, when practicable.
Responsible Staff:	SWPPP Manager & Superintendent

10.9 Soil Management (4.3.)

Will soil stockpiles be at the site during construction? ☑ Yes ☐ No.

Excess soil excavated from the construction area and/or clean fill brought on site may need to be temporarily stockpiled on site.

BMP Description: Plastic Covering	
BMP Manual/Publication: Anchorage Stormwater Manual, Vol 2, Page H-14	
☐ **Permanent**	☑ **Temporary**
Installation Schedule:	Plastic covering will be installed when the stockpile will not be actively worked on more than 14 days or when there are windy conditions. Plastic covering will be secured either by weighted or trenched method.
Maintenance and Inspection:	Inspection: Look for unsecured covering or locations of erosion under the covering. Maintenance: Re-secure covering.
Responsible Staff:	SWPPP Manager & Superintendent

10.10 Authorized Non-Storm Water Discharges (4.3.8)

Describe any measures taken to minimize any non-storm water authorized by this permit.

Contractor must minimize any non-storm water authorized by this permit.

Subject to compliance with the terms and conditions of the permit, the list of non-storm water discharges that are authorized under this general permit, provided the non-storm water component of that the discharge is in compliance with the SWPPP requirements in Part 5.3.9 are presented above in Section 6.2.

10.11 Sediment Basins (4.3.9)

Will a sediment basin be required during construction? ☐ Yes, ☑ No.

10.12 Dewatering (4.4)

Will dewatering be conducted during construction? ☐ Yes, ☑ No.

Dewatering is not anticipated. According to the Geotechnical Engineering Report, performed in November 2022, ground water was not encountered, however, should the Contractor determine excavation dewatering is necessary they shall obtain all permit(s) and include the appropriate BMPs in the SWPPP.

Will excavation dewatering be conducted within 1,500 feet of a DEC mapped contaminated site found on the following website? ☐ Yes, ☑ No.

10.13 Soil Stabilization (4.5, 5.3.6.3)

Contractor will consider the deadlines for soil stabilization in the sequencing of the project's construction. Stabilization must be initiated whenever any clearing, grading, excavating, or other earth disturbing activities have ceased permanently on any portion of the site or have temporarily ceased and will not resume for a period exceeding 14 calendar days. This process must be started no later than the end of the next workday following cessation of earth-disturbing activities.

Temporary stabilization must be completed as soon as practicable but no later than 14 calendar days after the initiation of soil stabilization measures. If the temporary stabilization is vegetative, all activities necessary to initially seed or plant the area must be completed. If the temporary stabilization is nonvegetative, the installation or application of all such non-vegetative measures must be complete.

10.14 Treatment Chemicals (4.6; 5.3.6.4)

Will treatment chemicals be used to control erosion and/or sediment during construction? ☐ Yes, ☑ No.

10.15 Active Treatment System Information or cationic treatment chemicals (4.6.7)

Will an ATS or cationic treatment chemicals be used as a control measure at the site? ☐ Yes, ☑ No.

10.16 Good Housekeeping Measures (4.8)

A permittee must design, install, implement, and maintain effective good housekeeping measures to prevent and/or minimize the discharge of pollutants. A permittee must include appropriate measures for any of the following activities at the site.

Consult the ADEC Storm Water Guide or other resources for more information or ideas on BMPs. See also the EPA's National Menu of BMPs at https://www.epa.gov/npdes/national-menu-best-management-practices-bmps-stormwater

10.17 Washing of Equipment and Vehicles (4.8.1)

Will equipment and vehicle washing and/or wheel wash-down be conducted at the site? ☐ Yes, ☐ No.

If YES, describe the control measures to be implemented to comply with CGP Section 4.8.1.

BMP Description: Insert text here

Installation Schedule: Insert text here

Maintenance and Inspection: Insert text here

Responsible Staff: Insert text here

Repeat as needed.

10.17.1 Fueling and Maintenance Areas (4.8.2)

Describe equipment/vehicle fueling and maintenance practices to be implemented to control pollutants to storm water (e.g., secondary containment, drip pans, spill kits, etc.).

Describe spill prevention and control measures to be implemented, including ways to reduce the chance of spills, stop the source of spills, contain and clean up spills, dispose of materials contaminated by spills, and train personnel responsible for spill prevention and control.

Will equipment and vehicle fueling or maintenance be conducted at the site? ☐ Yes, ☐ No.

If YES, describe the control measures to be implemented to comply with CGP Section 4.8.2.

BMP Description: Insert text here

Installation Schedule: Insert text here

Maintenance and Inspection: Insert text here

Responsible Staff: Insert text here
Repeat as needed.

10.17.2 Staging and Material Storage Areas (4.8.3)

Designate areas to be used for staging and material storage areas. Locate such activities, to the extent practicable, away from storm water conveyance channels, storm water inlets, and waters of the U.S.; and minimize the exposure to precipitation and storm water and vandalism for all chemicals, treatment chemicals, liquid products, petroleum products, and other materials that have the potential to pose a threat to human health or the environment.

10.17.3 Washout of Applicators/Containers Used for Paint, Concrete, and Other Materials (4.8.4)

Will washout areas for trucks, applicators, or containers of concrete, paint, or other materials be used at the site? ☑ Yes, ☐ No.

BMP Description: Concrete washout facilities will be considered where and when slurries containing Portland cement concrete (PCC) or asphalt concrete (AC) are generated such as from saw-cutting, coring, grinding, grooving, and hydro-concrete demolition. Concrete washout facilities may also be needed where concrete trucks and other concrete-coated equipment are washed on site, and where mortar-mixing stations exist.

BMP Description: Concrete Washout	
BMP Manual/Publication: Anchorage Stormwater Manual, Vol 2, Page H-42	
Installation Schedule:	Prior to cleaning out a concrete truck onsite
Maintenance and Inspection:	Inspection: Check current filled capacity, check that plastic lining is intact and sidewalls are not damaged, check if regularly used Maintenance: If filled to 75 percent capacity materials need to be removed, if plastic lining is damaged needs to be replaced,
Responsible Staff:	SWPPP Manager & Superintendent

10.17.4 Fertilizer or Pesticide Use (4.8.5)

Will fertilizers or pesticides be used at the site? ☐ Yes, ☑ No.

10.18 Spill Notification (4.9)

Any release of hazardous substance must be reported as soon as the person/s has knowledge of the discharge. To report a spill, call DEC Area Response Team Office at (907)-269-3063 and follow their reporting requirements. Outside of normal business hours, the permittee must call (800)-478-9300 to report a spill.

Oil/Petroleum Release:
To Water:
Any release of oil to water must be reported as soon as the person has knowledge of the discharge.
To Land:
Any release of oil in excess of 55 gallons must be reported as soon as the person has knowledge of the discharge. Any release of oil in excess of 10 gallons but less than 55 gallons must be reported within 48 hours after the person has knowledge of the discharge. A person in charge of a facility or operation shall maintain, and provide to the Department on a monthly basis, a written record of discharge of oil from 1 to 10 gallons. A copy of Monthly Oil Spill Reporting Log is included in Appendix K.

10.19 Construction and Waste Materials (4.8.6, 5.3.7)

Construction debris/waste including demolition materials and removed asphalt and concrete materials will be placed in trucks and will be transported daily to the designated disposal site. Smaller construction debris/wastes may be stored in lockable dumpsters with periodic removal service. Disposal of human/domestic wastes will be managed by a portable toilet rental company.

BMP Description: General Construction Site Waste Management	
BMP Manual/Publication: ADEC Alaska Storm Water Guide, December 2011	
Installation Schedule:	Continuously during construction activities
Maintenance and Inspection:	Inspection: Inspect storage and use areas and identify containers or equipment that could malfunction and cause leaks or spills. Check equipment and containers for leaks, corrosion, support or foundation failure, or other signs of deterioration, and test them for soundness. Maintenance: Immediately repair or replace any that are found to be defective.
Responsible Staff:	SWPPP Manager & Superintendent

11.0 INSPECTIONS (5.4; 6.0)

11.1 Inspection Schedules (5.4.1.2; 6.1; 6.2)

Inspection frequency: SWPPP inspections will occur once every seven calendar days. [Contractor to verify that this is the option they want].

Justification for reduction in inspection frequency, if applicable: In accordance with Section 6.2 of the APDES CGP, the Site Operator may reduce inspection frequency as follows:

- If the entire site is stabilized in accordance with Part 4.5 of the 2021 APDES CGP, the frequency of inspections may be reduced to at least once every 30 calendar days and within 2 business days of the end of a storm event at actively staffed sites that resulted in a discharge from the site;

- If portions of the project site achieve final stabilization in accordance with Part 4.5 of the APDES CGP 2021, but construction activity remains on other portions of the project site, inspections may be suspended for those portions that have achieved final stabilization; however, inspections will be conducted within 2 business days of the end of a storm event;

- If the project is undergoing winter shutdown, inspections may stop 14 calendar days after the anticipated fall freeze-up and must resume at least 21 calendar days prior to the anticipated spring thaw; or,

- If the entire site has achieved final stabilization and a Notice of Termination (NOT) has been submitted, no further inspection requirements apply to the project site.

Estimated date of winter shutdown: Not anticipated

11.2 Inspection Form or Checklist (5.4.1.3; 6.7)

A copy of a blank inspection form is included in Appendix J.

11.3 Corrective Action Procedures (5.4.1.4; 8.0)

The Corrective Action Log will be completed if any of the following conditions exist:

-If the SWPPP Inspector identifies an incident of non-compliance with the SWPPP or APDES CGP;

- If the SWPPP Inspector determines the SWPPP or any part of the SWPPP is ineffective in preventing the erosion, sedimentation, or discharge of pollutants;

- If the SWPPP Inspector determines that any BMP component is damaged, undercut, or unable to effectively perform its intended function;

- If the SWPPP Inspector determines that sediment for any BMP has reached approximately 50 percent of its design storage capacity and the sediment needs to be removed; or,

- If the SWPPP Inspector determines there is a change in conditions, design, construction, operation, or maintenance that could result in the erosion, sedimentation, or discharge of pollutants.

Corrective Action Log

The Corrective Action Log will describe the repair, replacement, and maintenance of BMPs. Action related to the findings of the inspections will reference the specific inspection report. The Corrective Action Log will describe actions taken, date completed, and the person(s) who completed the work. The completed Corrective Action Log will be inserted into Appendix I of the SWPPP.

11.4 Inspection recordkeeping (5.4.2)

Records will be maintained for a minimum period of at least three (3) years after the permit is terminated.

12.0 MONITORING PLAN (If Applicable) (5.5; 7.0)

12.1 Determination of Need for Monitoring Plan

Is there an EPA-established or approved TMDL for Chester Creek? Yes

Is the receiving water listed as impaired for turbidity and/or sediment? ☐ Yes, ☑ No.

13.0 POST-AUTHORIZATION RECORDS (5.8)

Copy of Permit Requirements (5.8.1)

The SWPPP must contain the following documents:

- copy of CGP (5.8.1.1);
- copy or signed and certified NOI form submitted to ADEC (5.8.1.2);
- upon receipt, a copy of letter from ADEC authorizing permit coverage, providing tracking number (5.8.1.3); and

These documents must be included in Appendix F.

13.1 Additional Documentation Requirements (5.8.2)

- Dates when grading activities occur (5.8.2.1; insert in Appendix G).
- Dates when construction activities temporarily or permanently cease on a portion of the site (5.8.2.1.3; insert in Appendix G).
- Dates when stabilization measures are initiated (5.8.2.1.4; insert in Appendix G).
- Date of beginning and ending period for winter shutdown (5.8.2.2; insert in Appendix G).
- Copies of inspection reports (5.4.2; 5.8.2.3; insert in Appendix K).
- Copies of monitoring reports, if applicable (5.8.2.4; insert in Appendix H).
- Documentation in support of chemical-treatment processes (4.6; 5.8.2.6; insert in Appendix H).
- Documentation of maintenance and repairs of control measures (5.8.2.8; 8.1; 8.2; insert in Appendix J).
- Documentation of any rainfall monitoring records (6.7.1.3)

13.1.1 Records of Employee Training (4.14; 5.8.2.7)

General storm water and BMP awareness training for staff and subcontractors:

Training for employees and subcontractors will be provided by "Insert Name of Contractor company "to make them aware of the applicable control measures to be implemented at the project site so that they follow applicable procedures. The training will be documented on a Training Log which is included in Appendix H.

Detailed training for staff and subcontractors with specific storm water responsibilities:

Insert Text

Individual(s) Responsible for Training:

Insert Names, Titles, and Contact Numbers here

14.0 MAINTAINING AN UPDATED SWPPP (5.9)

The permittee must modify the SWPPP, including site map(s), in response to any of the following:

- whenever changes are made to construction plans, control measures, good housekeeping measures, monitoring plan (if applicable), or other activities at the site that are no longer accurately reflected in SWPPP (5.9.1.1);
- if inspections of site investigations by staff or by local, state, tribal, or federal officials determine SWPPP modifications are necessary for permit compliance (5.9.1.2); and
- to reflect any revisions to applicable federal, state, tribal, or local laws that affect control measures implemented at the construction site (5.9.1.3).

14.1 Log of SWPPP Modifications (5.9.2)

A permittee must keep a log showing dates, name of person authorizing the change, and a brief summary of changes for all significant SWPPP modifications (e.g., adding new control measures, changes in project design, or significant storm events that cause replacement of control measures). A form to document SWPPP amendments has been placed at the beginning of this template.

14.2 Deadlines for SWPPP Modifications (5.9.3)

Revisions to the SWPPP must be completed within seven days of the inspection that identified the need for a SWPPP modification or within seven days of substantial modifications to the construction plans or changes in site conditions.

15.0 ADDITIONAL SWPPP REQUIREMENTS (5.10)

15.1 Retention of SWPPP (5.10.1)

A copy of the SWPPP (including a copy of the permit), NOI, and acknowledgement letter from ADEC must be retained at the construction site.

15.2 Main Entrance Signage (5.10.2)

A sign or other notice must be posted conspicuously near the main entrance of the site. The sign or notice must include the permit authorization number assigned to the NOI, Operator Contact Name and phone number for obtaining additional construction site information, and location of the SWPP or name and telephone number of the contact person for scheduling SWPPP viewing times. If the location of the SWPPP or the name and telephone number of the contact person for scheduling SWPPP viewing times has changed (i.e., is different than that submitted to DEC in the NOI), the current location of the SWPPP or name and telephone number of a contact person for scheduling viewing times.

15.3 Availability of SWPPP (5.10.3)

The permittee must keep a current copy of the SWPPP at the site. The SWPPP must be made available to subcontractors, government and tribal agencies, and MS4 operators, upon request.

15.4 Signature and Certification (5.10.4)

The SWPPP must be signed and certified in accordance with the requirements of the CGP Appendix A, Part 1.12. The certification form on page ii of this template meets the requirements of this paragraph.

15.5 Submittal of a Modification to NOI (2.7)

Note: A permittee must file an NOI modification form to DEC (see Permit Part 2.3) to update or correct the following information on the original NOI within 30 calendar days of the change:

- Owner/Operator address and contact information;
- Site information;
- Estimated start or end dates;
- Number of acres to be disturbed; or
- SWPPP location and contact information.

APPENDICES

APPENDIX A – SITE MAPS AND DRAWINGS

APPENDIX B – BMP DETAILS

APPENDIX C – PROJECT SCHEDULE

APPENDIX D – SUPPORTING DOCUMENTATION:

- CLIMATE & STORM DATA
- VEGETATION GROWING DATA & CLEARING GUIDELINES
- IMPAIRED WATERS & TMDL
- ENDANGERED SPECIES & CRITICAL HABITATS
- OTHER PERMITS

APPENDIX E – DELEGATION OF AUTHORITY, SUBCONTRACTOR CERTIFICATIONS

APPENDIX F – PERMIT CONDITIONS:

- COPY OF SIGNED NOTICE OF INTENT
- COPY OF ALASKA CONSTRUCTION GENERAL PERMIT 2021

APPENDIX G – GRADING AND STABILIZATION RECORDS

APPENDIX H – TRAINING RECORDS

APPENDIX I – CORRECTIVE ACTION LOG

APPENDIX J – INSPECTION RECORDS

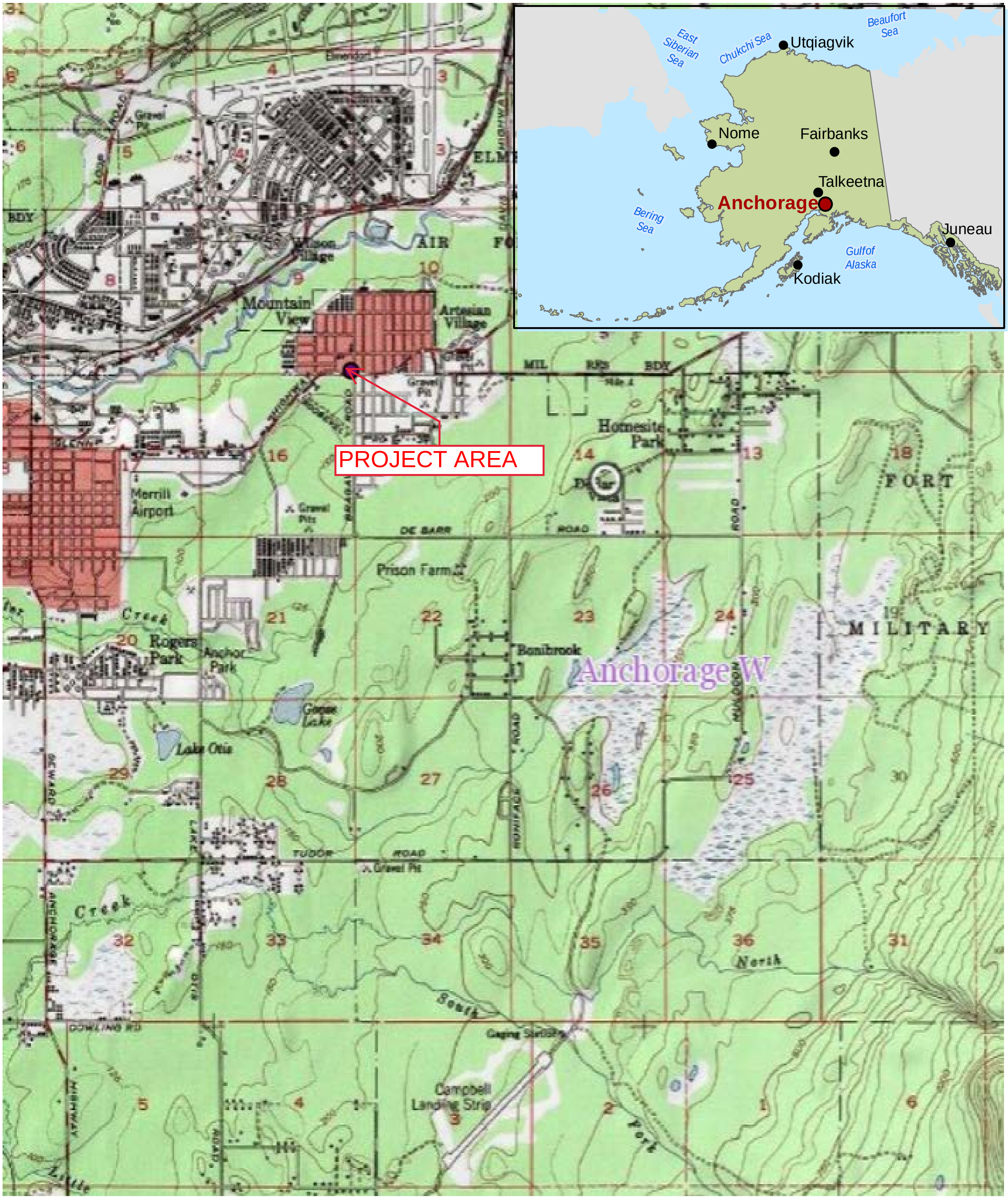
APPENDIX K – MONTHLY OIL SPILL REPORTING LOG

APPENDIX A
DRAWINGS

Location and Vicinity Map A-01

Area Map A-02

ESCP A-03



ALL LOCATIONS ARE APPROXIMATE

0 0.5 1 2

APPROXIMATE SCALE IN MILES

NOTES:

-USGS Quadrangles: Anchorage A-8 NE, 1:36,360 scale

N

R&M CONSULTANTS, INC.

CIHA BREWSTERS MULTI-FAMILY HOUSING
ANCHORAGE, ALASKA

LOCATION AND VICINITY MAP

PROJ.NO:	3026.01
DATE:	MARCH 2023
REF:	SWPPP
DRAWING NO:	A-01

ALL LOCATIONS ARE APPROXIMATE

0 100 200 400

APPROXIMATE SCALE IN FEET

NOTES:
-USGS Quadrangles: Anchorage A-8 NE, 1:63,360 scale

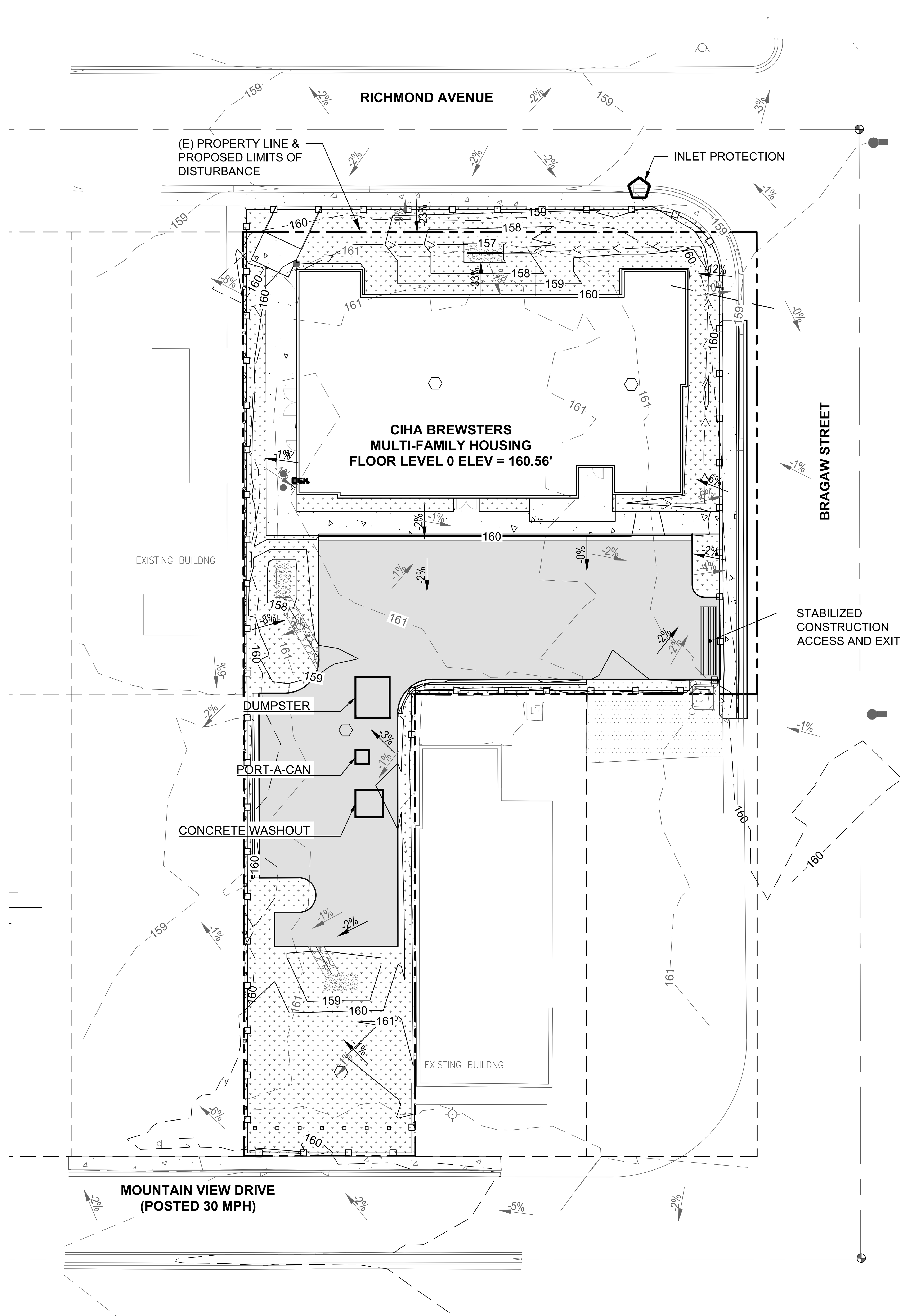
N

R&M CONSULTANTS, INC.

CIHA BREWSTERS MULTI-FAMILY HOUSING
ANCHORAGE, ALASKA

AREA MAP

PROJ.NO:	3026.01
DATE:	MARCH 2023
REF:	SWPPP
DRAWING NO:	A-02



LEGEND

EXISTING	PROPOSED	
X%	X%	SURFACE DRAINAGE DIRECTION
122	122	MAJOR CONTOUR
122	122	MINOR CONTOUR
		PERIMETER CONTROL
		INLET PROTECTION
		AREA OF DISTURBANCE
		ASPHALT
		CONCRETE
		STABILIZED CONSTRUCTION ACCESS
		LANDSCAPING

0 20 40
SCALE IN FEET

GENERAL ESCP NOTES:

1. THIS PLAN SUPPLEMENTS THE WRITTEN STORM WATER POLLUTION PREVENTION PLAN (SWPPP) FOR THIS PROJECT. THIS SITE PLAN WILL BE UPDATED REGULARLY TO REFLECT ACTUAL BMPS IMPLEMENTED IN COMPLIANCE WITH THE ALASKA POLLUTANT DISCHARGE ELIMINATION SYSTEM (APDES). NO EARTHWORK WILL BE ALLOWED ON A SPECIFIC STAGE/PHASE OF THE PROJECT UNTIL SWPPP BMPS HAVE BEEN IMPLEMENTED.
2. PRIOR TO CONSTRUCTION, THE PROJECT LIMITS AND CLEARING LIMITS WILL BE STAKED AND FLAGGED TO ASSURE NATURAL VEGETATION IS MAINTAINED TO THE MAXIMUM EXTENT POSSIBLE.
3. PERIMETER CONTROLS MAY INCLUDE SILT FENCE, FIBER ROLLS, AND/OR VEGETATIVE BUFFER. SPECIFIC BMPS IMPLEMENTED FOR PERIMETER CONTROL AND PROTECTION WILL BE ADDED TO THIS PLAN.
4. BMPS IMPLEMENTED ON THE PROJECT WILL UTILIZE THE SPECIFICATIONS PROVIDED IN THE ANCHORAGE STORMWATER MANUAL, VOL. 2, APPENDIX H - BMP TOOLBOX OR THE DOT&PF ALASKA SWPPP GUIDE WHENEVER POSSIBLE.
5. FUEL WILL NOT BE STORED ONSITE. BMPS WILL BE IN PLACE TO PREVENT THE RELEASE OF FUEL PRODUCT RELATED TO CONSTRUCTION EQUIPMENT OPERATIONS AND MAINTENANCE.
6. ENTRANCE/EXIT BMPS WILL BE ESTABLISHED WHERE VEHICLES WILL TRAVEL ON TO PAVED ROADWAYS FROM A DISTURBED AREA.
7. THE CONTRACTOR IS RESPONSIBLE FOR STAGING AND STOCKPILE AREAS, EITHER ON OR OFF PROPERTY. COORDINATE WITH THE ENGINEER.
8. IMPLEMENT STORM WATER DISCHARGE FLOW CONTROL BMPS (FIBER ROLLS, INLET PROTECTION) WHERE STORM WATER DISCHARGE MAY CONCENTRATE. I.E. FLOW TOWARDS STORM DRAIN SYSTEM INLETS/OUTLETS.
9. THE CONTRACTOR SHALL PROVIDE INLET PROTECTION ON ALL STORM DRAIN STRUCTURES WITHIN 25 FEET OF DISTURBED GROUND. INLET PROTECTION SHALL BE SEQUENCED TO PROTECT EXISTING INLETS AS PROJECT PHASING OCCURS.
10. THE CONTRACTOR SHALL USE WATER TO CONTROL DUST.
11. THE CONTRACTOR SHALL MINIMIZE THE AREA AND TIME PERIOD THAT ERODIBLE SOILS ARE EXPOSED TO STORM WATER. DISTURBED AREAS SHALL BE STABILIZED AS SOON AS PRACTICABLE AFTER DISTURBANCE AND IN ACCORDANCE WITH ALASKA CONSTRUCTION GENERAL PERMIT (ACGP) REQUIREMENTS.

STATE OF ALASKA
Carl E. Hall
Mar 16, 2023
No. CE 10059
REGISTERED PROFESSIONAL ENGINEER

CERTIFICATE OF AUTHORIZATION NO: R&M CONSULTANTS, INC #AECC111

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CIHA BREWSTERS MULTI-FAMILY HOUSING
3825 MOUNTAIN VIEW DRIVE
ANCHORAGE, ALASKA

REVISION SCHEDULE

#	DESCRIPTION	DATE

JOB NO.	3026.01
DATE	2023.03.08
DRAWN	VN
REVIEWED	CH

SHEET NAME
EROSION & SEDIMENT CONTROL PLAN

SHEET NO.
ESCP

HALF SCALE WHEN PRINTED AT 11x17

PERMIT DOCUMENTS

Z:\project\3026.01 SPARK CIHA Brewsters\Civil\ACAD\3026.01-ESCP.dwg

APPENDIX B
BMP's

BMP Details .... 29 pages

EROSION PREVENTION/CONTROL

Scheduling to Minimize Soil Exposure

The short construction season in Anchorage does not always allow flexibility for mass earthwork on each project to be performed at the ideal time of year. Because nothing is more unpredictable than the weather, contingencies must be developed to cover variations in climatic conditions. However, certain weather trends do exist in Anchorage and must be addressed in the project schedule. Care must be taken to minimize weather impacts. Although it may be advantageous to an owner or contractor to work in early spring or late fall, the downside must be understood – BMPs will require more attention and maintenance during these periods. Scheduling is a temporary BMP.

Selection

Any project can benefit from a well-conceived schedule that takes into account seasonal ESC issues.

Implementation

Discussions with the owner or contractor can aid in understanding the construction process in Anchorage and how to take advantage of dry periods to reduce erosion and sediment concerns.

Phased Clearing and Grading

Phased clearing and grading can significantly reduce the amount of disturbed area on a construction site. By phasing the construction, the time that soils are left exposed and the total area that is exposed during the rainy season can be reduced. Phasing the clearing and grading operations is a temporary BMP.

Selection

- Any project can benefit from a schedule that phases the construction to account for ESC issues.
- Discussions with the owner or contractor can aid in understanding the critical construction timelines in Anchorage and how to phase the land clearing construction activities to coincide with periods of expected dry weather.

Implementation

- Show areas to be cleared and graded in phases clearly on the site plan.
- Clear and grade as necessary for immediate construction only.

Maintenance

- Apply erosion control practices to cleared areas.
- Comply with CGP temporary stabilization requirements if the cleared area will not be worked immediately.

Flagging and Fencing of Clearing Limits

Flagging and fencing of clearing limits is the most positive method to ensure that the area of disturbance is controlled. As construction progresses and excavation and stockpiles occur at the site, it is easy to inadvertently expand the area of disturbance into areas to be protected without the presence of visual cues or physical barriers. Delineation of clearing limits is a temporary BMP. Figure I-1 illustrates the flagging and fencing clearing limits BMP.

<u>Selection</u>

Flagging and fencing of clearing limits is applicable for all construction sites.

<u>Implementation</u>

- Designate areas of retained vegetation clearly on the plans. Required buffers should also be designated on the site design plan.
- Delineate the clearing limits with a continuous length of brightly colored tape. Support highly visible tape with vegetation or stakes, 3 to 6 feet high.
- Individual trees and shrubs that are to be preserved within the cleared area should be identified.
- If the area is to be flagged only, the flagging should be spaced no greater than 200 feet apart and closer in wooded or hilly areas.

<u>Maintenance</u>

- Immediately repair or replace damaged fencing or flagging necessary to ensure the area of disturbance does not enlarge should be repaired or replaced.
- Check that vandals have not moved stakes or flagging.
- Make sure that the construction is staying within the clearing limits.

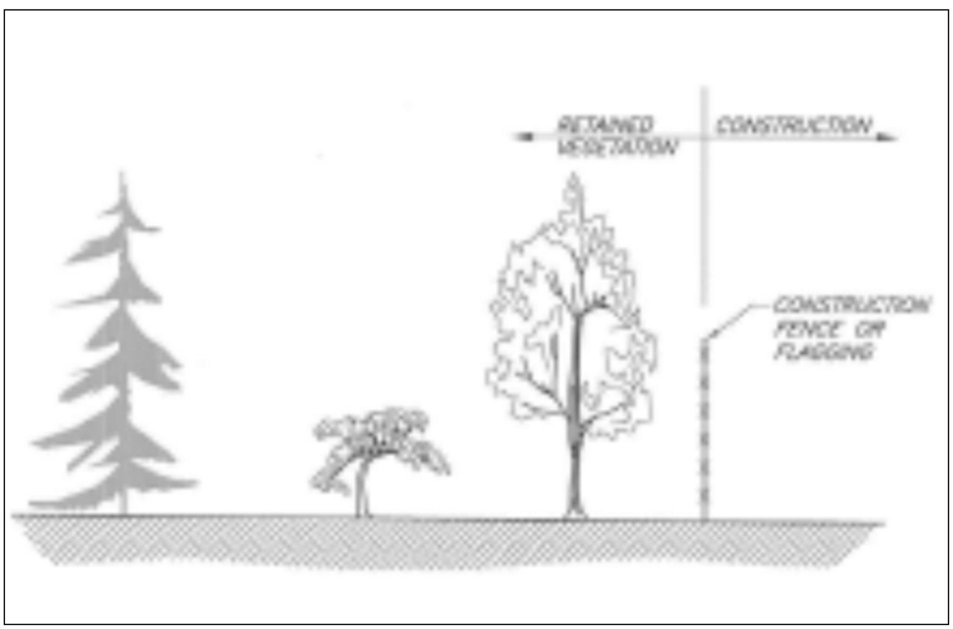


Figure I-1: Flagging and Fencing of Clearing Limits

Surface Roughening

Surface roughening, also called cat-tracking, is used on slopes to provide small pockets for trapping runoff and allowing infiltration. This temporary BMP is shown in Figure I-3. Surface roughening aids in the establishment of vegetation cover by providing a rough soil surface with horizontal depressions.

Selection

Surface roughening works on most sloped areas, except hard pan.

Implementation

- The contractor should run tracked machinery along the fall line of the slope with the blade raised.
- Roughening with tracked machinery needs to be limited to avoid compaction of the soil surface.
- Tracking should be performed in a manner that covers the slope with no more than one foot between tracks.
- Roughened areas should be seeded and mulched immediately.

Maintenance

Surface roughening is a temporary measure and should be inspected and shaped after each rainfall that causes erosion or after no more than 90 days since the last shaping, to minimize erosion.

- Make sure the area is adequately covered with tracking.
- Check for erosion after significant rainstorms. If rills appear, regrade and roughen again and reseed eroded area immediately, as appropriate.

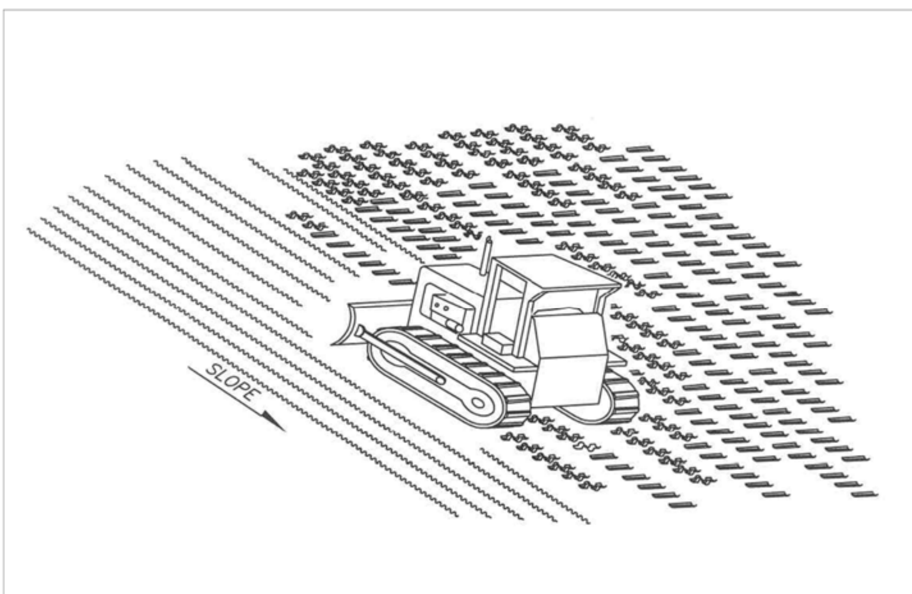


Figure I-3: Surface Roughening

Plastic Covering

Plastic covering, shown in Figure I-4, is used on steep slopes and material stockpiles to reduce erosion. This temporary BMP is a very reliable way to protect from erosion.

Selection

Plastic covering works on many surfaces that require protection from erosion. Clear plastic can be used to promote seed germination. Do not use upslope of areas that might be adversely impacted by concentrated runoff, such as steep or unstable slopes.

Implementation

- Plastic sheeting should have a minimum thickness of 0.06 mm.
- The plastic covering should be secured at the top of slope and should be anchored with tires, sandbags, or other appropriate ballast material to prevent plastic from being blown apart by wind.
- Space weights at a maximum of every 10 feet in all directions.
- Once the sheeting is anchored, secure edging at the top and toe of slope by tucking them into shallow trenches and backfilling.
- The plastic covering should overlap a minimum of one foot between sheets, the overlaps should run perpendicular to the slope, and the seams should be weighted or taped. The plastic covering should extend past the bottom of the slope.

Maintenance

- Check whether anchors are working properly.
- Verify that plastic is secured at the top of slope.
- Look for and replace torn or deteriorated plastic.
- Assure that the seams are taped or weighted and one foot overlap exists.
- Verify that the plastic extends past the top and bottom of slope.
- Remove plastic when it is no longer needed.

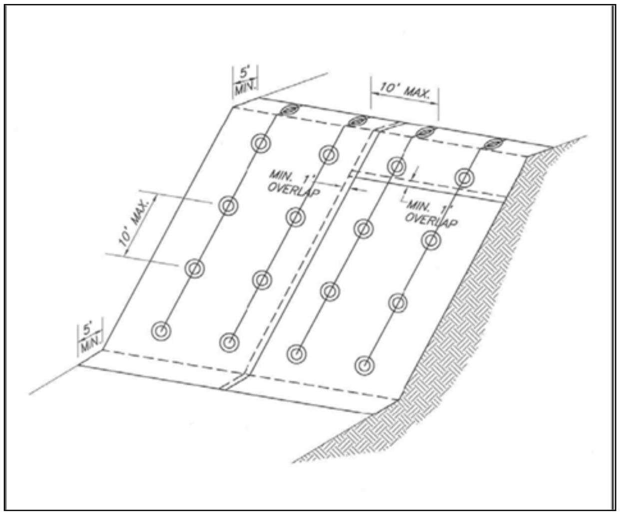


Figure I-4: Plastic Covering

Erosion Control Blankets

Erosion control blankets are used as an alternative to mulch but can also be used to provide structural erosion protection. They aid in controlling erosion on areas by providing a temporary or semi-permanent protective cover made of straw, jute, wood, plant fibers, or artificial products. Figure I-5 depicts the use of erosion control blankets.

<u>Selection</u>

Erosion control blankets function best in providing a protective cover on slopes and channels where the erosion hazard is high and plant growth is likely to be slow; generally on slopes steeper than 3H:1V and greater than 10 feet of vertical relief.

<u>Implementation</u>

- The manufacturer's recommendations for installation should be followed.
- Blankets must be anchored; spacing depends on type of material and slope steepness,
- Maintain a firm continuous contact between the blanket and soil to prevent erosion below the blanket.

<u>Maintenance</u>

When erosion blankets have been installed and anchored properly, little additional maintenance is required during the first few months. After high winds or significant rainstorms have occurred, blanketed areas should be checked for adequate cover and repaired if necessary. The blanket must last until vegetation develops to provide an erosion-resistant cover. After any damaged slope or drainage course has been repaired, the material should be reinstalled.

- Check that surfaces adhere, fasteners remain secure, and covering is in tight contact with soil surface beneath.
- After significant rainstorms, check for erosion and undermining and repair promptly.
- Look for and repair washouts.

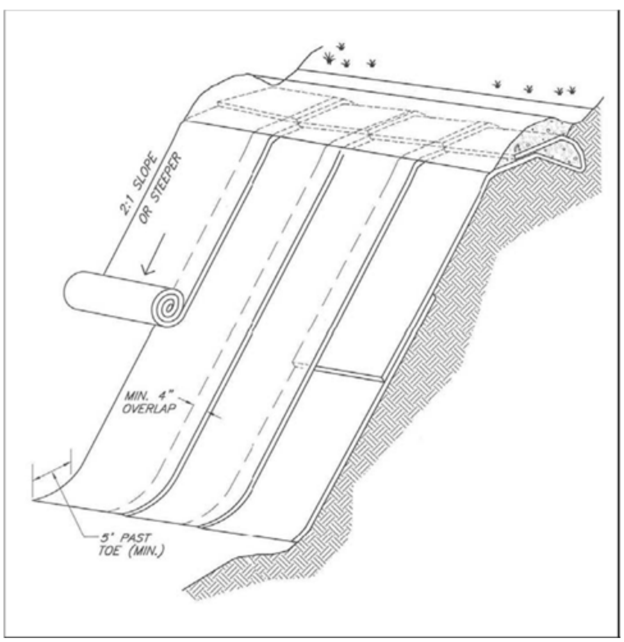


Figure I-5: Erosion Control Blankets

Seeding

Seeding is the establishment of perennial vegetation, usually lawns, on disturbed areas from seed. Seeding can be a temporary or permanent measure.

The seed mixture should be free of weeds and unwanted seeds to prevent invasive plants.

Selection

This practice is used when vegetation is desired for temporary or final stabilization. Temporary seeding is not recommended if permanent seeding will be completed in the same growing season. Other temporary stabilization should be considered.

Implementation

Proper seedbed preparation and the use of high quality seed are essential to the success of this practice.

- Seeding shall take place as soon as practicable after the last ground-disturbing activities in an area, but not during the period August 15 through May 1 unless dormant seeding is used.
- Supplement topsoil as necessary to ensure a minimum of 4 inches of topsoil in areas to be permanently seeded. Work topsoil into the layer below for a depth of at least 6 inches.
- The project plans and specifications produced by the landscape architect or engineer shall be followed.

Maintenance

All seeding should be inspected periodically following installation. Seeded areas should be checked for erosion and flooding after significant rainstorms. Any repairs must be made immediately.

- Water seeded areas daily until initial ground cover is established if rainfall does not provide moisture for seed germination.
- Check the area to ensure the grass is growing; replant at appropriate times if required.
- Look for damage to the seeded area due to runoff and repair before the next runoff event.
- Check for erosion and flooding after significant rainstorms and repair before the next runoff event.

Slope Revegetation

Slope revegetation is used to re-establish a live organic surface on disturbed slopes to inhibit erosion. It is usually a permanent installation on a completed portion of the work, but can be used as a temporary or interim measure. See Figure I-6 for an illustration.

Selection

All disturbed land areas with slopes steeper than 3H:1V should be protected or revegetated to inhibit erosion.

Implementation

The slope revegetation should be completed as early in the planting season as practicable, generally between May and August. The revegetation should occur on adequately prepared areas. This BMP shall not be used in excessively wet or frozen ground conditions.

Maintenance

The slope revegetation should receive adequate moisture through either watering or precipitation to establish a vegetative mat. Eroded areas should be stabilized and reseeded. Diseased or dead areas should be revegetated. Mowing and fertilization should occur to maintain healthy growth.

- Check whether adequate water is being supplied and correct as necessary.
- Look for and correct areas that have eroded.
- Look for dead or diseased areas; remove or treat as necessary.
- Confirm that growth is green and lush.

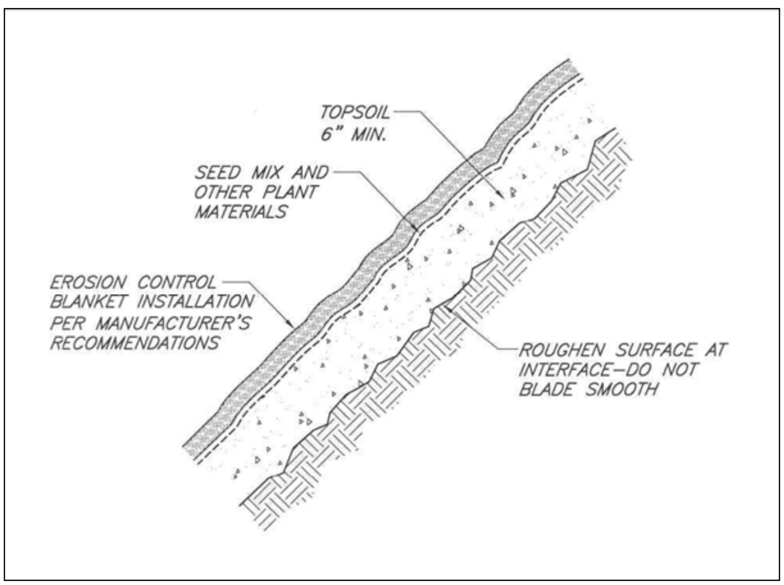


Figure I-6: Slope Revegetation

TEMPORARY SEDIMENTATION CONTROL

Silt Fence

Silt fences are used to filter sediments from sheet flow runoff on sloped areas. The fences can be very effective in removing sediment from runoff. See Figure I-7 for details on this temporary BMP.

Selection

Silt fences are appropriate for the majority of construction sites. The design life a silt fence is six months or less. The maximum contributory sheet flow drainage area shall not exceed 0.25 acres per 100 feet of silt fence. Use of a silt fence is usually more complex, expensive, and maintenance-prone than other slope stabilization measures.

Implementation

Silt fences should be installed at right angles to the slope and along contours. Posts should be securely installed. The filter fabric should be securely attached to the posts. The filter fabric should be keyed into the surrounding earth.

Maintenance

The filter fabric should be kept up to maintain its function. It should be replaced if it is torn or frayed. The posts should be reinstalled if loose. The filter fabric should be reinstalled if it is not keyed into the surrounding earth. The silt fence should be cleaned when sediment accumulates to nine inches in height, and cleaned or replaced when it is covered with sediment.

- Confirm that the fence posts are secure.
- Assure that the filter fabric is securely attached to the fence posts.
- Look for and repair filter fabric that is torn or frayed.
- Check for evidence of runoff overtopping the filter fabric; correct as necessary.
- Verify the silt fence is not leaning over.
- Check for underflow, re-key if necessary.
- Remedy fence sags as needed.

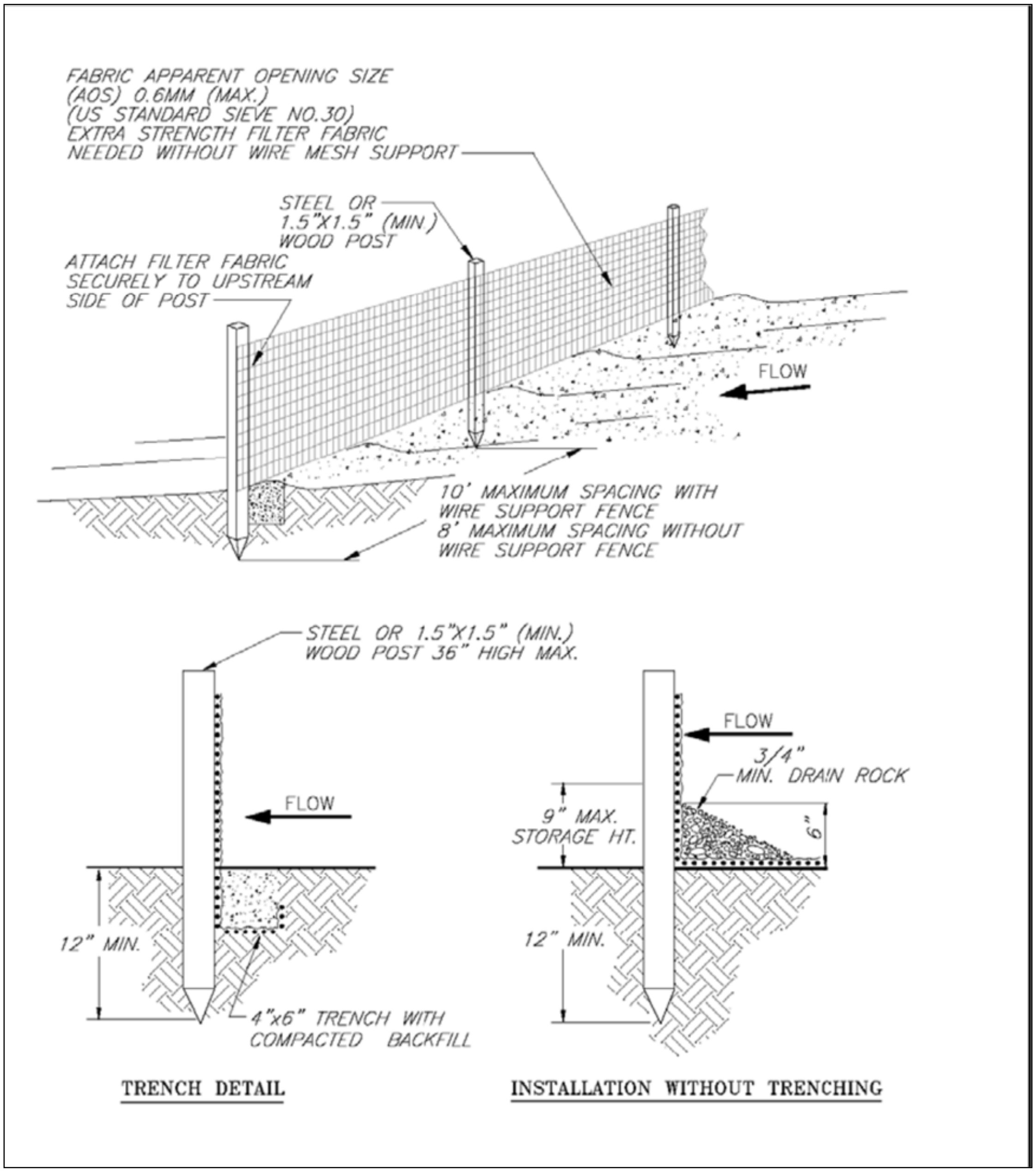


Figure I-7: Silt Fence

Catchbasin Insert

A catchbasin insert is a "sock" made from a porous fabric with an apparent opening size (AOS) U.S. Standard Sieve No. 30 (0.6 millimeter) that is installed in the drainage structure to filter the sediments from the runoff. This temporary BMP is a last line of defense for containing sediments on-site. See Figure I-9 for an illustration.

Selection

Catchbasin inserts are applicable for use on projects where the quantity of sediment anticipated would average 0.1 cubic yards per month or less. The insert should be properly sized for the catch basin and the drainage area and it should allow flow bypass during significant runoff events. Oversized inserts may be difficult to remove when full and, under freezing conditions may cause pipe damage. Inserts that are tapered are easier to maintain.

Implementation

The insert should be installed in a fashion that holds the device securely in place and prohibits it from falling into the catchbasin.

Maintenance

- The insert should be cleaned when half full of sediment. It should be replaced if torn or frayed.
- Confirm that the insert is securely fastened.
- Look for and replace insert material that is torn or frayed.
- Remove sediment or replace the insert if the insert is half full.
- Look for evidence that the sediment or runoff is traveling around and not entering the catchbasin and make corrections as necessary.
- Remove for winter shutdown.

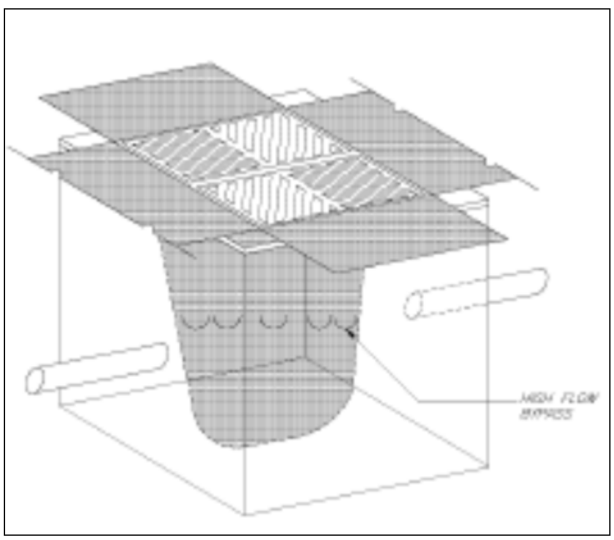


Figure I-9: Catchbasin Insert

Curb Inlet Protection

Curb inlet protection uses sandbags to prevent sediment from entering curb inlet drainage structures. Figures I-13 and I-14 show sample installations of this temporary BMP.

Selection

Curb inlet protection must not be used in areas open to bicycle and motor vehicle traffic. Use of curb inlet protection is appropriate for construction projects near roadways with curb and gutter drainage systems that are closed to traffic.

Implementation

At a minimum, sandbags should be placed upstream of curb inlet.

Maintenance

Curb inlet protection should be inspected and cleaned regularly. Sediment should be removed from behind sandbags after each significant storm to provide adequate storage volume for the next event, and damaged sandbags should be replaced as necessary. All sediment should be removed immediately from the roadway. The sediment should be disposed of in a location where it cannot enter a storm drain or stream, or be transported off site.

- Check sandbags after each storm.
- Confirm that sandbags are not packed with sediment.
- Replace damaged sandbags.
- Remove sandbags in traveled ways before winter freeze up.

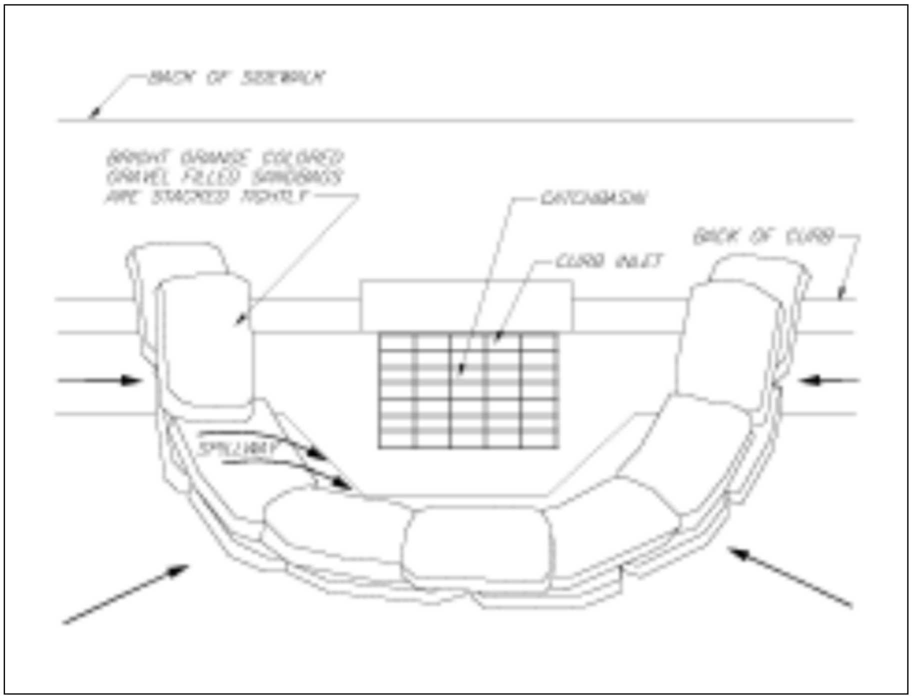


Figure I-13: Curb Inlet Protection

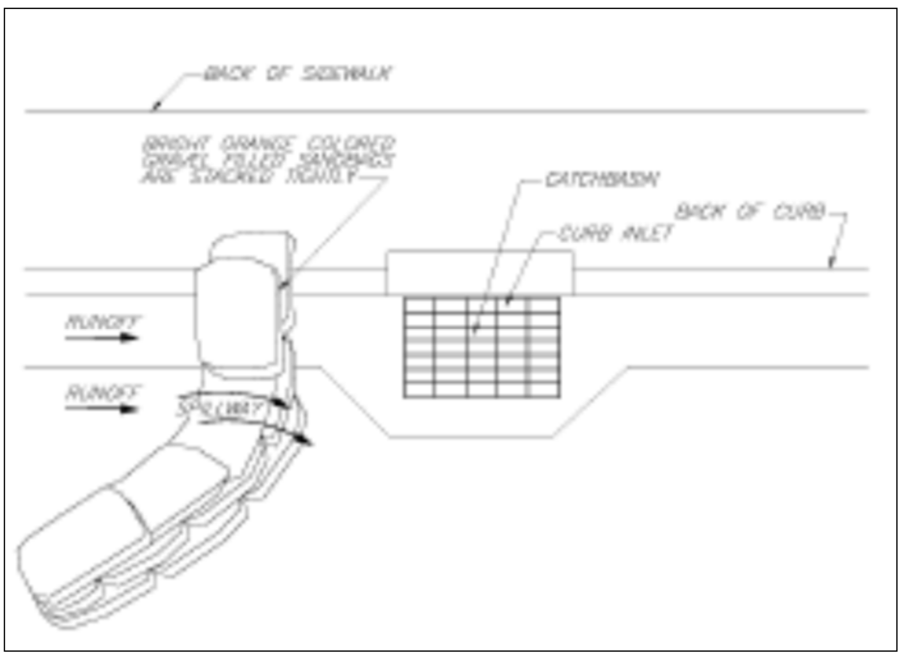


Figure I-14: Curb Inlet Protection

Wattles

Wattles are used to control soil erosion and to filter surface runoff leaving a construction site. Wattles are manufactured from fibers such as straw and coconut. They are typically bound into eight- or nine-inch diameter tubes that are seven to twenty-five feet long. The binding is biodegradable plastic netting allowing the whole structure to decompose over time. See Figure I-15 for an illustration of this temporary BMP.

Selection

Wattles are placed in shallow trenches perpendicular to newly constructed or disturbed slopes. They are useful to break up slope length and thus reduce the potential for erosion on slopes susceptible to sheet and rill erosion.

The use of wattles treated with chemical coagulants or flocculants must be stated in the SWPPP and the location shown on the site plan. Treated wattles will not be allowed near storm drain inlets and at project site stormwater discharge points.

Implementation

Trenches should be deep enough to accommodate half the diameter of the wattle. Wattles must be staked a minimum of every four feet but may require more staking in order to hold them tightly to the soil. Stakes should extend twelve inches into undisturbed soil. Wattles can be left in place to biodegrade. This is a particularly appealing option when live willow stakes have been used in place of rebar or wood stakes. The wattle will hold moisture to help the willow get established, and then will slowly decompose as the plant grows. Wattles can be used in place of silt fences on steep slopes.

Maintenance

Wattles should be inspected once per week on active construction sites, and every two weeks on inactive sites. In addition to this regular inspection routine, inspections should be made after any rainfall event greater than half an inch. Wattles that are no longer in contact with the soil should be restaked. If a wattle becomes too sediment laden to filter runoff then it should be replaced.

- Check that the wattle is properly staked and is in tight contact with the soil surface beneath.
- After significant rainstorms, check for erosion and undermining.
- Check that wattles are securely fastened together.

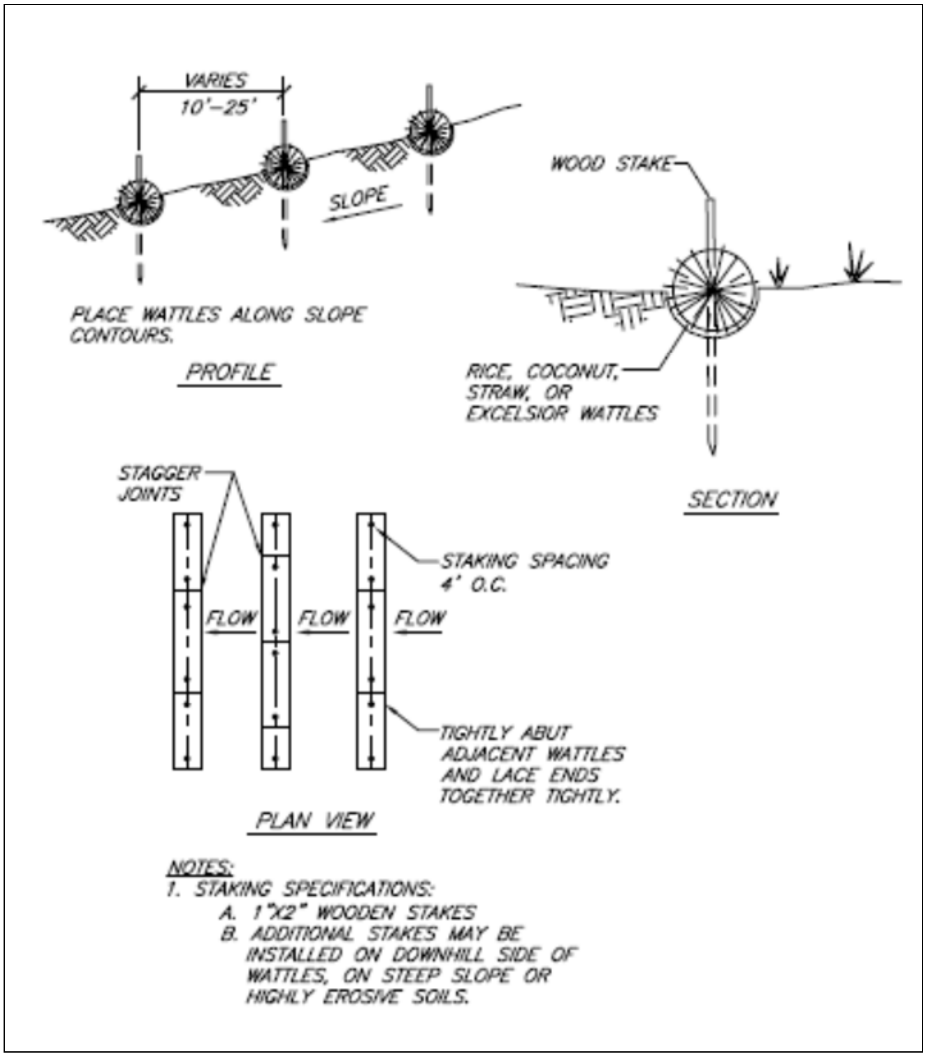


Figure I-15: Wattles

Outlet Protection

Outlet protection can be either a temporary or permanent control that prevents scour at pipe outlets and reduces the velocity of the concentrated discharge. Guidelines for implementation of outlet protection are shown in Figure I-21.

Selection

Outlet protection is applicable wherever high-velocity discharge must be released on erodible soils. A lined apron is the most commonly used practice for this purpose because of its low cost and ease of installation. Select the gravel or riprap diameter based on the design flow velocity (refer to the MOA Design Criteria Manual Chapter 2). Stilling basins or plunge pools should be considered in lieu of aprons where pipe outlets are perched or where high flows would require excessive apron length.

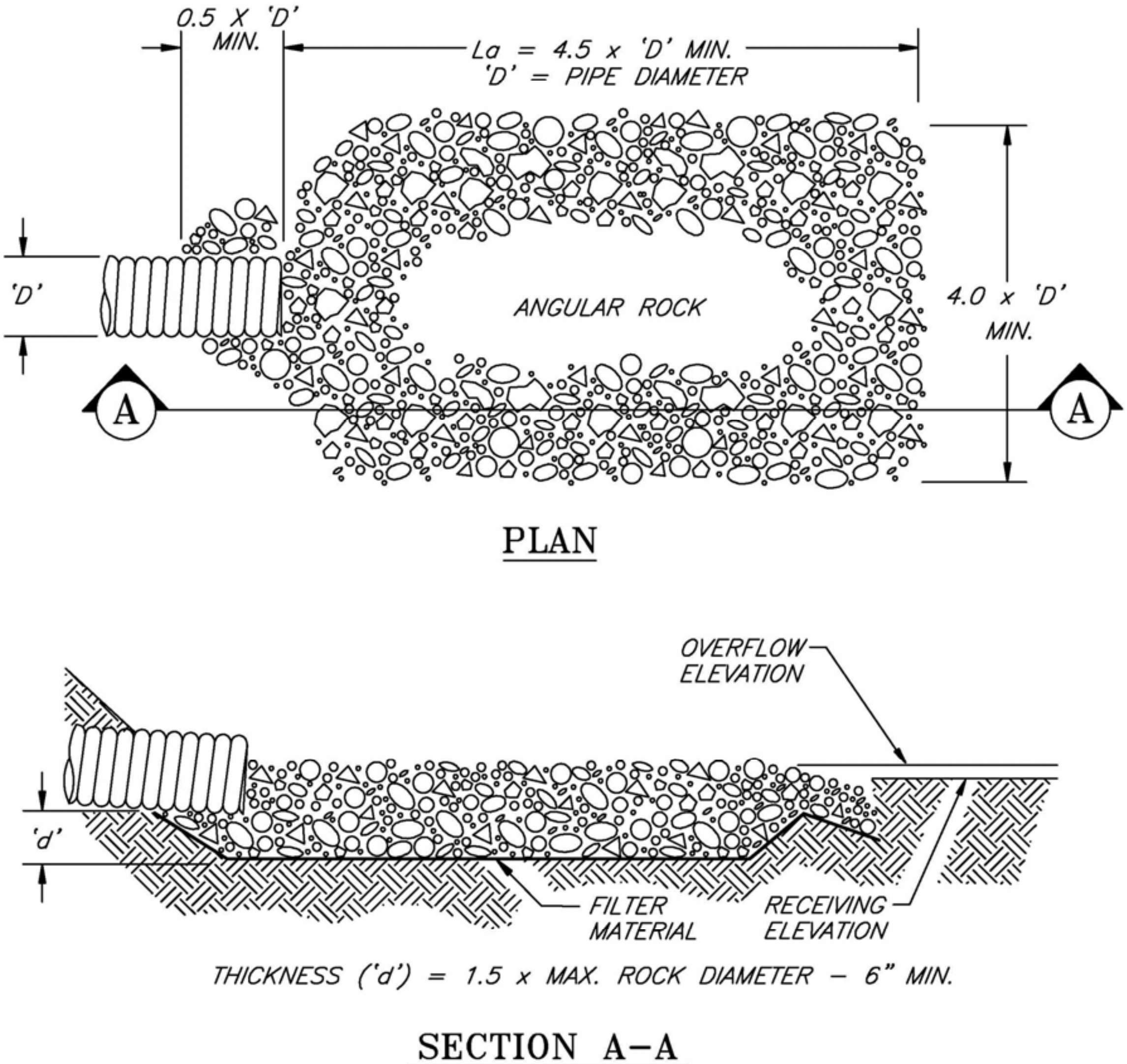
Implementation

The installation must conform to the required lines and grades shown in the plan. All elements of the outlet protection installation should follow the plans and specifications. Designs will vary based on discharge specifics and receiving area conditions.

Maintenance

Outlet protection should be inspected after heavy rains to see if any erosion has occurred or if rock has been dislodged. All repairs should be made immediately to prevent further damage.

- Look for and correct erosion at the outlet.
- Check that rocks are in place and replace them as necessary.
- Ensure that any geotextile installed is in working order.
- Remove sediment when it fills the voids between rocks.



NOTES:

1. 'La' = LENGTH OF APRON. DISTANCE 'La' SHALL BE OF SUFFICIENT LENGTH TO DISSIPATE ENERGY.
2. APRON SHALL BE SET AT A ZERO GRADE AND ALIGNED STRAIGHT.
3. FILTER MATERIAL SHALL BE FILTER FABRIC OR 6" THICK MINIMUM GRADED GRAVEL LAYER.

Figure I-21: Outlet Protection

CONSTRUCTION ACTIVITIES CONTROL

Stockpile Topsoil and Reapply to Revegetate Site

Because of the high organic content of topsoil, it cannot be used as fill material or under pavement, and is typically removed. Since topsoil is essential to establish new vegetation, it should be stockpiled and then reapplied to the site for revegetation, if appropriate. Unprotected stockpiles are very prone to erosion and therefore must be protected. Small stockpiles can be covered with a tarp to prevent erosion. Large stockpiles should be stabilized by erosion blankets, seeding, and/or mulching.

Concrete Washout

Concrete waste management includes procedures and practices that minimize or eliminate the discharge of concrete waste materials to the storm drain systems or watercourses.

Selection

Concrete washout facilities should be considered on construction projects where

- Slurries containing Portland cement concrete (PCC) or asphalt concrete (AC) are generated, such as from sawcutting, coring, grinding, grooving, and hydro-concrete demolition
- Concrete trucks and other concrete-coated equipment are washed on site, and
- Mortar-mixing stations exist.

Implementation

- Temporary concrete washout facilities shall be located a minimum of 50 ft from storm drain inlets, open drainage facilities, and watercourses,
- Each facility shall be located away from construction traffic or access areas to prevent disturbance or tracking.
- Install a sign adjacent to each washout facility to inform concrete equipment operators to utilize the proper facilities.
- Plastic lining material shall be a minimum of 10-mil polyethylene sheeting and shall be free of holes, tears or other defects that compromise the impermeability of the material.
- The soil base shall be prepared free of rocks or other debris that may cause tears or holes in the plastic lining material.
- Temporary washout facilities shall have a temporary pit or bermed areas of sufficient volume to completely contain all liquid and waste concrete materials generated during washout procedures.

Maintenance

- Supervise onsite concrete working tasks, such as saw cutting, coring, grinding and grooving to ensure proper methods are implemented.
- Vacuum slurry residue and dispose in a temporary facility and allow slurry to dry. Dispose of dry slurry residue and concrete wastes as solid waste.
- Temporary concrete washout facilities shall be maintained to provide adequate holding capacity with a minimum freeboard of 4 inches for above grade facilities and 2 inches for below grade facilities.
- Maintaining temporary concrete washout facilities shall include removing and disposing of hardened concrete and returning the facilities to a functional condition.
- Existing facilities must be cleaned, or new facilities must be constructed and ready for use once the washout is 75% full.
- Temporary concrete washout facilities shall be inspected for damage (i.e. tears in PVC liner, missing sand bags, etc.). Damaged facilities shall be repaired.

Dewatering Controls

Definition and Purpose

Dewatering controls are practices that manage the discharge of pollutants when non-stormwater and accumulated precipitation (stormwater) must be removed from a work location so that construction work may be accomplished.

Controls are required to ensure that water that is discharged to surface waterbodies or the storm drain system meets water quality standards and does not cause erosion or flooding.

Appropriate Applications

- These practices are implemented for discharges of non-stormwater and stormwater (accumulated rain water) from construction sites. Non-stormwater includes, but is not limited to, groundwater, dewatering of piles, water from cofferdams, water diversions, and water used during construction activities that must be removed from a work area.
- Practices identified in this section are also appropriate for implementation when managing the removal of accumulated precipitation (stormwater) from depressed areas at a construction site.
- Excavation dewatering options include:
  - Haul it off for proper disposal elsewhere
  - Discharge to sanitary sewer (requires permit from AWWU)
  - Discharge clean water to storm sewer (requires permit from MOA)
  - Discharge to uplands or areas that provide infiltration and no runoff to surface waters
  - Install well points and discharge clean water
  - Provide for settling prior to discharge to storm sewer (requires permit from MOA) or waterbody
  - Provide filtration prior to discharge to storm sewer (requires permit from MOA) or waterbody
- A dewatering plan shall be submitted as part of the SWPPP detailing the location of dewatering activities, equipment, and discharge point. PM&E may require that the planned be stamped by a registered engineer.

Limitations

- Dewatering operations for non-stormwater will require, and must comply with, applicable state permits, project-specific permits, and regulations.
- Discharges to surface water must comply with state of Alaska Water Quality Standards, which can be found in 18 Alaska Administrative Code 70.020.
- Coverage under the Alaska Department of Environmental Conservation (ADEC) General Permit for excavation dewatering is required for discharges that don't otherwise have coverage under the ADEC CGP. More information can be found at: http://www.dec.state.ak.us/water/wwdp/online_permitting/ind_ww_apps.htm.
- Site conditions will dictate design and use of dewatering operations.
- Removal efficiency by settling (sedimentation) depends on particle size, flow rate, water temperature, and other factors. This may not be a treatment option if soil particles are fine. Consult the Design Criteria Manual for additional information on design of sedimentation facilities.
- The controls discussed in this best management practice (BMP) address sediment only. If the presence of polluted water with hazardous substances is identified in the contract, the contractor shall contact the ADEC. If the quality of water to be removed by dewatering is not identified as polluted in the dewatering plan, but is later determined by observation or testing to be polluted, the contractor shall notify PM&E and ADEC.
- Avoid dewatering discharges where possible by using the water for dust control, by infiltration, etc.

- Dewatering discharges must not cause flooding or erosion at the discharge point.
- Dewatering records shall be maintained for a period of 3 years.

Maintenance and Inspection

- Inspect all BMPs implemented to comply with permit requirements frequently and repair or replace to ensure the BMPs function as designed.
- Conduct water quality monitoring pursuant to the "Stormwater Dewatering Operations BMP Discharge Monitoring Forms".
- Accumulated sediment removed during the maintenance of a dewatering device may be incorporated in the project at locations designated in the dewatering plan or disposed of outside the right-of-way in conformance with applicable laws and regulations.
- Accumulated sediment that is commingled with other pollutants must be disposed of in accordance with all applicable laws and regulations.
- Assure that there is no downstream flooding if discharges are made to storm sewers, creeks, or streams.

Summary of Water Quality Standards (see 18 Alaska Administrative code 70.200.)

Maximum Concentrations in Dewatering Effluent

Indicator	**Maximum Concentration or value**
Turbidity	5 nephelometric turbidity units above natural conditions
Total aqueous hydrocarbons	15 microgram/liter
Total aromatic hydrocarbons	10 micrograms/liter
Settleable solids	0.2 milliliters per liter
pH	Between 6.5 and 8.5 pH units
Additives, such as antifreeze or solvents	None in detectable amounts
Toxic substances	None in detectable amounts
Sheen due to grease and oils	None in detectable amounts
Foam in other than trace amounts	None
Garbage, debris, or other contaminants	None in detectable amounts

Sediment Treatment

A variety of methods can be used to treat water during dewatering. Several devices are presented in this section that provide options to achieve sediment removal. The size of particles present in the sediment and receiving water quality limitations are key considerations for selecting sediment treatment option(s); in some cases, the use of multiple devices may be appropriate.

Category 1: Constructed Settling Technologies

The devices discussed in this category are to be used exclusively for dewatering operations only. Removal efficiency depends on particle size, flow rate, water temperature, and other factors. This may not be a treatment option if soil particles are fine. Consult the Design Criteria Manual for additional information on design of sedimentation facilities.

Sediment/Desilting Basin

Description:

A desilting basin is a temporary basin with a controlled release structure that is formed by excavation and/or construction of an embankment to detain sediment-laden runoff and allow sediment to settle out before discharging.

Appropriate Applications:

Effective for the removal of trash, gravel, sand, and silt and some metals that settle out with the sediment.

Implementation:

- Excavation and construction of related facilities is required.
- Temporary desilting basins must be fenced if safety is a concern.
- Outlet protection is required to prevent erosion at the outfall location.

Maintenance:

- Maintenance is required for safety fencing, vegetation, embankment, inlet and outfall structures, as well as other features.
- Removal of sediment is required when the storage volume is reduced by one-third.

Sediment Trap

Description:

A sediment trap is a temporary basin formed by excavation and/or construction of an earthen embankment across a waterway or low drainage area to detain sediment-laden runoff and allow sediment to settle out before discharging.

Appropriate Applications:

Effective for the removal of large and medium sized particles (sand and gravel) and some metals that settle out with the sediment.

Implementation:

- Excavation and construction of related facilities is required.
- Trap inlets shall be located to maximize the travel distance to the trap outlet.
- Use rock or vegetation to protect the trap outlets against erosion.

Maintenance:

- Maintenance is required for vegetation, embankment, inlet and outfall structures, as well as other features.
- Removal of sediment is required when the storage volume is reduced by one-third.

Category 2: Mobile Settling Technologies

These devices are typical of tanks that can be used for sediment treatment of dewatering operations.

Weir Tank

Description:

A weir tank separates water and waste by using weirs. The configuration of the weirs (over and under weirs) maximizes the residence time in the tank and determines the waste to be removed from the water, such as oil, grease, and sediments.

Appropriate Applications:

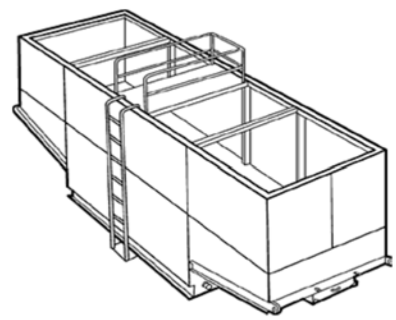
The tank removes trash, some settleable solids (gravel, sand, and silt), some visible oil and grease, and some metals (removed with sediment). To achieve high levels of flow, multiple tanks can be used in parallel. If additional treatment is desired, the tanks can be placed in series or as pre-treatment for other methods.

Implementation:

- Tanks are delivered to the site by the vendor, who can provide assistance with set-up and operation.
- Tank size will depend on flow volume, constituents of concern, and residency period required. Vendors shall be consulted to appropriately size tank.

Maintenance:

- Periodic cleaning is required based on visual inspection or reduced flow.
- Oil and grease disposal must be by licensed waste disposal company.



Weir Tank

Dewatering Tank

Description:

A dewatering tank removes debris and sediment. Flow enters the tank through the top, passes through a fabric filter, and is discharged through the bottom of the tank. The filter separates the solids from the liquids.

Appropriate Applications:

The tank removes trash, gravel, sand, and silt, some visible oil and grease, and some metals (removed with sediment). To achieve high levels of flow, multiple tanks can be used in parallel. If additional treatment is desired, the tanks can be placed in series or as pre-treatment for other methods.

Implementation:

- Tanks are delivered to the site by the vendor, who can provide assistance with set-up and operation.
- Tank size will depend on flow volume, constituents of concern, and residency period required. Vendors shall be consulted to appropriately size tank.

Maintenance:

- Periodic cleaning is required based on visual inspection or reduced flow.
- Oil and grease disposal must be by licensed waste disposal company.

Dewatering Tank

DEWATERING OPERATIONS DISCHARGE MONITORING FORM

GENERAL INFORMATION				
Project Name				
Operator				
Location				
Sampler's Name				
Sampler's Signature				
Date Discharge Began			Date of Sampling	
Size of Pump			Hours of operation	
Time pump started		Time pump shut off		
WATER SAMPLE LOG				
Constituent	**Units**	**Sample Results**		
Turbidity	NTUs			

One sample shall be taken at a point representative of discharge prior to its entering the receiving water. A second sample shall be taken of the receiving water upstream of the discharge point or in the case of receiving waters with low or no flow, prior to discharge at a location representative of the receiving water. Both samples shall be taken during the same day within a reasonable timeframe (i.e., thirty minutes).

DISCHARGE LIMITATION (See Alaska Water Quality Standards in 18 Alaska Administrative Code 70.200)

Constituent	Units	Receiving Water
pH	Standard	between 6.5 and 8.5
Turbidity	NTUs	5 NTU above background

Notes:

Dust Control

Dust control is a temporary BMP that is necessary during dry periods when soil is exposed to wind. This BMP prevents dust from leaving disturbed soil surfaces and falling onto surface waters, which causes sedimentation.

Selection

Dust control is necessary on construction haul routes and disturbed areas.

Implementation

The most common method for dust control is application of water to exposed soil surfaces to reduce the generation of dust, with re-application as needed. Alternate dust control methods include covering and acrylic soil treatments.

Other soil treatments may be acceptable; check with PM&E.

Sweeping

Street sweeping is an effective temporary BMP to prevent construction mud and sediment from entering the stormwater collection system.

Selection

All construction sites shall institute sweeping or equivalent measures to ensure that sediment and mud is not tracked onto roadways.

Implementation

- The haul route within a 500-foot radius of the construction exit, or farther as required, shall be cleaned from curb to curb thoroughly at the end of each day, and more often as necessary to ensure that sediment and mud is not tracked onto roadways.
- The entire haul route shall be cleaned thoroughly from curb to curb each week.
- Sediment shall be removed from roads by shoveling or pickup sweeping and shall be transported to a controlled sediment disposal area. Street washing will be allowed only after sediment is removed in this manner.
- Street sweeping equipment, such as vacuum trucks, must be equipped with an effective baghouse or other filtering devices. The use of sweeping equipment with air pollution control devices that are in disrepair is prohibited.
- Mechanical devices without filtering equipment may be used only when wet sweeping methods are effectively employed.
- Vacuum sweepers must be used with water.
- The use of leaf blowers and other similar equipment for sweeping is prohibited.
- Manual broom sweeping is allowed
- Reasonable measures must be employed to prevent dust from becoming airborne during any operation where particulate matter is handled, transported or stored.
- Control dust and particulate matter to comply with MOA fugitive emissions standards (AMC 15.35.090).

Maintenance

- Each hour during hauling operations, check to see that sediment and mud are not tracked onto the roadways.

Gravel Construction Exit

The gravel construction exit is used to reduce mud and sediment on a roadway adjacent to a construction site. Figure I-23 illustrates this BMP. The gravel acts to remove the excess dirt on dump trucks as they travel across the bumpy surface. Gravel construction exists are a temporary measure used during construction. The effectiveness of this BMP is enhanced when used with a truck wash basin.

Selection

Gravel construction exits are appropriate on all projects where soil is being hauled from the site. Mud on a road can create a safety hazard as well as a sediment problem. If the exit is not preventing sediment from being tracked onto pavement, then alternative measures to keep the streets free of sediment shall be used. This will include street sweeping, an increase in the dimensions of the entrance, or the installation of a truck wash basin.

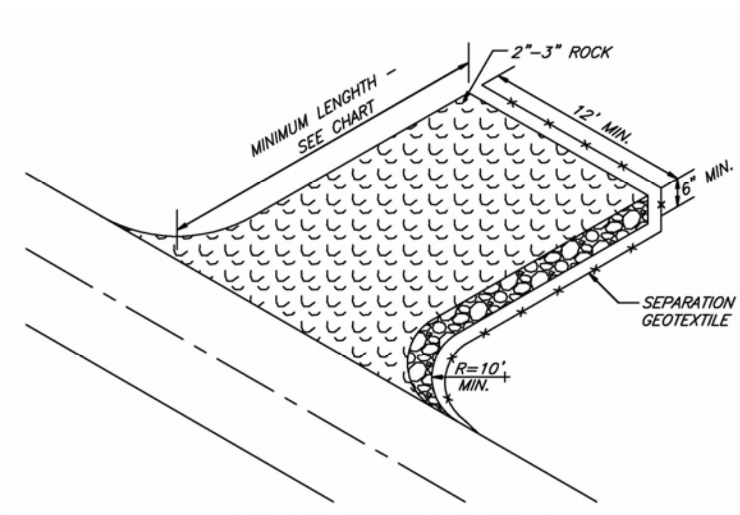
Implementation

The gravel construction exits should be installed at all construction site exits in a manner that minimizes sediment leaving the site. They should not be placed at locations that have steep grades or at curves in public roads where sight distance may be a problem. Rocks should be installed so that a bumpy and rough surface is created.

Maintenance

The gravel construction exit should be cleaned or replaced as needed. Remove all mud and sediment deposited on paved roadways within 24 hours.

- Check for and remove dirt present on roadways adjacent to the site.
- Verify that the dump trucks leaving the site are using the exit.
- Confirm that the surface is rough and bumpy.
- Check for sediment that has accumulated in the rocks. Replace or provide additional gravel as necessary.



Area of Disturbance	Minimum Length
Less than 10,000 square feet	25 feet
10,000 square feet or more	50 feet

Figure I-23: Gravel Construction Exit

Truck Wheel Wash Basin

Truck wheel wash basins are a temporary measure for removing dirt and debris from dump trucks to reduce tracking of sediment onto roadways adjacent to the construction site. An illustration is shown in Figure I-24. The basins are most effective when used in combination with a gravel construction exit.

Selection

Truck wheel wash basins are appropriate on all projects where soil is being hauled from the site.

Implementation

The truck wheel wash basin should be installed at all construction site egress points in a manner that keeps sediments from leaving the site. The rocks should be installed so that a bumpy and rough surface is created. Construction of the truck wash basin should prevent the water from overflowing the basin.

Maintenance

The truck wash basin water should be replaced weekly or more frequently as necessary to clean the trucks. The rocks should be cleaned or replaced as needed.

- Check for dirt present on roadways adjacent to site.
- Verify that dump trucks leaving the site are using the basin.
- Check for and correct water overflowing the basin.
- Check on whether the water needs changing.
- Look for the accumulation of sediment in the rocks and remove or add additional gravel as necessary.
- Confirm that the basin is rough and bumpy.

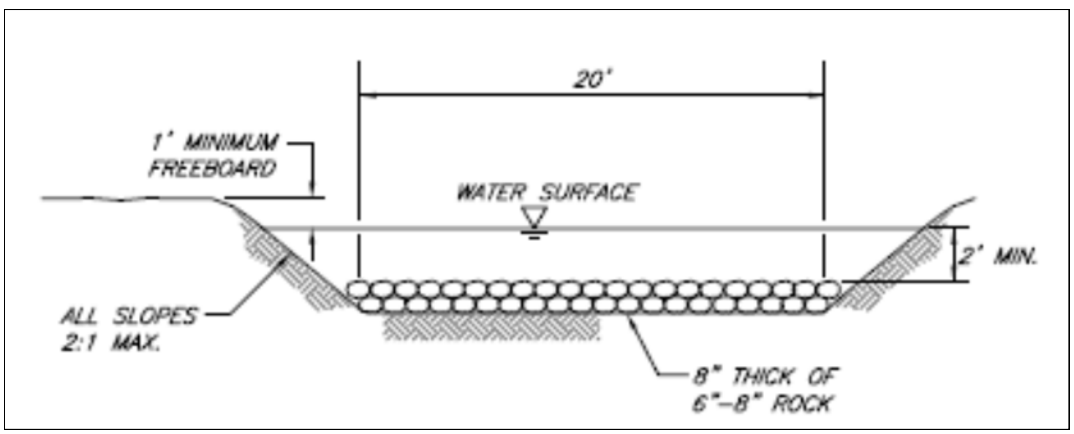


Figure I-24: Truck Wheel Wash Basin

Mud Mats

Mud mats are a temporary measure for providing parking on dirt surfaces to reduce tracking of sediment onto roadways adjacent to the construction site. The mats are most effective when used in on flat slopes with light to moderate traffic.

Selection

Mud mats are appropriate on projects where worker parking is not provided in stabilized areas.

Implementation

Mud mats should be installed at all dirt parking areas in a manner that keeps sediments from leaving the site, either by foot or on vehicle wheels. The mats should be installed so that the entire area that may be used for parking or driving is covered..

Maintenance

The mud mat should be inspected weekly or more frequently as necessary to assure proper coverage and usage. The mats should be cleaned or replaced as needed.

- Check for dirt present on roadways adjacent to site.
- Verify that workers are parking in designated areas.
- Check on whether the mats need changing or sweeping.

APPENDIX C
PROJECT SCHEDULE

A.. C-01

B.. C-02

C.. C-03

D.. C-04

E.. C-05

APPENDIX D
SUPPORTING DOCUMENTATION

D1- Climate Summary .... 1 page

D2- Storm Precipitation Data .... 4 pages

D3- Vegetations Growing Seasons .... 1 page

D4- Vegetations Clearing Guidelines .... 2 pages

D5- Impaired Waters .... 9 pages

D6- TMDL: Chester Creek .... 137 pages

D7- Critical Habitat .... 11 pages

D8-Water Protection Areas .... 1 page

Other Permits

ANCHORAGE INTL AP, ALASKA (500280)

Period of Record Monthly Climate Summary

Period of Record : 04/01/1952 to 06/09/2016

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	21.5	26.1	32.7	43.7	55.1	62.3	65.2	63.3	55.1	40.7	27.9	22.8	43.0
Average Min. Temperature (F)	8.5	12.2	17.4	28.6	38.9	47.3	51.6	49.6	41.5	28.8	16.1	10.4	29.2
Average Total Precipitation (in.)	0.76	0.83	0.64	0.55	0.65	1.01	1.91	2.71	2.75	1.89	1.15	1.13	15.97
Average Total SnowFall (in.)	9.8	12.1	9.4	5.0	0.2	0.0	0.0	0.0	0.3	7.2	12.2	16.1	72.3
Average Snow Depth (in.)	11	12	11	4	0	0	0	0	0	1	4	9	4

Percent of possible observations for period of record.
Max. Temp.: 99.4% Min. Temp.: 99.6% Precipitation: 99.6% Snowfall: 98.1% Snow Depth: 97.9%
Check Station Metadata or Metadata graphics for more detail about data completeness.

Western Regional Climate Center, wrcc@dri.edu

NOAA Atlas 14, Volume 7, Version 2
Location name: Anchorage, Alaska, USA*
Latitude: 61.2248°, Longitude: -149.8091°
Elevation: m/ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Douglas Kane, Sarah Dietz, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Svetlana Stuefer, Amy Tidwell, Carl Trypaluk, Dale Unruh, Michael Yekta, Erica Betts, Geoffrey Bonnin, Sarah Heim, Lillian Hiner, Elizabeth Lilly, Jayashree Narayanan, Fenglin Yan, Tan Zhao

NOAA, National Weather Service, Silver Spring, Maryland
and
University of Alaska Fairbanks, Water and Environmental Research Center

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.091** (0.073-0.116)	**0.113** (0.089-0.146)	**0.144** (0.111-0.191)	**0.169** (0.128-0.228)	**0.203** (0.150-0.282)	**0.230** (0.167-0.326)	**0.257** (0.183-0.371)	**0.287** (0.201-0.422)	**0.328** (0.224-0.495)	**0.359** (0.241-0.551)
10-min	**0.123** (0.099-0.157)	**0.152** (0.120-0.197)	**0.193** (0.149-0.256)	**0.227** (0.172-0.307)	**0.273** (0.202-0.379)	**0.309** (0.224-0.437)	**0.345** (0.246-0.498)	**0.386** (0.270-0.568)	**0.441** (0.301-0.665)	**0.482** (0.323-0.740)
15-min	**0.144** (0.115-0.183)	**0.178** (0.141-0.230)	**0.226** (0.175-0.299)	**0.265** (0.201-0.358)	**0.320** (0.237-0.444)	**0.361** (0.262-0.511)	**0.403** (0.287-0.582)	**0.452** (0.316-0.665)	**0.516** (0.352-0.779)	**0.564** (0.378-0.866)
30-min	**0.191** (0.153-0.243)	**0.237** (0.187-0.306)	**0.300** (0.232-0.397)	**0.352** (0.267-0.476)	**0.424** (0.314-0.588)	**0.480** (0.348-0.679)	**0.535** (0.381-0.772)	**0.599** (0.419-0.881)	**0.685** (0.468-1.03)	**0.749** (0.503-1.15)
60-min	**0.261** (0.209-0.332)	**0.324** (0.256-0.419)	**0.411** (0.318-0.544)	**0.482** (0.366-0.651)	**0.581** (0.430-0.806)	**0.657** (0.477-0.930)	**0.733** (0.522-1.06)	**0.821** (0.574-1.21)	**0.938** (0.641-1.42)	**1.03** (0.688-1.58)
2-hr	**0.332** (0.266-0.423)	**0.412** (0.326-0.533)	**0.522** (0.403-0.691)	**0.613** (0.465-0.828)	**0.738** (0.546-1.02)	**0.835** (0.606-1.18)	**0.931** (0.663-1.34)	**1.04** (0.729-1.54)	**1.19** (0.814-1.80)	**1.30** (0.875-2.00)
3-hr	**0.402** (0.322-0.512)	**0.499** (0.394-0.645)	**0.632** (0.488-0.837)	**0.742** (0.563-1.00)	**0.894** (0.661-1.24)	**1.01** (0.734-1.43)	**1.13** (0.803-1.63)	**1.26** (0.883-1.86)	**1.44** (0.985-2.18)	**1.58** (1.06-2.42)
6-hr	**0.571** (0.458-0.727)	**0.709** (0.561-0.917)	**0.898** (0.694-1.19)	**1.05** (0.799-1.42)	**1.27** (0.939-1.76)	**1.44** (1.04-2.03)	**1.60** (1.14-2.31)	**1.80** (1.25-2.64)	**2.05** (1.40-3.09)	**2.24** (1.50-3.44)
12-hr	**0.777** (0.623-0.990)	**0.966** (0.764-1.25)	**1.23** (0.947-1.62)	**1.44** (1.09-1.94)	**1.73** (1.28-2.39)	**1.95** (1.42-2.76)	**2.18** (1.56-3.15)	**2.44** (1.71-3.59)	**2.78** (1.90-4.20)	**3.04** (2.04-4.67)
24-hr	**1.03** (0.897-1.19)	**1.28** (1.10-1.50)	**1.62** (1.37-1.94)	**1.89** (1.57-2.30)	**2.27** (1.85-2.83)	**2.57** (2.06-3.26)	**2.88** (2.27-3.71)	**3.23** (2.50-4.22)	**3.69** (2.79-4.93)	**4.04** (3.00-5.48)
2-day	**1.26** (1.10-1.46)	**1.54** (1.33-1.81)	**1.94** (1.64-2.32)	**2.27** (1.88-2.76)	**2.74** (2.22-3.40)	**3.12** (2.49-3.95)	**3.53** (2.78-4.54)	**4.02** (3.11-5.26)	**4.67** (3.53-6.24)	**5.16** (3.84-7.00)
3-day	**1.41** (1.23-1.63)	**1.70** (1.47-2.00)	**2.13** (1.80-2.55)	**2.49** (2.07-3.03)	**3.02** (2.45-3.75)	**3.46** (2.76-4.38)	**3.94** (3.10-5.07)	**4.54** (3.51-5.94)	**5.33** (4.03-7.12)	**5.92** (4.41-8.04)
4-day	**1.53** (1.34-1.78)	**1.84** (1.59-2.16)	**2.30** (1.94-2.75)	**2.68** (2.23-3.26)	**3.25** (2.64-4.05)	**3.73** (2.98-4.72)	**4.26** (3.35-5.48)	**4.91** (3.80-6.43)	**5.78** (4.37-7.73)	**6.44** (4.79-8.74)
7-day	**1.89** (1.65-2.19)	**2.26** (1.95-2.65)	**2.81** (2.37-3.36)	**3.26** (2.71-3.97)	**3.92** (3.19-4.88)	**4.47** (3.57-5.65)	**5.06** (3.97-6.51)	**5.76** (4.45-7.54)	**6.70** (5.07-8.95)	**7.40** (5.51-10.1)
10-day	**2.17** (1.90-2.52)	**2.61** (2.25-3.06)	**3.23** (2.73-3.86)	**3.73** (3.10-4.54)	**4.44** (3.61-5.53)	**5.03** (4.01-6.36)	**5.64** (4.43-7.26)	**6.36** (4.91-8.31)	**7.30** (5.52-9.76)	**8.02** (5.97-10.9)
20-day	**3.03** (2.65-3.51)	**3.64** (3.14-4.26)	**4.46** (3.77-5.34)	**5.10** (4.24-6.21)	**5.98** (4.86-7.44)	**6.66** (5.32-8.43)	**7.36** (5.78-9.47)	**8.11** (6.26-10.6)	**9.09** (6.88-12.2)	**9.84** (7.32-13.4)
30-day	**3.83** (3.34-4.43)	**4.60** (3.96-5.39)	**5.61** (4.74-6.72)	**6.38** (5.30-7.76)	**7.40** (6.01-9.20)	**8.17** (6.53-10.3)	**8.94** (7.02-11.5)	**9.71** (7.51-12.7)	**10.7** (8.12-14.3)	**11.5** (8.57-15.6)
45-day	**4.84** (4.22-5.60)	**5.81** (5.01-6.81)	**7.06** (5.96-8.45)	**7.97** (6.62-9.70)	**9.14** (7.43-11.4)	**10.0** (7.99-12.7)	**10.8** (8.51-13.9)	**11.6** (8.97-15.2)	**12.6** (9.56-16.9)	**13.4** (9.98-18.2)
60-day	**5.51** (4.81-6.38)	**6.63** (5.72-7.78)	**8.01** (6.77-9.59)	**8.98** (7.46-10.9)	**10.2** (8.27-12.7)	**11.0** (8.81-13.9)	**11.8** (9.29-15.2)	**12.5** (9.68-16.4)	**13.5** (10.2-18.0)	**14.2** (10.5-19.2)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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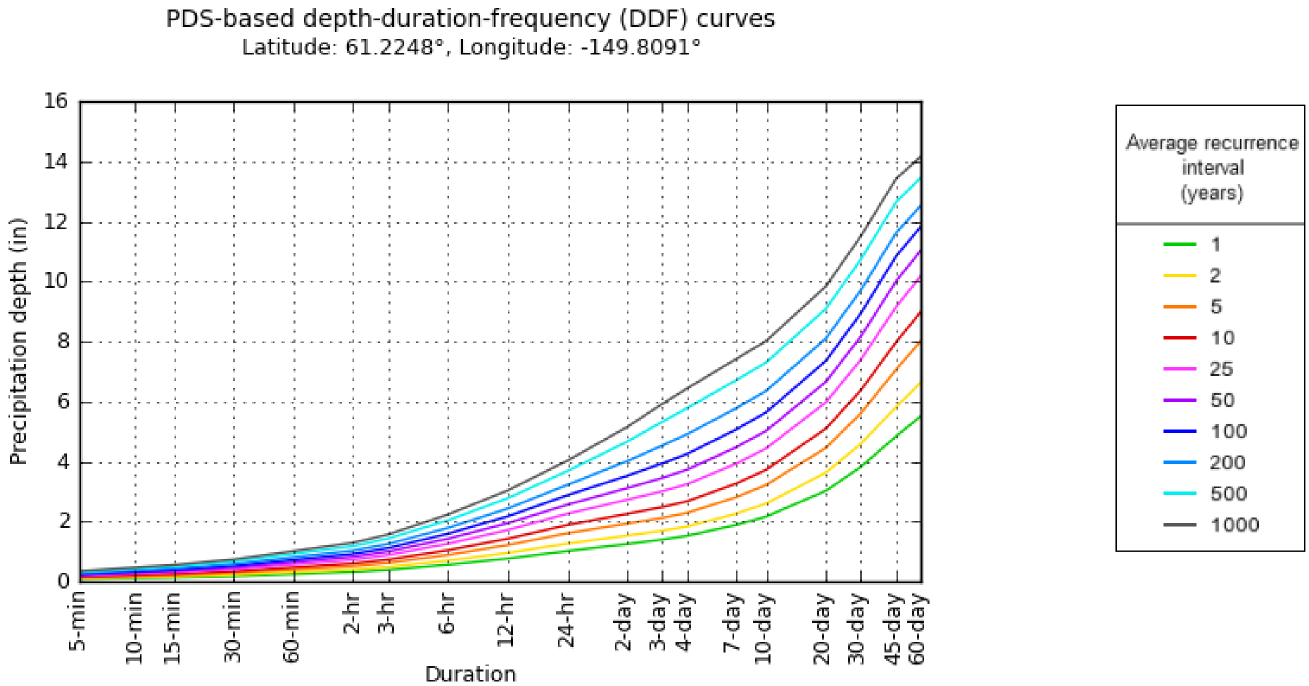
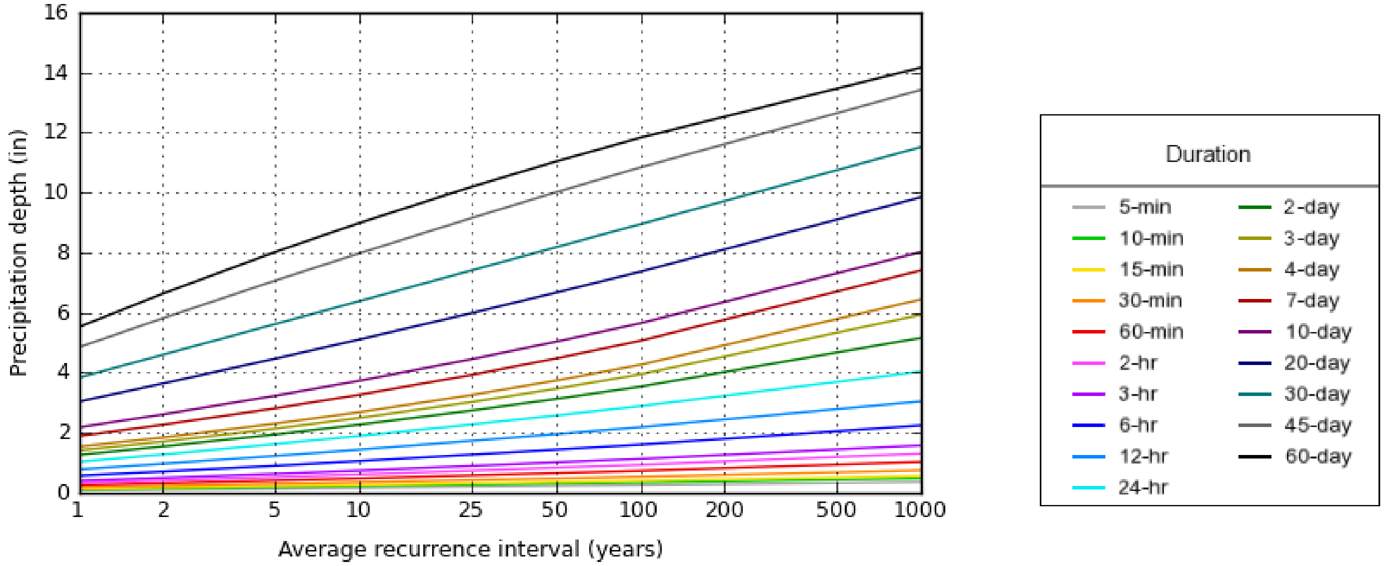
PF graphical





NOAA Atlas 14, Volume 7, Version 2 Created (GMT): Wed Mar 15 18:35:54 2023

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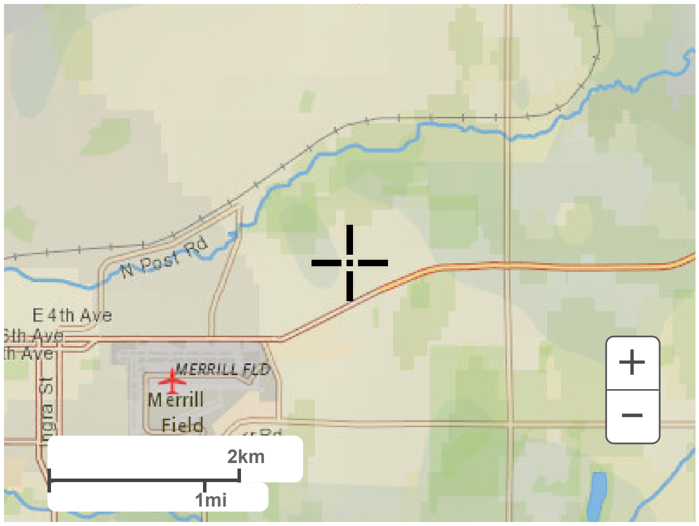
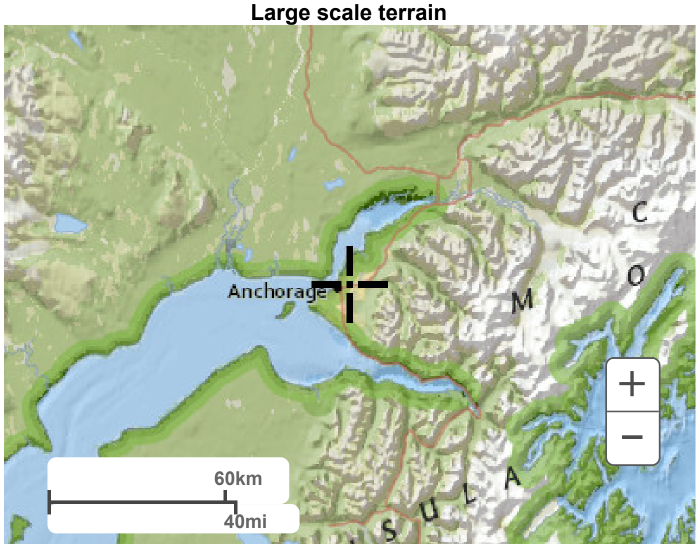
Maps & aerials

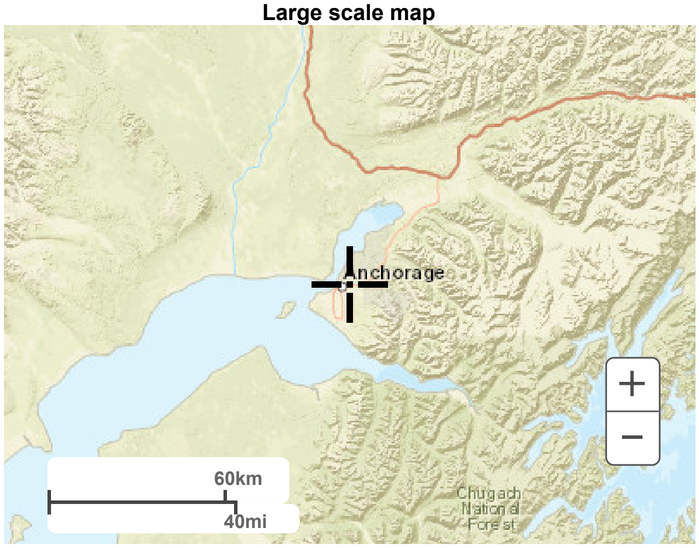
Small scale terrain



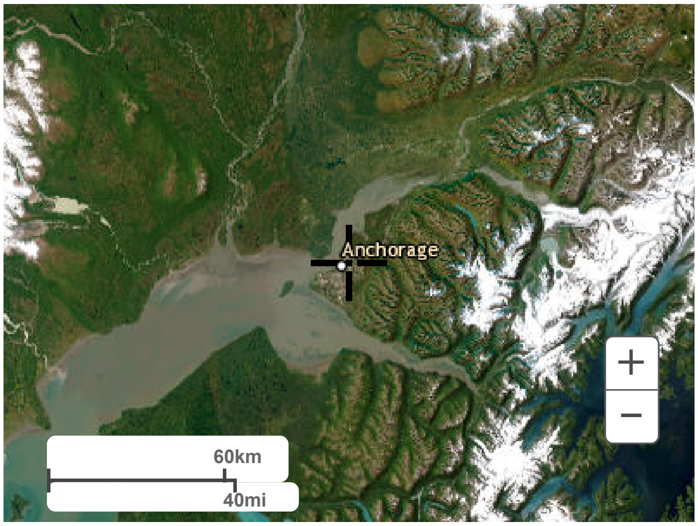
Large scale terrain



Large scale map



Large scale aerial



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US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

Table 5. Median beginning and ending dates of the growing season for ecoregions in Alaska, derived from Markon (2001).

Ecoregion[1]	Beginning of Growing Season ('Minday')		End of Growing Season ('Lastday')	
	Julian Date	Calendar Date[2]	Julian Date	Calendar Date[2]
101 Arctic Coastal Plain	171	Jun 20	261	Sep 18
102 Arctic Foothills	158	Jun 7	264	Sep 21
103 Brooks Range	150	May 30	267	Sep 24
104 Interior Forested Lowlands and Uplands	123	May 3	276	Oct 3
105 Interior Highlands	124	May 4	275	Oct 2
106 Interior Bottomlands	122	May 2	277	Oct 4
107 Yukon Flats	110	Apr 20	276	Oct 3
108 Ogilvie Mountains	110	Apr 20	276	Oct 3
109 Subarctic Coastal Plains	143	May 23	276	Oct 3
110 Seward Peninsula	153	Jun 2	274	Oct 1
111 Ahklun and Kilbuck Mountains	136	May 16	275	Oct 2
112 Bristol Bay – Nushagak Lowlands	115	Apr 25	277	Oct 4
113 Alaska Peninsula Mountains	135	May 15	274	Oct 1
114 Aleutian Islands	--[3]	--[3]	--[3]	--[3]
115 Cook Inlet	128	May 8	278	Oct 5
116 Alaska Range	144	May 24	276	Oct 3
117 Copper Plateau	122	May 2	276	Oct 3
118 Wrangell Mountains	131	May 11	272	Sep 29
119 Pacific Coastal Mountains[4]	149	May 29	270	Sep 27
120 Coastal Western Hemlock – Sitka Spruce Forests[4]	119	Apr 29	271	Sep 28

[1] See Figure 21.

[2] Calendar dates shown are for non-leap years. For a leap year, subtract one day (e.g., for Ecoregion 101, the growing season would begin on June 19 in a leap year).

[3] There were no data available for Ecoregion 114 – Aleutian Islands. Growing season dates for Ecoregion 112 may be substituted when onsite data are lacking.

[4] Ecoregions 119 and 120 are intermingled in Southeast Alaska. Generally, 1,600 ft (500 m) in elevation separates the two ecoregions. Use growing season dates for Ecoregion 119 above 1,600 ft elevation and dates for Ecoregion 120 below 1,600 ft elevation. Annual variability may occur as the snow recedes from lower elevations at different rates.

U.S. Fish & Wildlife Service Region 7

Timing Recommendations for Land Disturbance & Vegetation Clearing

Planning Ahead to Protect Nesting Birds

In Alaska all native birds except grouse and ptarmigan, which are managed by the State of Alaska, are protected by the Migratory Bird Treaty Act (MBTA). Under the MBTA (16 U.S.C. 703) it is illegal for anyone to "take" migratory birds, their eggs, feathers or nests, unless permitted by regulations. "Take" is defined as "to pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to pursue, hunt, shoot, wound, kill, trap, capture or collect" a migratory bird (50 CFR §10.12). For more information, please see: http://www.fws.gov/birds/policies-and-regulations/laws-legislations/migratory-bird-treaty-act.php.

Destruction of active nests, eggs, or nestlings can result from spring and summer vegetation clearing, grubbing, brush hogging, burning, stockpiling fill, and other land disturbance and construction activities. An "active" nest is indicated by intact eggs, live chicks, or presence of at least one adult on the nest. Human disturbance and repeated loud noises near nest sites can cause nest failure and is considered "take". Avoiding nesting seasons during project implementation minimizes the risk of encountering an active nest or inadvertently causing a nest to fail.

Rusty Blackbird

Some bird species and their nests have additional protections under other federal laws, including Bald and Golden eagles under the Bald and Golden Eagle Protection Act (Eagle Act), and those listed under the Endangered Species Act (ESA). Please contact the U.S. Fish and Wildlife Service if these species may be present in your project area to ensure Eagle Act and ESA compliance.

Implementing the following timing recommendations considerably reduces the risk of "take" under the MBTA. Final compliance with the law is your responsibility.

Recommendations:

1. Conduct land disturbance and vegetation clearing activities as described above outside of the nesting season (please see nesting season timing for your area on the next page).

2. If you encounter an active nest *at any time*, including before or after the local recommended avoidance times, leave it undisturbed until the eggs hatch and the young depart the nest.

3. If you have any questions regarding the MBTA, the timing recommendations, or if you are unable to comply with the timing recommendations, please contact your local U.S. Fish and Wildlife Service Fish and Wildlife Conservation Office for assistance:

   Anchorage (includes Juneau and Kenai areas) - (907) 271-2888
   Fairbanks (includes the North Slope, Interior, and Western Alaska) - (907) 456-0203

U.S. Fish & Wildlife Service Region 7

Timing Recommendations for Land Disturbance & Vegetation Clearing

Planning Ahead to Protect Nesting Birds

Nesting Seasons by Habitat Type and Region:
Recommended Times to Avoid Land Disturbance & Vegetation Clearing

<table>
<tr><th>HABITAT TYPE→
REGION ↓</th><th>Forest or Woodland (i.e., trees present)</th><th>Shrub or Open (i.e., shrub cover or marsh, pond, tundra, gravel, or other treeless/shrubless ground habitat)</th><th>Seabird Colonies (including cliff and burrow colonies)</th><th>Eagles [e]</th></tr>
<tr><td>Southeast</td><td rowspan="2">April 15-July 15[a]</td><td rowspan="2">May 1-July 15[a, b]</td><td>May 1-September 15</td><td rowspan="11">March 1-August 31</td></tr>
<tr><td>Kodiak Archipelago</td><td rowspan="2">April 15-September 7</td></tr>
<tr><td>Southcentral (Lake Illiamna to Copper River Delta; north to Talkeetna)</td><td colspan="2">May 1-July 15[a, b]</td></tr>
<tr><td>Bristol Bay/AK Peninsula (north to Lake Illiamna)</td><td colspan="2">May 1-July 15[a, b, c]</td><td>May 10-September 15</td></tr>
<tr><td>Interior (north of Talkeetna to south slope Brooks Range; west to treeline)</td><td colspan="2">May 1-July 15[a, b]</td><td>May 1-July 20[d]</td></tr>
<tr><td>Aleutian Islands</td><td></td><td>April 25-July 15[a]</td><td>May 1-September 15</td></tr>
<tr><td>Yukon-Kuskokwim Delta</td><td>May 1-July 15</td><td>May 5-July 25 [a, b, c]</td><td rowspan="3">May 20-September 15</td></tr>
<tr><td>Seward Peninsula</td><td>May 1-July 15</td><td>May 10-July 20[a, c]</td></tr>
<tr><td>Northern (includes northern foothills of Brooks Range)</td><td rowspan="2"></td><td>June 1-July 31[a, c]</td></tr>
<tr><td>Pribilof and Bering Sea Islands</td><td>May 15-July 15[a]</td><td>May 15-September 15</td></tr>
</table>

[a] Raptors may nest two or more months earlier than other birds.
[b] Canada geese and swans begin nesting April 20.
[c] Black scoter are known to nest through August 10.
[d] Seabird colonies in Interior refer to terns and gulls.
[e] Eagles and their nests have additional protections under the Eagle Act and a permit may be required to conduct activities near an eagle nest. Visit the U.S. Fish and Wildlife Service's Alaska Region Eagle Permit Program web page (https://www.fws.gov/alaska/eaglepermit/guidelines/disturbnestingbaea1.htm) or call your local Fish and Wildlife Conservation Office for step-by-step guidance to determine if your activity is likely to take or disturb eagles and for conservation measures to that avoid disturbance.

USFWS June 2017

ALASKA's IMPAIRED WATERS – 2010

As of September 2010

Impaired Waterbody Categories:

Category 4a – Impaired water with a final/approved TMDL

Category 4b – Impaired water with other pollution controls

Category 5 – Impaired water, Section 303(d) list, require TMDL

Within the tables waters are listed by region - -Interior, Southcentral, Southeast – and alphabetically.

Category 4a Waterbodies

Alaska's 2010

Category 4a Waterbodies – Impaired but not needing a TMDL, TMDL has been completed

Region	*Category*	*Alaska ID #*	*Waterbody*	*Location*	*Area of Concern*	*Water Quality Standard*	*Pollutant Parameters*	*Pollutant Sources*
IN	**Category 4a**	**40402-001**	**Birch Creek Drainage:- Upper Birch Creek; Eagle Creek; Golddust Creek**	**North of Fairbanks**	**N/A**	**Turbidity**	**Turbidity**	**Placer Mining**
IN	**Category 4a**	**40506-009**	**Garrison Slough**	**Eielson Air Force Base**	**N/A**	**Toxic & Other Deleterious Organic and Inorganic Substances**	**Polychlorinated biphenyls (PCBs)**	**Military Base/ Operations**
IN	**Category 4a**	**40506-003**	**Noyes Slough**	**Fairbanks**	**7 miles**	**Residues**	**Debris**	**Urban Runoff**
SC	**Category 4a**	**30102-604**	**Akutan Harbor**	**Akutan Island**	**N/A**	**Residues** **Dissolved Gas**	**Settleable Solids** **Low Dissolved Oxygen**	**Seafood Processing/ Waste**
SC	**Category 4a**	**20401-004**	**Campbell Creek**	**Anchorage**	**10 miles**	**Fecal Coliform Bacteria**	**Fecal Coliform Bacteria**	**Urban Runoff**
SC	**Category 4a**	**20401-402**	**Campbell Lake**	**Anchorage**	**125 acres**	**Fecal Coliform Bacteria**	**Fecal Coliform Bacteria**	**Urban Runoff**

SC	Category 4a	20401-003	Chester Creek	Anchorage	4.1 miles	Fecal Coliform Bacteria	Fecal Coliform Bacteria	Urban Runoff, Industrial
SC	Category 4a	20402-002	Eagle River	Eagle River	N/A	Toxic & Other Deleterious Organic and Inorganic Substances	Ammonia, Chlorine, Copper, Lead, Silver	Wastewater Treatment Facility
SC	Category 4a	20401-005	Fish Creek	Anchorage	6.4 miles	Fecal Coliform Bacteria	Fecal Coliform Bacteria	Urban Runoff
SC	Category 4a	20401-006	Furrow Creek	Anchorage	5.3 miles	Fecal Coliform Bacteria	Fecal Coliform Bacteria	Urban Runoff
SC	Category 4a	30101-501	King Cove	King Cove	N/A	Residues	Seafood Waste Residue	Seafood Processing/ Waste
SC	Category 4a	20505-409	Lake Lucille	Wasilla	N/A	Dissolved Gas	Low Dissolved Oxygen	Urban Runoff
SC	Category 4a	20401-017	Little Campbell Creek	Anchorage	8.3 miles	Fecal Coliform Bacteria	Fecal Coliform Bacteria	Urban Runoff
SC	Category 4a	20401-024	Little Rabbit Creek	Anchorage	6.2 miles	Fecal Coliform Bacteria	Fecal Coliform Bacteria	Urban Runoff
SC	Category 4a	20401-018	Little Survival Creek	Anchorage	3.0 miles	Fecal Coliform Bacteria	Fecal Coliform Bacteria	Urban Runoff
SC	Category 4a	20401-020	Ship Creek Glenn Hwy. Bridge. Down to Mouth	Anchorage	Glenn Hwy. Bridge. to Mouth	Fecal Coliform Bacteria	Fecal Coliform Bacteria	Urban Runoff
SC	Category 4a	30102-603	South Unalaska Bay	Unalaska Island	N/A	Residues, Low Dissolved Oxygen (BOD5)	Seafood Waste Residues, Dissolved Gas	Seafood Processing Waste
SC	Category 4a	30102-607	Udagak Bay	Unalaska Island	N/A	Residues	Settleable solids	Seafood Processing Waste
SC	Category 4a	20401-419	University Lake	Anchorage	10 acres	Fecal Coliform	Fecal Coliform Bacteria	Urban Runoff

						Bacteria		
SC	Category 4a	20401-421	Westchester Lagoon	Anchorage	30 acres	Fecal Coliform Bacteria	Fecal Coliform Bacteria	Urban Runoff
SE	Category 4a	10301-005	Duck Creek	Juneau	N/A	Dissolved Gas, Residues, Toxic & Other Deleterious Organic and Inorganic Sub-stances, Fecal Coliform Bacteria Turbidity	Low Dissolved Oxygen, Debris, Iron, Fecal Coliform Bacteria, and Turbidity	Urban Runoff, Landfill, Road Runoff, Land Develop-ment
SE	Category 4a	10203-005	Granite Creek	Sitka	N/A	Turbidity Sediment	Turbidity, Sediment	Gravel Mining
SE	Category 4a	10203-601-001	Herring Cove of Silver Bay	Sitka	102 acres	Residues	Bark & Woody Debris	Log Storage from former Pulp Mill Operations
SE	Category 4a	10301-004	Jordan Creek	Juneau	3 miles from tide-water up-stream	Dissolved Gas, Residues, Sediment	Debris, Sediment Low Dissolved Oxygen	Land Develop-ment, Road Runoff
SE	Category 4a	10203-602	Klag Bay	West Chichagof Island	1.25 acres	Toxic & Other Deleterious Organic and Inorganic Substances	Metals – Arsenic, Cobalt, Copper, Lead, Manganese, Mercury, Silver, Zinc	Mining

SE	**Category 4a**	**10301-001**	**Lemon Creek**	**Juneau**	**N/A**	**Turbidity Sediment**	**Turbidity, Sediment**	**Urban Runoff, Gravel Mining**
SE	**Category 4a**	**10301-014**	**Pederson Hill Creek**	**Juneau**	**Lower two miles**	**Fecal Coliform Bacteria**	**Fecal Coliform Bacteria**	**Septic Tanks**
SE	**Category 4a**	**10303-004**	**Pullen Creek (Lower Mile)**	**Skagway**	**Lower mile of Pullen Creek**	**Toxic & Other Deleterious Organic and Inorganic Substances**	**Metals – Cadmium, Copper, Lead, Zinc**	**Industrial**
SE	**Category 4a**	**10203-601**	**Silver Bay**	**Sitka**	**6.5 acres**	**Residues Toxic & Other Deleterious Organic and Inorganic Substances**	**Pulp Residues, Logs, Bark & Woody Debris, Sediment Toxicity due to Wood Decomposition By-products**	**Industrial, Historical Pulp Mill Activity**
SE	**Category 4a**	**10103-602**	**Thorne Bay**	**Prince of Wales Island**	**7.5 acres**	**Residues**	**Bark & Wood Debris**	**Historical Log Transfer Facility**
SE	**Category 4a**	**10301-017**	**Vanderbilt Creek**	**Juneau**	**N/A**	**Turbidity Residues Sediment**	**Turbidity, Debris, Sediment**	**Urban Runoff**
SE	**Category 4a**	**10102-601**	**Ward Cove**	**Ketchikan**	**250 acres**	**Residues Dissolved Gas**	**Pulp Residues, Logs, Bark & Woody Debris, Low Dissolved Oxygen**	**Industrial**

Category 4b Waterbodies

Alaska's 2010

Category 4b Waterbodies – Impaired, not needing a TMDL, and under "other pollution controls" and expected to meet standards in a reasonable time period

Region	*Category*	*Alaska ID #*	*Waterbody*	*Location*	*Area of Concern*	*Water Quality Standard*	*Pollutant Parameters*	*Pollutant Sources*
IN	**Category 4b**	**40501-001**	**Cabin Creek**	**Nabesna**	**1.5 miles**	**Toxic & Other Deleterious Organic and Inorganic Substances**	**Manganese, Arsenic, Iron, Copper & Cadmium**	**Mine Tailings**
SC	**Category 4b**	**N/A**	**Exxon Valdez Beaches**	**Prince William Sound - Alaska**	**23 beaches**	**Petroleum Hydrocar-bons, Oil & Grease**	**Petroleum Products**	**Oil Spill**

				Peninsula				
SE	**Category 4b**	**10203-808**	**East Port Frederick**	**NE Chichagof Island**	**0.4 acres**	**Residues**	**Bark & Woody Debris**	**Log Transfer Facility**
SE	**Category 4b**	**10103-031**	**Fubar Creek**	**Prince of Wales Island**	**N/A**	**Sediment**	**Sediment**	**Timber Harvesting**

Category 5/Section 303(d) Listed Waterbodies

Alaska's 2010

Category 5 Waterbodies – Impaired by pollutant(s) for one or more designated uses and requiring a TMDL; Clean Water Act Section 303(d) Listed Waters

Region	*Category*	*Alaska ID #*	*Waterbody*	*Location*	*Area of Concern*	*Water Quality Standard*	*Pollutant Parameters*	*Pollutant Sources*
IN	**Category 5 Section 303(d) listed**	**40506-007**	**Chena River**	**Fairbanks**	**15 miles**	**Sediment**	**Sediment**	**Urban Runoff**
IN	**Category 5 Section 303(d) listed**	**40506-002**	**Chena Slough**	**Fairbanks**	**13 miles**	**Sediment**	**Sediment**	**Urban Runoff**
IN	**Category 5 Section 303(d) listed**	**40402-010**	**Crooked Creek Bonanza Crooked Deadwood Ketchem Mammoth Mastodon Porcupine**	**North of Fairbanks**	**77 miles**	**Turbidity**	**Turbidity**	**Placer Mining**
IN	**Category 5 Section 303(d) listed**	**40509-001**	**Goldstream Creek**	**Fairbanks**	**70 miles**	**Turbidity**	**Turbidity**	**Placer Mining**
IN	**Category 5 Section 303(d) listed**	**30501-002**	**Kuskokwim River**	**Red Devil**	**1,000 feet, 900 feet down river and 100 feet upriver from mouth of Red**	**Toxic & Other Deleterious Organic and Inorganic Substances**	**Metals - Antimony, Arsenic, Mercury**	**Mining**

					Devil Creek			
IN	**Category 5 Section 303(d) listed**	**40506-003**	**Noyes Slough**	**Fairbanks**	**7 miles**	**Sediment, Petroleum Hydrocar-bons, Oil & Grease**	**Sediment, Petroleum Products,**	**Urban Runoff**
IN	**Category 5 Section 303(d) listed**	**30501-002**	**Red Devil Creek**	**Red Devil**	**0.5 mile of creek**	**Toxic & Other Deleterious Organic and Inorganic Substances**	**Metals - Antimony, Arsenic, Mercury**	**Inactive Mine**
IN	**Category 5 Section 303(d) listed**	**40510-101**	**Slate Creek**	**Denali National Park**	**2.5 miles**	**Turbidity**	**Turbidity**	**Mining**
SC	**Category 5 Section 303(d) listed**	**20505-401**	**Big Lake**	**Wasilla**	**1,250 acres**	**Petroleum Hydrocar-bons**	**Total Aromatic Hydrocarbons (TAH)**	**Motorized watercraft**

SC	Category 5 Section 303(d) listed	30101-503	Cold Bay	King Cove, Alaska Peninsula	0.01 acre	Petroleum Hydrocar-bons, Oil & Grease	Petroleum Products	Military, Fuel Storage
SC	Category 5 Section 303(d) listed	20505-001	Cottonwood Creek	Wasilla	7 miles	Fecal Coliform Bacteria	Fecal Coliform Bacteria	Urban Runoff, Urban Development
SC	Category 5 Section 303(d) listed	30102-606	Dutch Harbor	Unalaska Island	0.5 acre	Petroleum Hydrocar-bons, Oil & Grease	Petroleum Products	Industrial, Urban Runoff
SC	Category 5 Section 303(d) listed	30203-001	Egegik River	Egegik	0.25 mile	Petroleum Hydrocar-bons, Oil & Grease	Petroleum Products	Spills, Fuel Tanks, Under-ground Fuel Tanks
SC	Category 5 Section 303(d) listed	20201-401	Eyak Lake	Cordova	50 feet of shore-line	Petroleum Hydrocarbons, Oil & Grease	Petroleum Products, Petroleum Contamination, Sheen	Above Ground Storage Tanks, Spills
SC	Category 5 Section 303(d) listed	20401-412	Hood/ Spenard Lake	Anchorage	307 acres	Dissolved Gas	Low Dissolved Oxygen	Urban Runoff, Industrial
SC	Category 5 Section 303(d) listed	30102-602	Iliuliuk Harbor	Dutch Harbor	1.4 acres	Petroleum Hydrocarbons, Oil & Grease	Petroleum Products	Urban Runoff
SC	Category 5 Section 303(d) listed	20402-001	Matanuska River	Palmer	½ mile	Residues	Debris	Landfill
SC	Category 5 Section 303(d) listed	30101-502	Popof Strait	East Aleutians Borough	5 miles	Residues	Seafood Waste Residue	Seafood Processor
SC	Category 5 Section 303(d) listed	30102-409	Red Lake Anton Road Ponds	Kodiak	2.0 acres	Toxic & Other Deleterious Organic and Inorganic Substances	Metals – Iron, Manganese	Urban Runoff

SC	**Category 5 Section 303(d) listed**	**20401-020**	**Ship Creek Glenn Hwy. Bridge. Down to Mouth**	**Anchorage**	**11 miles, Glenn Hwy. Bridge. Down to Mouth**	**Petroleum Hydrocar-bons, Oil & Grease**	**Petroleum Products**	**Urban Runoff**
SE	**Category 5 Section 303(d) listed**	**10203-002**	**Katlian River**	**N. of Sitka, Baranof Island**	**4.5 miles**	**Sediment, Turbidity**	**Sediment, Turbidity**	**Timber Harvest**
SE	**Category 5 Section 303(d) listed**	**10103-504**	**Salt Chuck Bay**	**Kasaan Area, Prince of Wales Island**	**0.03 square miles**	**Toxic & Other Deleterious Organic and Inorganic Substances**	**Metals -- Copper**	
SE	**Category 5 Section 303(d) listed**	**10303-601**	**Skagway Harbor**	**Skagway**	**1.0 acre**	**Toxic & Other Deleterious Organic and Inorganic Substances**	**Metals – Cadmium, Copper, Lead, Mercury, Zinc**	**Industrial**

SE	**Category** 5 Section 303(d) listed	**10103-010**	**Unnamed Creek, Sweetwater Lake, USFS 3030 Road, ADF&G Stream 3027 (Stream 3)**	**Prince of Wales Island**	**0.4 mile**	**Toxic & Other Deleterious Organic and Inorganic Substances**	**Metals - Aluminum, Cadmium, Copper, Iron**	**Road Construction**
SE	**Category 5 Section 303(d) listed**	**10103-012**	**Unnamed Creek, Sweetwater Lake, USFS 3030 Road, ADF&G Stream 3021 (Stream 6)**	**Prince of Wales Island**	**1.14 mile**	**Toxic & Other Deleterious Organic and Inorganic Substances, Dissolved Inorganic Substances**	**Metals – Aluminum, Cadmium, Copper, Iron, Manganese, Sulfate**	**Road Construction**
SE	**Category 5 Section 303(d) listed**	**10103-013**	**Unnamed Creek, Sweetwater Lake, USFS 3030 Road, ADF&G Stream 3019 tributary (Stream 7)**	**Prince of Wales Island**	**0.3 mile**	**Toxic & Other Deleterious Organic and Inorganic Substances**	**Metals - Aluminum, Cadmium, Copper, Iron, Manganese**	**Road Construction**
SE	**Category 5 Section 303(d) listed**	**10103-014**	**Unnamed Creek, Sweetwater Lake, USFS 3030 Road, ADF&G Stream 3019 (Stream 8)**	**Prince of Wales Island**	**0.3 mile**	**Toxic & Other Deleterious Organic and Inorganic Substances**	**Metals - Cadmium, Copper, Iron, Manganese, Nickel, Zinc**	**Road Construction**
SE	**Category 5 Section 303(d) listed**	**10103-015**	**Unnamed Creek, Sweetwater Lake, USFS 3030 Road, ADF&G Stream 3017 (Stream 9)**	**Prince of Wales Island**	**0.8 mile**	**Toxic & Other Deleterious Organic and Inorganic Substances, Dissolved Inorganic Substances**	**Metals – Aluminum, Cadmium, Copper, Iron, Manganese, Nickel, Zinc, Sulfate**	**Road Construction**

Total Maximum Daily Load for Fecal Coliform in Chester Creek, University Lake, and Westchester Lagoon, Anchorage, Alaska

FINAL

Alaska Department of Environmental Conservation
555 Cordova Street
Anchorage , Alaska 99501

May 2005

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Total Maximum Daily Load for Fecal Coliform in the Waters of Chester Creek in Anchorage, Alaska

TMDL AT A GLANCE:

TMDL is for: Chester Creek, University Lake and Westchester Lagoon
Water Quality-limited? Yes
Hydrologic Unit Code: 19020401
Criteria of Concern: Fecal coliform
Designated Uses Affected: Water supply and water recreation
Major Source(s): Urban runoff
Loading Capacity: 6.46×10^{11} to 4.15×10^{12}FC/year
Wasteload Allocation: 5.18×10^{11} to 3.73×10^{12}FC/year (Sections 6 to 8 include monthly allocations)
Load Allocation: 0 FC/year
Margin of Safety: 10 percent
Necessary Annual Reduction: 54 to 98 percent (Sections 6 to 8 include monthly load reductions)

EXECUTIVE SUMMARY

The Chester Creek watershed is located in the Municipality of Anchorage (MOA), the urban center of the Anchorage Bowl in south-central Alaska. Chester Creek flows through University Lake and Westchester Lagoon. The state of Alaska included the entire length of Chester Creek, University Lake and Westchester Lagoon on its 1990 303(d) list as water quality-limited due to fecal coliform, identifying urban runoff as the expected pollutant source. These waters have been included on all subsequent state 303(d) listings. A Total Maximum Daily Load (TMDL) is established in this document for these waters to meet requirements of Section 303(d)(1)(C) of the Clean Water Act and the U.S. Environmental Protection Agency's (EPA) implementing regulations (40 CFR Part 130), which require the establishment of a TMDL for the achievement of water quality standards when a waterbody is water quality-limited. A TMDL is composed of the sum of individual waste load allocations (WLAs) for point sources and load allocations (LAs) for nonpoint sources and natural background loads. In addition, the TMDL must include a margin of safety (MOS), either implicitly or explicitly, that accounts for the uncertainty in the relationship between pollutant loads and the quality of the receiving waterbody. A TMDL represents the amount of a pollutant the waterbody can assimilate while maintaining compliance with applicable water quality standards. Although separate TMDLs could have been prepared for each of the three waters, DEC integrated them into one TMDL as University Lake and Westchester Lagoon are part of the mainstem flow of Chester Creek and have no other natural inlets or outlets.

Applicable water quality standards for fecal coliform bacteria in Chester Creek, University Lake, and Westchester Lagoons establish protection for designated uses of water supply, water recreation, and growth and propagation of fish, shellfish, and other aquatic life, and wildlife. The TMDLs are developed for the most stringent of these—the fecal coliform criteria for drinking, culinary, and food processing water supply that states that in a 30-day period, the geometric mean may not exceed 20 FC/100 mL, and not more than 10 percent of the samples may exceed 40 FC/100 mL (18 AAC 70.020(2)(b)(2)(A)(i)). If the water quality is restored to meet drinking water criteria it will also meet other designated use criteria.

Fecal coliform data indicate that Chester Creek, University Lake and Westchester Lagoons do not meet the applicable water quality standards related to drinking water or water recreation uses. The largest and most frequent exceedances of the water quality criteria occur during summer months, likely due to increased storm water runoff. Fecal coliform concentrations are lower during colder winter months that experience less storm water runoff. Concentrations steadily increase during spring months, with increased surface runoff during spring thaw and breakup. Because of the substantial seasonal variation in fecal coliform levels, the Chester Creek, University Lake, and Westchester Lagoons TMDLs are developed on a monthly basis to isolate times of similar weather, runoff and in-stream conditions.

Due to the water quality criteria being based on a 30-day geometric mean, the urban character of the watershed, previous modeling efforts made by MOA, and availability of USGS flow data, the Storm Water Management Model (SWMM) (USEPA, 2000) was selected to estimate existing and potential future fecal coliform counts in the Chester Creek watershed. SWMM simulates the quantity and quality of runoff produced by storms, as well as during baseflow conditions, and is one of the most advanced tools available for evaluating water quality in urban watersheds. SWMM simulates real storm events based on rainfall and other meteorological inputs, such as evaporation and temperature, and watershed transport, storage and management practices to predict runoff quantity and quality. At the subwatershed scale, SWMM provides predictions of daily fecal coliform counts, which allows for a direct comparison with Alaska's water quality standards.

The SWMM model was first calibrated to observed hydrology and fecal coliform counts for the period 1987 to 1993 and was then used to assess the effectiveness of various implementation options. Seven "analysis points" were identified to evaluate conditions at various points along Chester Creek and in

University Lake and Westchester Lagoon. The following nine tables summarize the results of the TMDL analysis. They indicate that significant reductions in existing loads throughout the watershed are necessary to meet water quality standards. Areas of the watershed with the highest fecal coliform loading rates tend to be residential land uses with a high degree of imperviousness and located in close proximity to the stream. MOA (2003) reports that the likely sources associated with these land uses are warm-blooded animal sources including domestic pets (particularly cats and dogs) and wild animals.

Although all of Chester Creek originally was listed in 1990, the stretch actually impaired is smaller. This document identifies the section of stream that monitoring data indicates is water-quality limited and recommends that the listing be amended to reflect the new boundaries. Specifically, the available monitoring data indicate that the portion of Chester Creek above the Municipality of Anchorage/ Fort Richardson property line is not water-quality limited by bacteria impairment.

Through an evaluation of information collected in developing this TMDL and in a fecal coliform assessment of Chester Creek done through a DEC grant to the University of Alaska (to be published in July 2005), DEC believes three potential sources of fecal coliform contribute little or insignificant loads of fecal coliform bacteria to the Chester Creek system: onsite septic systems, illegal campsites, and leaking sewage lines. DEC believes that waterfowl and wildlife contribute little fecal coliform through most of the watershed, but at some locations may contribute higher amounts at certain times of the year. As any contributions they provide are not resulting from human actions, they are not included in the TMDL loading allocations. This TMDL focuses on stormwater discharges as the main component. These discharges in the MOA are regulated by a National Pollutant Discharge Elimination System (NPDES) storm water permit for municipal separate storm sewer systems (MS4), watershed loads delivered to Chester Creek are addressed through the wasteload allocation component of this TMDL.

Implementation of the stormwater control actions in this TMDL will be achieved through actions associated with the MOA's MS4 permit. EPA recommends that for NPDES-regulated municipal and small construction storm water discharges effluent limits should be expressed as best management practices (BMPs) or other similar requirements, rather than as numeric effluent limits. This recognizes the need for an iterative approach to control pollutants in storm water discharges and anticipates that a suite of BMPs will be used in the initial rounds of permits and that these BMPs will be tailored in subsequent rounds. Follow-up monitoring will be coordinated between DEC and MOA to track the progress of TMDL implementation and subsequent water quality response, track BMP effectiveness, and track the water quality of Chester Creek, University Lake, and Westchester Lagoons to evaluate future attainment of water quality standards.

Although the SWMM scenarios in this TMDL did not show that fecal coliform bacteria will be reduced to levels meeting state water quality standards, DEC believes the standards will be met because of the following mitigating issues: 1) although SWMM is considered the best model for the type and amount of data available, it was not designed for Alaska's extreme northern climate and could have predicted conservative reductions under the implementation scenarios; 2) the data used are 10-15 years old and do not reflect improvements in stormwater management known to have occurred since the data was collected; and 3) recent monitoring data[1] consistently shows fecal coliform levels are considerably lower than levels seen in data used to develop the TMDL, translating into fewer reductions needed to meet state water quality standards than projected by the model. DEC will continue to monitor these waters for levels of fecal coliform bacteria and if sampling results show the actions are not achieving the target levels, DEC will, in coordination with the MOA, consider and take other actions to adjust and meet the targets.

[1] In 2004, DEC contracted with the University of Alaska, Anchorage to collect temporal and spatial fecal coliform data on Chester Creek. Unfortunately the data collected could not used in developing the TMDL because there wasn't any corresponding flow data need for SWMM.

Table ES-1. Summary of the Middle Fork Chester Creek TMDL (Analysis Point 112).

Month	Existing (FC/month)	Loading Capacity (FC/month)	Margin of Safety (FC/month)	Waste Load Allocation (FC/month)	Required Reduction
Jan	**3.11E+09**	**2.90E+09**	**2.90E+08**	**2.61E+09**	**7%**
Feb	**1.45E+12**	**4.78E+11**	**4.78E+10**	**4.30E+11**	**67%**
Mar	8.51E+11	3.21E+10	3.21E+09	2.89E+10	96%
Apr	9.58E+12	8.85E+10	8.85E+09	7.96E+10	99%
May	2.99E+12	6.75E+10	6.75E+09	6.08E+10	98%
Jun	1.10E+12	6.44E+10	6.44E+09	5.80E+10	94%
Jul	2.05E+12	6.55E+10	6.55E+09	5.90E+10	97%
Aug	5.13E+12	8.10E+10	8.10E+09	7.29E+10	98%
Sep	5.12E+12	8.07E+10	8.07E+09	7.26E+10	98%
Oct	1.15E+12	6.69E+10	6.69E+09	6.02E+10	94%
Nov	2.01E+11	4.23E+10	4.23E+09	3.81E+10	79%
Dec	**2.50E+10**	**1.80E+10**	**1.80E+09**	**1.62E+10**	**28%**
Annual	2.82E+13	6.46E+11	6.46E+10	5.81E+11	98%

Bold denotes monthly values assessed for not-to-exceed standard.
Annual loads are given in FC/year.

Table ES-2. Summary of the South Fork Chester Creek TMDL (Analysis Point 171).

Month	Existing (FC/month)	Loading Capacity (FC/month)	Margin of Safety (FC/month)	Waste Load Allocation (FC/month)	Required Reduction
Jan	5.18E+11	3.63E+10	3.63E+09	3.27E+10	93%
Feb	7.55E+11	3.75E+10	3.75E+09	3.38E+10	95%
Mar	2.01E+12	7.25E+10	7.25E+09	6.53E+10	96%
Apr	9.06E+12	1.97E+11	1.97E+10	1.77E+11	98%
May	6.87E+12	1.66E+11	1.66E+10	1.49E+11	98%
Jun	2.91E+12	1.46E+11	1.46E+10	1.32E+11	95%
Jul	3.23E+12	1.43E+11	1.43E+10	1.28E+11	96%
Aug	4.75E+12	1.74E+11	1.74E+10	1.56E+11	96%
Sep	4.92E+12	1.78E+11	1.78E+10	1.60E+11	96%
Oct	2.86E+12	1.52E+11	1.52E+10	1.37E+11	95%
Nov	1.57E+12	9.81E+10	9.81E+09	8.83E+10	94%
Dec	6.37E+11	5.80E+10	5.80E+09	5.22E+10	91%
Annual	4.01E+13	1.46E+12	1.46E+11	1.31E+12	96%

Annual loads are given in FC/year.

Table ES-3. Summary of the South Fork Chester Creek TMDL (Analysis Point 350).

Month	Existing (FC/month)	Loading Capacity (FC/month)	Margin of Safety (FC/month)	Waste Load Allocation (FC/month)	Required Reduction
Jan	6.42E+10	5.71E+10	5.71E+09	5.14E+10	11%
Feb	1.32E+11	5.96E+10	5.96E+09	5.36E+10	55%
Mar	9.09E+11	1.15E+11	1.15E+10	1.04E+11	87%
Apr	4.66E+12	2.99E+11	2.99E+10	2.69E+11	94%
May	2.88E+12	2.53E+11	2.53E+10	2.27E+11	91%
Jun	1.08E+12	2.29E+11	2.29E+10	2.06E+11	79%
Jul	1.26E+12	2.28E+11	2.28E+10	2.05E+11	82%
Aug	2.28E+12	2.77E+11	2.77E+10	2.49E+11	88%
Sep	2.22E+12	2.77E+11	2.77E+10	2.49E+11	88%
Oct	1.15E+12	2.37E+11	2.37E+10	2.13E+11	79%
Nov	5.77E+11	1.55E+11	1.55E+10	1.39E+11	73%
Dec	1.28E+11	9.01E+10	9.01E+09	8.11E+10	30%
Annual	1.73E+13	2.27E+12	2.27E+11	2.05E+12	87%

Annual loads are given in FC/year.

Table ES-4. Summary of the Chester Creek TMDL (Analysis Point 101).

Month	Existing (FC/month)	Loading Capacity (FC/month)	Margin of Safety (FC/month)	Waste Load Allocation (FC/month)	Required Reduction
Jan	**9.59E+09**	**8.69E+09**	**8.69E+08**	**7.82E+09**	**9%**
Feb	**1.26E+11**	**1.04E+11**	**1.04E+10**	**9.35E+10**	**18%**
Mar	**7.76E+11**	**4.02E+11**	**4.02E+10**	**3.62E+11**	**48%**
Apr	**4.28E+12**	**1.26E+12**	**1.26E+11**	**1.13E+12**	**71%**
May	**2.69E+11**	**1.50E+11**	**1.50E+10**	**1.35E+11**	**44%**
Jun	**2.69E+11**	**1.74E+11**	**1.74E+10**	**1.56E+11**	**36%**
Jul	**4.87E+11**	**2.76E+11**	**2.76E+10**	**2.49E+11**	**43%**
Aug	**9.51E+11**	**4.09E+11**	**4.09E+10**	**3.68E+11**	**57%**
Sep	**8.30E+11**	**3.89E+11**	**3.89E+10**	**3.51E+11**	**53%**
Oct	**2.85E+11**	**1.82E+11**	**1.82E+10**	**1.64E+11**	**36%**
Nov	**1.44E+11**	**1.01E+11**	**1.01E+10**	**9.11E+10**	**30%**
Dec	1.63E+10	1.63E+10	1.63E+09	1.47E+10	0%
Annual	**8.44E+12**	**3.47E+12**	**3.47E+11**	**3.12E+12**	**59%**

Bold denotes monthly values assessed for not-to-exceed standard.
Annual loads are given in FC/year.

Table ES-5. Summary of the Chester Creek TMDL (Analysis Point CH2).

Month	Existing (FC/month)	Loading Capacity (FC/month)	Margin of Safety (FC/month)	Waste Load Allocation (FC/month)	Required Reduction
Jan	1.21E+12	1.80E+11	1.80E+10	1.62E+11	85%
Feb	1.23E+12	1.85E+11	1.85E+10	1.66E+11	85%
Mar	1.98E+12	2.75E+11	2.75E+10	2.48E+11	86%
Apr	3.40E+12	5.03E+11	5.03E+10	4.53E+11	85%
May	2.84E+12	4.39E+11	4.39E+10	3.95E+11	85%
Jun	3.14E+12	3.73E+11	3.73E+10	3.35E+11	88%
Jul	3.45E+12	3.87E+11	3.87E+10	3.49E+11	89%
Aug	3.28E+12	4.58E+11	4.58E+10	4.12E+11	86%
Sep	2.69E+12	4.55E+11	4.55E+10	4.09E+11	83%
Oct	2.80E+12	3.91E+11	3.91E+10	3.52E+11	86%
Nov	2.91E+12	2.91E+11	2.91E+10	2.62E+11	90%
Dec	1.74E+12	2.13E+11	2.13E+10	1.92E+11	88%
Annual	3.07E+13	4.15E+12	4.15E+11	3.73E+12	86%

Annual loads are given in FC/year.

Table ES-6. Summary of the University Lake TMDL, Analysis Point 171.

Month	Existing (FC/month)	Loading Capacity (FC/month)	Margin of Safety (FC/month)	Waste Load Allocation (FC/month)	Required Reduction
Jan	5.18E+11	3.63E+10	3.63E+09	3.27E+10	93%
Feb	7.55E+11	3.75E+10	3.75E+09	3.38E+10	95%
Mar	2.01E+12	7.25E+10	7.25E+09	6.53E+10	96%
Apr	9.06E+12	1.97E+11	1.97E+10	1.77E+11	98%
May	6.87E+12	1.66E+11	1.66E+10	1.49E+11	98%
Jun	2.91E+12	1.46E+11	1.46E+10	1.32E+11	95%
Jul	3.23E+12	1.43E+11	1.43E+10	1.28E+11	96%
Aug	4.75E+12	1.74E+11	1.74E+10	1.56E+11	96%
Sep	4.92E+12	1.78E+11	1.78E+10	1.60E+11	96%
Oct	2.86E+12	1.52E+11	1.52E+10	1.37E+11	95%
Nov	1.57E+12	9.81E+10	9.81E+09	8.83E+10	94%
Dec	6.37E+11	5.80E+10	5.80E+09	5.22E+10	91%
Annual	4.01E+13	1.46E+12	1.46E+11	1.31E+12	96%

Annual loads are given in FC/year.

Table ES-7. Summary of the University Lake TMDL, Analysis Point ULO.

Month	Existing (FC/month)	Loading Capacity (FC/month)	Margin of Safety (FC/month)	Waste Load Allocation (FC/month)	Required Reduction
Jan	1.35E+11	5.71E+10	5.71E+09	5.14E+10	58%
Feb	2.02E+11	5.95E+10	5.95E+09	5.36E+10	71%
Mar	5.97E+11	1.10E+11	1.10E+10	9.92E+10	82%
Apr	3.67E+12	2.80E+11	2.80E+10	2.52E+11	92%
May	3.05E+12	2.48E+11	2.48E+10	2.23E+11	92%
Jun	1.15E+12	2.25E+11	2.25E+10	2.02E+11	80%
Jul	1.24E+12	2.21E+11	2.21E+10	1.99E+11	82%
Aug	1.97E+12	2.65E+11	2.65E+10	2.39E+11	87%
Sep	2.05E+12	2.68E+11	2.68E+10	2.41E+11	87%
Oct	1.14E+12	2.32E+11	2.32E+10	2.09E+11	80%
Nov	5.60E+11	1.53E+11	1.53E+10	1.38E+11	73%
Dec	2.06E+11	9.00E+10	9.00E+09	8.10E+10	56%
Annual	1.60E+13	2.21E+12	2.21E+11	1.99E+12	86%

Annual loads are given in FC/year.

Table ES-8. Summary of the Westchester Lagoon TMDL, Analysis Point CH2.

Month	Existing (FC/month)	Loading Capacity (FC/month)	Margin of Safety (FC/month)	Waste Load Allocation (FC/month)	Required Reduction
Jan	1.21E+12	1.80E+11	1.80E+10	1.62E+11	85%
Feb	1.23E+12	1.85E+11	1.85E+10	1.66E+11	85%
Mar	1.98E+12	2.75E+11	2.75E+10	2.48E+11	86%
Apr	3.40E+12	5.03E+11	5.03E+10	4.53E+11	85%
May	2.84E+12	4.39E+11	4.39E+10	3.95E+11	85%
Jun	3.14E+12	3.73E+11	3.73E+10	3.35E+11	88%
Jul	3.45E+12	3.87E+11	3.87E+10	3.49E+11	89%
Aug	3.28E+12	4.58E+11	4.58E+10	4.12E+11	86%
Sep	2.69E+12	4.55E+11	4.55E+10	4.09E+11	83%
Oct	2.80E+12	3.91E+11	3.91E+10	3.52E+11	86%
Nov	2.91E+12	2.91E+11	2.91E+10	2.62E+11	90%
Dec	1.74E+12	2.13E+11	2.13E+10	1.92E+11	88%
Annual	3.07E+13	4.15E+12	4.15E+11	3.73E+12	86%

Annual loads are given in FC/year.

Table ES-9. Summary of the Westchester Lagoon TMDL, Analysis Point CL2.

Month	Existing (FC/month)	Loading Capacity (FC/month)	Margin of Safety (FC/month)	Waste Load Allocation (FC/month)	Required Reduction
Jan	**1.48E+11**	**1.34E+11**	**1.34E+10**	**1.21E+11**	**9%**
Feb	2.14E+11	2.14E+11	2.14E+10	1.93E+11	0%
Mar	**5.41E+11**	**3.34E+11**	**3.34E+10**	**3.01E+11**	**38%**
Apr	1.13E+12	2.80E+11	2.80E+10	2.52E+11	75%
May	6.53E+11	2.58E+11	2.58E+10	2.33E+11	60%
Jun	6.00E+11	2.49E+11	2.49E+10	2.24E+11	59%
Jul	6.64E+11	2.59E+11	2.59E+10	2.33E+11	61%
Aug	8.94E+11	2.71E+11	2.71E+10	2.44E+11	70%
Sep	8.25E+11	2.62E+11	2.62E+10	2.36E+11	68%
Oct	6.14E+11	2.58E+11	2.58E+10	2.32E+11	58%
Nov	3.79E+11	2.33E+11	2.33E+10	2.10E+11	39%
Dec	2.24E+11	2.08E+11	2.08E+10	1.87E+11	7%
Annual	6.63E+12	2.92E+12	2.92E+11	2.63E+12	56%

Bold denotes monthly values assessed for not-to-exceed standard.
Annual loads are given in FC/year.

1.0 DESCRIPTION OF THE WATERSHED AND WATERBODIES

Section 303(d)(1)(C) of the Clean Water Act and the U.S. Environmental Protection Agency's (EPA) implementing regulations (40 CFR Part 130) require the establishment of a Total Maximum Daily Load (TMDL) for the achievement of state water quality standards when a waterbody is water quality-limited. A TMDL identifies the amount of pollution control needed to maintain compliance with standards and includes an appropriate margin of safety. The focus of the TMDL is reduction of pollutant inputs to a level (or "load") that fully supports the designated uses of a given waterbody. The mechanisms used to address water quality problems after the TMDL is developed can include a combination of best management practices and/or effluent limits required through National Pollutant Discharge Elimination System (NPDES) permits.

The state of Alaska first included Chester Creek, University Lake and Westchester Lagoon on its 1990 303(d) list as water quality-limited due to fecal coliform and identified urban runoff as the expected pollutant source. These waters have been included on all subsequent 303(d) lists. This document establishes a TMDL to address the fecal coliform impairment throughout the Chester Creek watershed, including University Lake and Westchester Lagoon.

1.1 Location

The Chester Creek watershed is located in south-central Alaska, and is bounded on the east by the Chugach Mountains, on the north by the Ship Creek watershed, and on the south by the Campbell Creek watershed (see Figure 1-1). The basin lies entirely within Anchorage Borough and drains an area of approximately 30.2 square miles. Additionally, the Chester Creek watershed lies within the approximate 1,000 square mile, 8-digit U.S. Geological Survey hydrologic unit code (HUC) 19020401. University Lake and Westchester Lagoon are located within the Chester Creek watershed and are hydrologically connected to Chester Creek as shown in Figure 1-1.

The headwaters of Chester Creek are in the Chugach Mountains that form the eastern boundary of the Municipality of Anchorage (MOA). From the headwater region, the main stream flows toward the northwest and upon reaching the municipality flows to the west, through University Lake and Westchester Lagoons, and ultimately discharges into Cook Inlet.

For the purposes of storm water and drainage management, the MOA has identified three major subwatersheds within the Chester Creek watershed: the Lower Chester Creek subwatershed, the Upper Chester Creek subwatershed, and the Headwaters subwatershed (Figure 1-2; MOA, 2002). The Lower Chester Creek subwatershed is further subdivided into the Westchester drainage and the North Fork of Chester Creek drainage. Likewise, the Upper Chester subwatershed is comprised of the Middle Fork of Chester Creek drainage, the South Fork of Chester Creek drainage, and the Reflection Lake drainage. The Headwaters subwatershed is defined by the drainage divide of the Chugach Mountains, which forms the eastern-most boundary of the entire Chester Creek watershed, and the eastern boundary of the Municipality of Anchorage. Table 1-1 summarizes the major subwatersheds and drainages within the Chester Creek watershed.

Table 1-1. Major Subwatersheds and Drainages within the Chester Creek Watershed.

Subwatershed Name	Area Acres	Area Square Miles
Lower Chester Creek	**3,838.6**	**6.0**
• Westchester drainage	2,703.9	4.2
• North Fork of Chester Creek drainage	1,134.7	1.8
Upper Chester Creek	**9,297.0**	**14.5**
• Middle Fork of Chester Creek drainage	2,354.3	3.6
• South Fork of Chester Creek drainage	6,563.2	10.3
• Reflection Lake drainage	379.5	0.6
Headwaters	**6,226.2**	**9.7**
Total Watershed Area	**19,361.8**	**30.2**

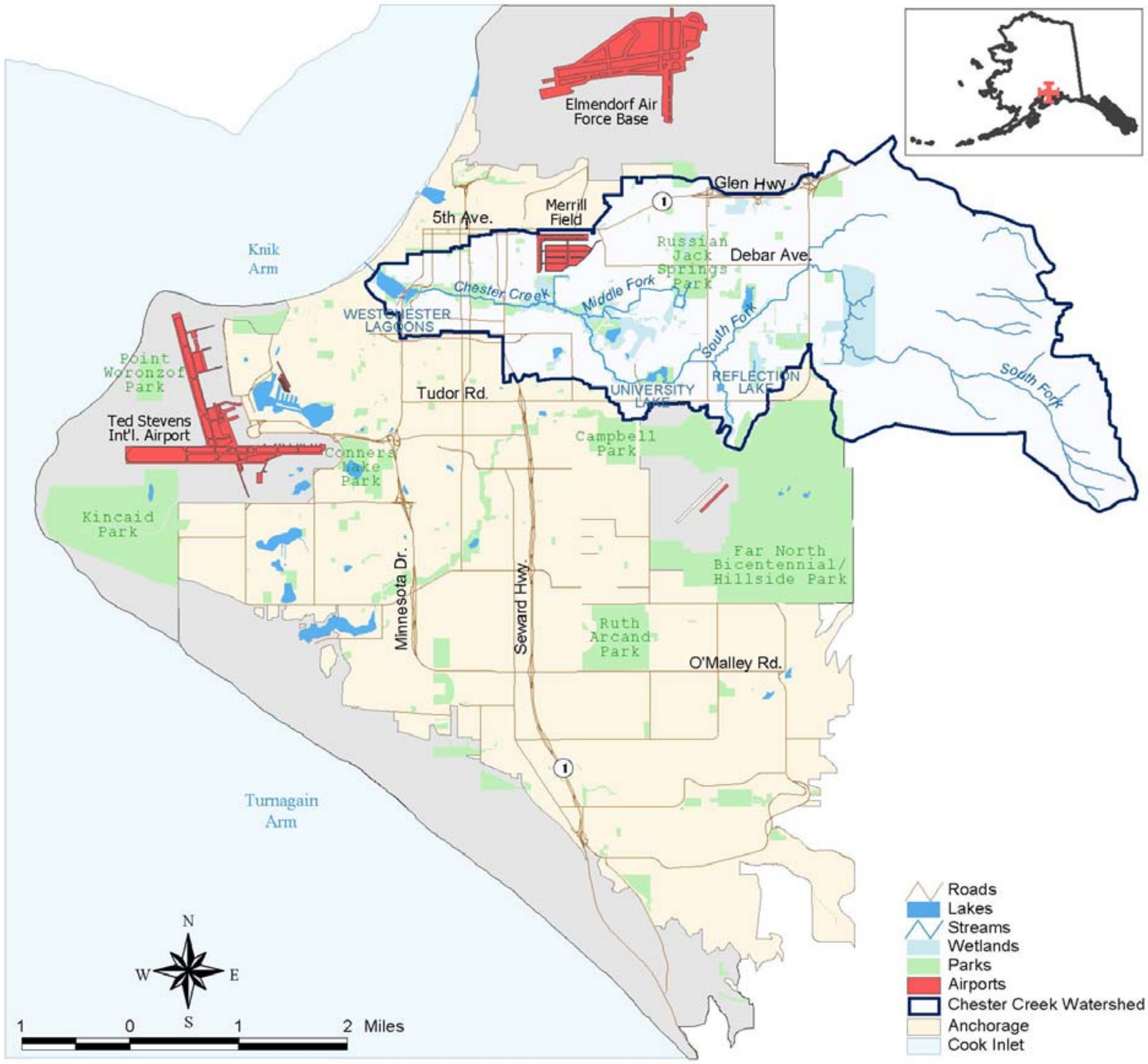


Figure 1-1. Location of the Chester Creek watershed.

1.2 Population

Population within the Chester Creek watershed was estimated using geographic information systems (GIS) analysis that incorporated 2000 census block data for the basin. Block level spatial and census data for the Municipality of Anchorage were downloaded from the online Geography Network (2002) and clipped to the watershed boundary. Population was then summed for each block within the watershed. The analysis resulted in an estimated population of 78,262 persons and a total of 30,319 households within the basin.

1.3 Topography

Elevations in the Chester Creek watershed range from 1,357 feet above sea level along the drainage divide in the Chugach Mountains to zero feet above sea level at the outlet into Cook Inlet. The rate of fall varies from an average of 931 feet per mile in the eastern mountainous region of the basin to an average of 73 feet per mile in the western portion of the basin. Slope gradients in the extreme western portion of the watershed are very low.

1.4 Land Cover

Information on land use and land cover is important because they significantly affect a stream's hydrology and water quality. MOA offers the best available land cover data for the Chester Creek watershed (MOA, 2002). The land cover data were derived from satellite imagery in the summer of 2000 and classified to provide information best suited for storm water management applications.

The land cover data include five major classes: Impervious, Barren Pervious, Vegetated Pervious, Snow and Ice, and Water. These land cover classes were further subdivided to reflect changes in perviousness due to different land development applications. For example, impervious surfaces are classified as either street surface, directly connected impervious, or indirectly connected impervious. Values for hydraulic connectedness (direct or indirect connection) are attributed to each mapped land parcel independently of the degree of surrounding pervious land cover. Vegetation classes were reclassified as either landscaped or forested. Wetlands were derived from features mapped by the MOA and superimposed on the land cover data. The MOA land cover classification scheme is given in Table 1-2.

Land cover in the Chester Creek watershed is shown in Figure 1-2 and summarized in Table 1-3. Figure 1-2 shows that at the higher elevations in the upper portion of the Chester Creek watershed, land cover is primarily forest with tenure by the federal government (military lands) and state parklands (Brabets et al., 1999). The lower portion of the watershed is dominated by urban residential and commercial land uses. Forest cover accounts for 51.3 percent of the total land cover in the basin (Table 1-3), while urban land covers (landscape, impervious surfaces, and streets) account for 42 percent of the total land cover in the basin.

Table 1-2. The Municipality of Anchorage land cover classification system

Land Cover	Land Cover Description
Impervious	Large paved areas, parking lots, and rooftops.
Directly Connected Impervious	Impervious features (not including roads) that are immediately adjacent to paved roads and spatially intersect a 60-foot buffer from the edge of pavement. For example, a large parking lot that extends beyond 60 feet from the edge of a paved road will be categorized as directly connected impervious as long as a portion of that feature enters a 60-foot buffer from an adjacent roadway.
Indirectly Connected Impervious	Areas that do not intersect the 60-foot buffer from the edge of pavement are classified as Indirectly Connected Impervious (ICI). These include impervious areas that are adjacent and/or within the vicinity of dirt or unpaved roads.
Streets	Paved roadways.
Landscaped	Parks, open fields, residential yards, large areas of non-forested and non-wetland vegetation.
Forested	Areas of tree canopy—natural forest.
Barren	Includes areas of zero or little vegetation, exposed soil, non-active land-cover.
Wetland	Moist areas containing vegetation, marshes, bogs.
Lakes/Water	Areas of exposed water bodies, reservoirs.

Table 1-3. Land cover within the Chester Creek watershed.

Land Cover/Land Use	Area		Percent of Watershed Area
	Acres	Square Miles	
Forested	10,015.6	15.5	51.3
Landscaped	3,233.3	5.1	16.9
Directly Connected Impervious	2,746.9	4.3	14.2
Street	1,381.2	2.2	7.3
Wetland	1,124.4	1.8	6.0
Indirectly Connected Impervious	692.3	1.1	3.6
Lakes	156.7	0.2	0.7
Barren	11.5	< 0.1	< 0.1
Total	**19,361.9**	**30.2**	**100.0**

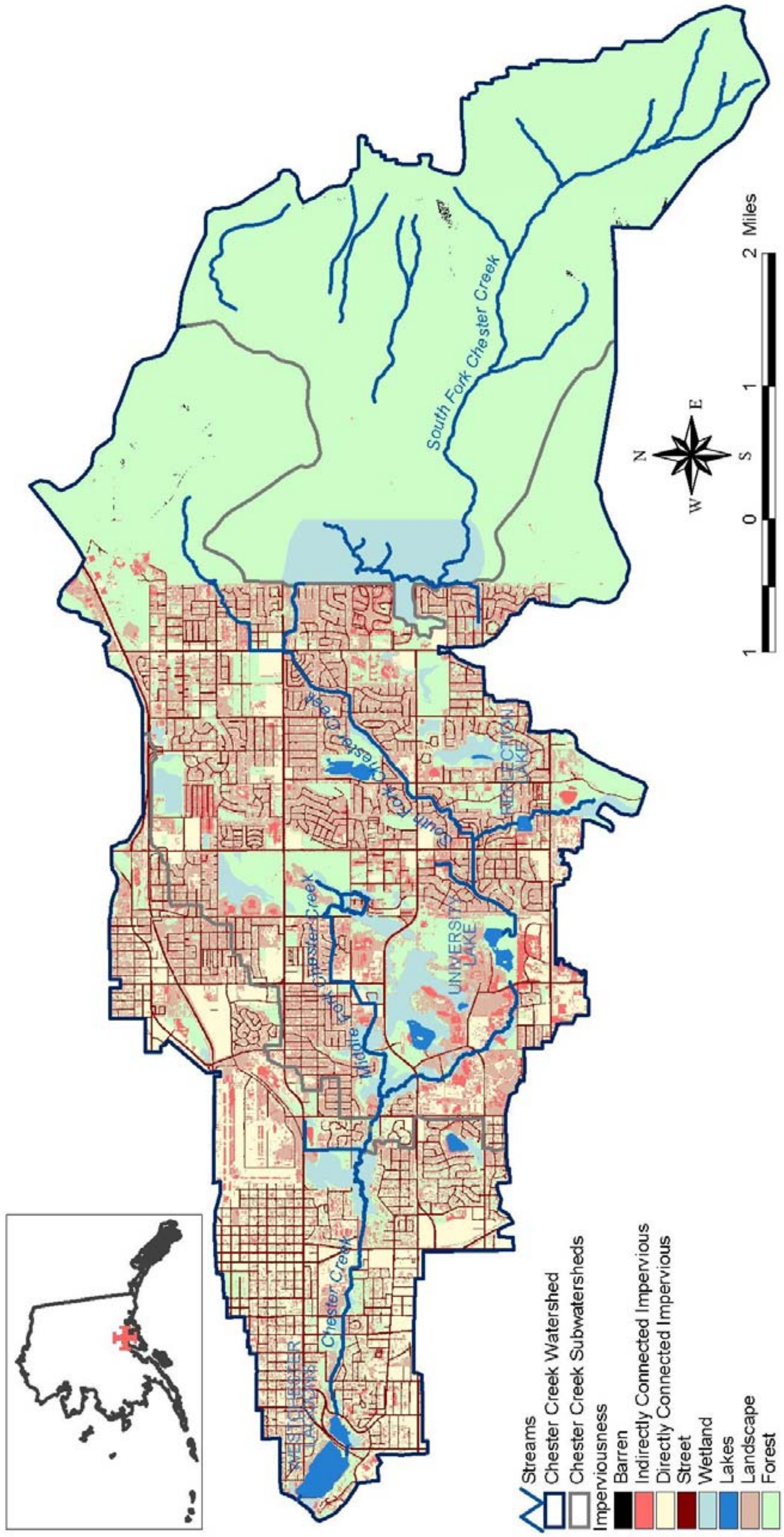


Figure 1-2. Chester Creek watershed MOA land cover classification.

Land cover may also be examined within major subwatershed divisions. Table 1-4 presents land cover within each of the three major subwatersheds in the Chester Creek basin. As seen in the table, the Lower Chester Creek subwatershed is the most urbanized subwatershed, with landscape, impervious surfaces, and streets accounting for 80.8 percent of the subwatershed area. Significant urbanization also occurs in the Upper Chester Creek subwatershed where landscape, impervious surfaces, and streets account for 53 percent of the total subwatershed area. A large portion of the Upper Chester Creek subwatershed, approximately 40 percent of the total subbasin area, is comprised of forest cover. In contrast to the lower portions of the Chester Creek watershed, the Headwaters subwatershed is comprised primarily of forested lands and wetlands, which together represent 99.8 percent of the total subwatershed area.

Table 1-4. Land cover within the major subwatersheds of the Chester Creek watershed.

Subwatershed Name	Area		Percent of Watershed Area
	Acres	Square Miles	
Lower Chester Creek			
Directly Connected Impervious	1,515.7	2.4	39.4
Landscaped	763.1	1.2	19.9
Street	581.8	0.9	15.2
Forested	525.0	0.8	13.7
Indirectly Connected Impervious	241.5	0.4	6.3
Wetland	129.7	0.2	3.4
Lakes	81.8	0.1	2.1
Subwatershed Total	**3,838.6**	**6.0**	**100.0**
Upper Chester Creek			
Forested	3,753.3	5.9	40.4
Landscaped	2,469.5	3.9	26.7
Directly Connected Impervious	1,231.1	1.9	13.2
Street	799.3	1.2	8.6
Wetland	515.5	0.8	5.5
Indirectly Connected Impervious	450.2	0.7	4.8
Lakes	74.9	0.1	0.8
Barren	3.2	< 0.1	< 0.1
Subwatershed Total	**9,297.0**	**14.5**	**100.0**
Headwaters			
Forested	5737.3	9.0	92.1
Wetland	479.2	0.7	7.7
Landscaped	0.8	< 0.1	< 0.1
Barren	8.2	< 0.1	0.1
Directly Connected Impervious	0.0	< 0.1	< 0.1
Indirectly Connected Impervious	0.6	< 0.1	< 0.1
Street	0.1	< 0.1	< 0.1
Subwatershed Total	**6,226.2**	**9.7**	**100.0**

1.5 Climate

Searby (1968) identified three distinct climate zones in the Cook Inlet region: continental, transition, and maritime. These climate zones are broadly defined by variations in precipitation and temperature. Chester Creek lies within the transition climate zone, where average annual precipitation is roughly 16 inches and annual average temperature is around 27 °F.

Figure 1-3 presents monthly average precipitation, snowfall, and temperature for Anchorage Ted Stevens International Airport (cooperative station number 500280) located at an elevation of 131.9 feet above sea level (WRCC, 2002). Figure 1-3 shows that the data for Anchorage fits within the transition climate zone discussed above, although average annual precipitation for the station is 15.7 inches, a bit lower than the zonal average. However, elevations in the eastern portion of the basin exceed 1,000 feet and precipitation is expected to increase accordingly. An average minimum monthly temperature of 15.8 °F occurs in January and an average maximum monthly temperature of 58.4 °F occurs in July. Most of the precipitation occurs from June through December, peaking in late summer during August and September with monthly mean precipitation of 2.7 inches and 2.6 inches, respectively. Snowfall occurs from September through May, with the greatest snowfall occurring during the months of December, February, and November.

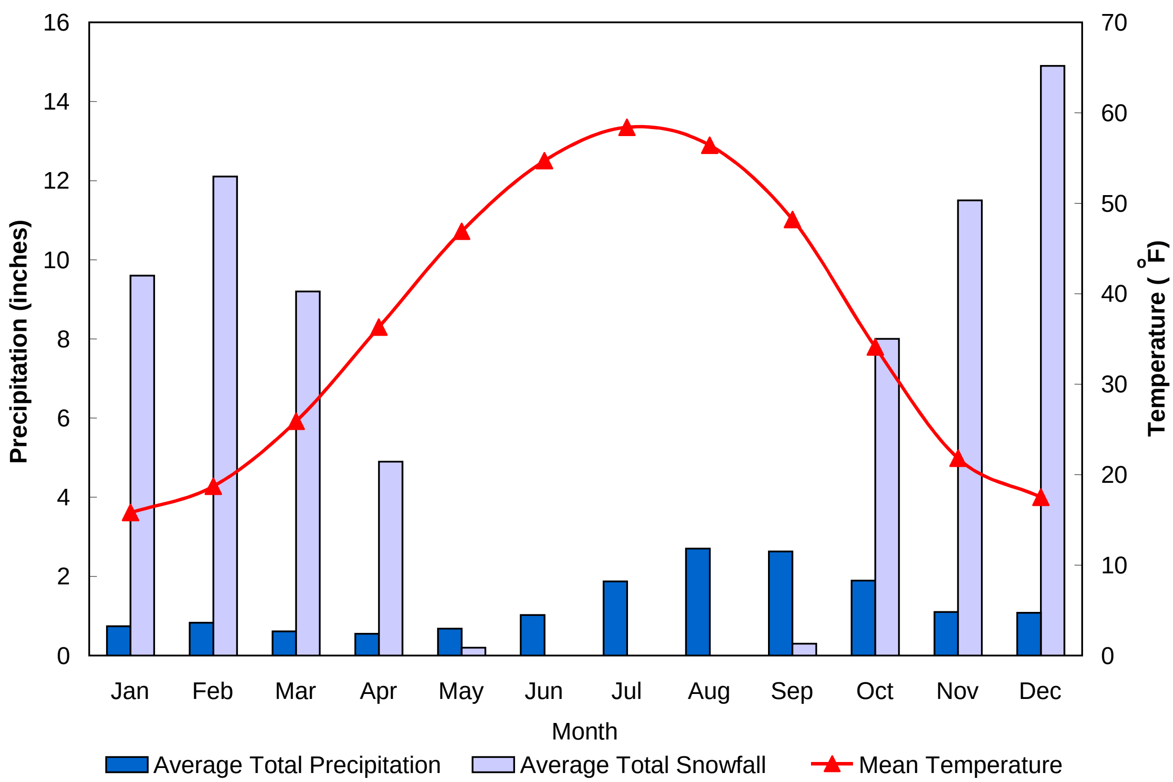


Figure 1-3. Climate summary for Anchorage Ted Stevens International Airport. Data cover the period April 1, 1952 to March 31, 2003.

1.6 Hydrology

Chester Creek originates from the combined flow of smaller tributary streams located in the Chugach Mountains. The creek flows through Anchorage on the way to its mouth along the Cook Inlet. Ice cover affects streams for a significant part of the year. Ice typically forms over the streams in late November to early December and open water reappears around the beginning of April (Ourso, 2001). The time of ice cover varies according to the elevation of a particular segment of the stream.

As shown in Figure 1-2, MOA has identified three major subwatersheds in the Chester Creek basin: the lower Chester Creek subwatershed, the upper Chester Creek subwatershed, and the headwaters of the Chester Creek watershed. The lower Chester Creek subwatershed is defined at its upper-most reach by a point just downstream of the confluence of the South Fork and Middle Fork of Chester Creek, and at its lower-most reach by the outlet of Westchester Lagoon to Cook Inlet. The upper Chester Creek subwatershed unit is bounded by the limits of the municipality at it upper-most reach, and the confluence of the South Fork and Middle Fork of Chester Creek at its lower-most reach. The headwaters subwatershed is defined by the drainage divide at the upper-most reach and the limits of the municipality at its lower-most reach.

Much of Chester Creek has been modified through wetland drainage for development and Westchester Lagoon and University Lake are two man-made waterbodies directly connected to Chester Creek. Westchester Lagoon is located in the lowermost portion of the watershed. A dam with a concrete weir was constructed across the Chester Creek estuary in 1971 forming the Westchester Lagoon (Davis and Muhlberg, 2001). Minnesota Drive and Spenard Road divide the lagoon into three sections. The upper lagoon basin is located from the mouth of Chester Creek to Spenard Road and covers approximately two acres. The upper basin is a major site for sediment deposition within the Chester Creek system. The middle basin lies between Spenard Road and Minnesota Road and cover 17 acres. The middle basin provides most of the waterfowl nesting and rearing area in the lagoon. The lower basin extends from Minnesota Road to the concrete weir, and covers approximately 65 acres. The lower basin provides recreational opportunities for canoeists and kayakers, and habitat for waterfowl. Overall the lagoon basin system is very shallow with maximum depths of 1.5 feet in the upper, most eastern basin, 5-feet in the middle basin, and 22 feet near the weir in the old stream channel in the lower, larger basin.

University Lake is located on the South Fork of Chester Creek and has a surface area of approximately 35 acres. The lake was originally a gravel pit subject to groundwater intrusion. Chester Creek was channeled through the gravel pit in 1983 forming University Lake. The lake does not have any control structures and is typically regarded as a wide stream reach in the South Fork of Chester Creek. The lake is used for recreational purposes, such as boating and fishing, and provides a nesting and rearing area for waterfowl.

The United States Geological Survey (USGS) has measured continuous streamflow in Chester Creek at two stations (15275000 and 15275100) over the past 34 years. Only one of these stations (USGS stream gage 15275100) is in operation today and is located on Arctic Boulevard, near the stream outlet into Westchester Lagoons. This gage site has a long-term mean annual flow of 21 cubic feet per second (cfs). Long-term daily average flow for the site is presented in Figure 1-4. The figure shows that daily mean flows peak in late April due primarily to snowmelt and again in early fall, primarily in response to precipitation. The amount of water available in Chester Creek at any given time and location is impacted by a variety of consumptive uses and by the influence of shallow and deep-water aquifers (groundwater systems) through natural processes and disturbances within the streambed. In turn, some water is gained from returns by non-consumptive users and from springs from groundwater systems. In addition, seasonal flow fluctuations make available stream flow highly variable, while most consumptive user demand tends to be more constant. The exceptions are seasonal uses such as golf course irrigation, watering of lawns and trees, etc.

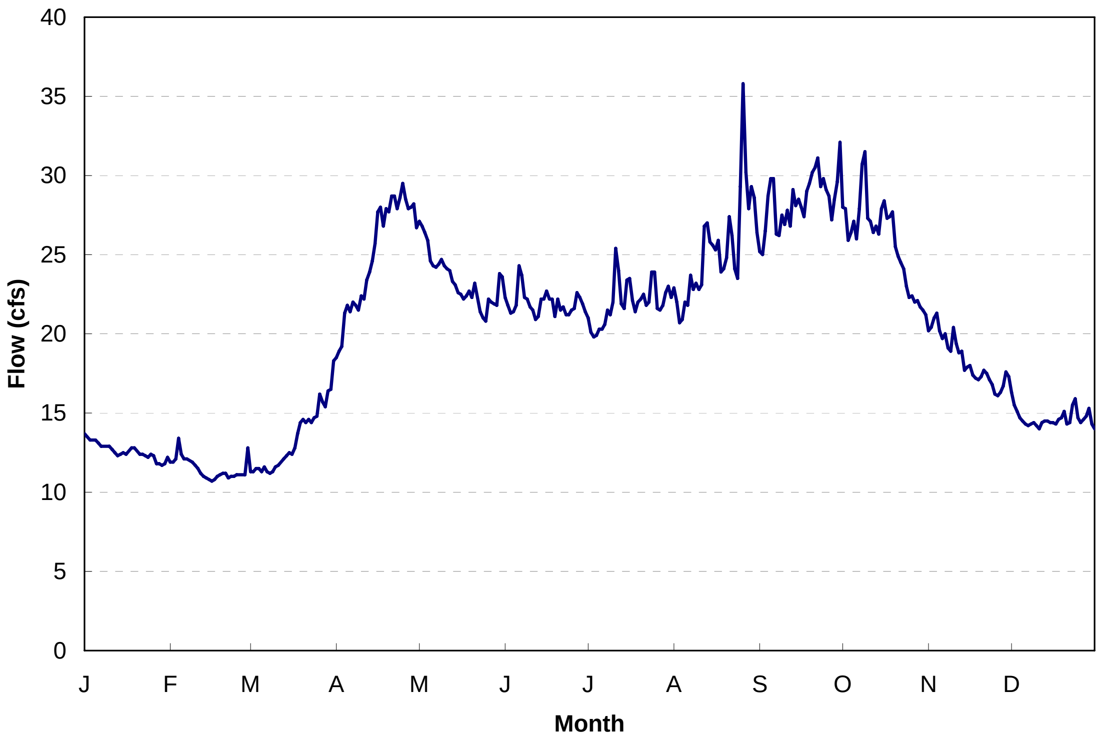


Figure 1-4. Average daily streamflow in Chester Creek at USGS stream Gage # 15275100. Data cover the period June 17, 1966 to September 30, 2001.

2.0 WATER QUALITY STANDARDS, TMDL TARGET AND AREA OF COVERAGE

The purpose of developing a TMDL is to identify the allowable loads of a pollutant such that water quality standards will be met. This section of the report presents the water quality standards for fecal coliform that apply to Chester Creek, University Lake, and Westchester Lagoon.

2.1 Applicable Water Quality Standards

Within the State of Alaska, water quality standards are published pursuant to Title 46 of the Alaska Statutes (AS). Regulations dealing with water quality (46.03.02 & 46.03.080) are found in Title 18, Chapter 70 of the Alaska Administrative Code (AAC). Through the adoption of water quality standards, Alaska has defined the beneficial uses to be protected in each of its drainage basins and the criteria necessary to protect these uses (see Table 2-1).

Water quality criteria are developed for each designated use and give guidance on how much pollution a waterbody can accommodate while still supporting the designated uses. The most stringent of Alaska's water quality standards with respect to fecal coliform bacteria (FC) is for drinking, culinary, and food processing water supply. The applicable standard states that

> *In a 30-day period, the geometric mean may not exceed 20 FC/100 mL, and not more than 10% of the samples may exceed 40 FC/100 mL. (*18 AAC 70.020(2)(b)(2)(A)(i)*)*

The TMDL must therefore identify the allowable load (or loading capacity) such that both the 30-day geometric mean and the not-to-exceed portions of the standards will be met.

Table 2-1. Alaska water quality standards for fecal coliform.

Water Use	Description of Standard
(A) Water Supply (i) drinking, culinary and food processing	In a 30-day period, the geometric mean may not exceed 20/FC/100 ml, and not more than 10% of the samples may exceed 40 FC/100 ml. For groundwater, the FC concentration must be less than 1 FC/100 ml, using the fecal coliform Membrane Filter Technique, or less than 3 FC/100 ml, using the fecal coliform most probable number (MPN) technique.
(A) Water Supply (ii) agriculture, including irrigation and stock watering	The geometric mean of samples taken in a 30-day period may not exceed 200 FC/100 ml, and not more than 10% of the samples may exceed 400 FC/100 ml. For products not normally cooked and for dairy sanitation of unpasteurized products, the criteria for dinking water supply, (1)(A)(i), apply.
(A) Water Supply (iii) aquaculture	For products normally cooked, the geometric mean of samples taken in a 30-day period may not exceed 200 FC/100 ml, and not more than 10% of the samples may exceed 400 FC/100 ml. For products not normally cooked, the criteria for drinking water supply, (1)(A)(i), apply.
(A) Water Supply (iii) Industrial	Where worker contact is present, the geometric mean of samples taken in a 30-day period may not exceed 200 FC/100 ml, and not more than 10% of the samples may exceed 400 FC/100 ml.
(B) Water Recreation (i) contact recreation	In a 30-day period, the geometric mean of samples may not exceed 100 FC/100 ml, and not more than one sample or more than 10% of the samples if there are more than 10 samples, may exceed 200 FC/100 ml.
(B) Water Recreation (ii) secondary contact	In a 30-day period, the geometric mean of samples may not exceed 200 FC/100 ml, and not more than 10% of the total samples may exceed 400 FC/100 ml.
(C) Growth and Propagation of Fish, Shellfish, other Aquatic Life and Wildlife	Not applicable.

2.2 Designated Use Impacts

Designated uses for Alaska's waters are established by regulation and are specified in the State of Alaska Water Quality Standards (18 AAC 70). For fresh waters of the state, designated uses include (1) water supply, (2) water recreation, and (3) growth and propagation of fish, shellfish, other aquatic life, and wildlife. Chester Creek does not support its designated uses of water supply and water recreation due to elevated fecal coliform levels. The presence of fecal coliform indicates an increased risk of pathogen contamination. Consumption of or contact with pathogen-contaminated water can result in a variety of gastrointestinal, respiratory, eye, ear, nose, throat, and skin diseases.

2.3 Area of Coverage

Because of the lack of delineating information at the time of listing, all of Chester Creek was listed as impaired. However, monitoring data included in the studies listed in Section 3.1 below show the portion of Chester Creek above the Municipality of Anchorage/ Fort Richardson property line is not water-quality limited by bacteria impairment. Based on the evaluation of this data, this document proposes a new boundary for the 303(d)-listed stretch. The TMDL concludes that the actual water-quality limited areas are the upper and lower subwatershed areas from the Municipal/Fort Richardson property line to the Cook Inlet. The section of stream is best depicted in Figure 3-1.

3.0 DATA ANALYSIS

Several important previous water quality studies have been performed for the Chester Creek watershed. These earlier studies provide some insight to the fecal coliform loadings in the Chester Creek watershed and were consulted during the development of the TMDL. This section of the report summarizes these previous studies and also presents the available fecal coliform sampling data.

3.1 Previous Studies

Brabets (1986) performed a water quantity and quality study of the Chester Creek watershed and found that water quality in the watershed varies according to season and flow conditions. The study found that average fecal coliform counts in Chester Creek ranged from 211 to 4,000 FC/ 100 mL, and that fecal coliform counts near the mouth of Chester Creek exceeded water quality standards during all flow ranges. The study also concluded that the primary source of fecal coliform bacteria originated from residential areas.

MOA conducted a water quality monitoring program, of which fecal coliform was one of the observed parameters, that included nine stations in the Chester Creek watershed during the period 1986 to 1994. The data observed during the monitoring period suggest that fecal coliform counts were lowest in the winter months and increased in the spring during snowmelt. MOA concluded that the primary source of fecal coliform bacteria was storm drain runoff from urban areas (MOA, 1990).

A draft water quality assessment for Chester Creek was completed in April 1993 (ADEC, 1993). The assessment concluded that the Chester Creek drainage was water-quality limited due to violations of the fecal coliform standard. Potential point sources identified included Merrill Field Landfill and public sanitary sewers upstream of University Lake. To alleviate the impact of the landfill, the report recommended that North Fork of Chester Creek be rerouted around the landfill facility. This project was begun in 1993 and is now completed. Potential nonpoint sources identified by the report include urban runoff, waterfowl, and domestic animals.

The USGS collected fecal coliform in five creeks characterized as "undeveloped", "semi-developed", and "developed areas" in Anchorage from August 19 to September 4, 1998 (USGS, 1999). Included in this study were three samples collected from an undeveloped site on upper Chester Creek, located on Fort Richardson approximately three miles upstream from Muldoon Road. Additionally, one sample was collected on a developed site in the lower reach of Chester Creek, near Arctic Boulevard. The data collected at the undeveloped site in upper Chester Creek ranged from 2 FC/100 ml to 10 FC/100 ml, while the single sample collected in the developed portion of lower Chester Creek yielded 80 FC/100 ml.

Frenzel and Couvillion (2002) evaluated fourteen sites in Anchorage to determine the effects of urbanization on water quality. Three of the sites were on Chester Creek and a total of sixteen samples were collected from these three stations during the period March 2000 to November 2000. As part of the overall study the authors concluded that higher counts of fecal coliform, *Escherichia coli*, and enterococci were measured at the most urbanized sites. They also found that fecal indicator bacteria counts were higher in the summer than in the winter, but that seasonal differences were not significant.

MOA released a report in 2003 discussing fecal coliform sources and transport processes in Anchorage streams (MOA, 2003). This report indicated that the least likely sources of fecal coliform included municipal community piped sanitary sewer systems, on-site wastewater disposal systems, and street surfaces. MOA investigators attributed the primary source of fecal coliform concentrations to animal (non-human) origin. Warm-blooded animal sources include domestic pets (particularly cats and dogs) and wild animals (particularly terrestrial and aquatic birds, shrews, rabbits, rodents, foxes, coyotes, wolves, bears, and moose). MOA also suggests that elevated fecal coliform concentrations result from a complex relationship between sources and transport processes within local storm drainage systems and the streams themselves.

3.2 Data Inventory

The fecal coliform data collected by MOA during the period 1986 to 1994 are the data used in this study because they are the most recent data set with both good spatial and temporal coverage and have corresponding USGS flow data [1]. The data are available at eleven different stations within the Chester Creek watershed. The locations of these stations are shown in Figure 3-1 relative to the major subwatersheds comprising the Chester Creek drainage. Most data are from the period 1988 to 1994, although some older and a few more recent data are also available.

3.3 Data Analysis

The available fecal coliform data in Chester Creek were compared to the geometric mean and not-to-exceed standards to evaluate impairment and water quality standards violations. Table 3-1 presents the results of the not-to-exceed comparison for each standard. All stations exceeded the standard more than 10 percent of the time.

Table 3-1. Summary of available fecal coliform data for Chester Creek.

Station	No. of Samples	Start Date	End Date	Min	Average	Max	Over 40 FC/100 mL	
							No.	Percentage
CH11	62	3/16/1993	12/20/1994	0	442	7,000	53	85%
CH10	58	3/16/1993	9/30/1994	0	147	2,500	18	31%
CH9	431	4/15/1986	9/30/1994	0	564	28,000	365	85%
CH7A	375	12/16/1987	9/30/1994	0	133	3,940	159	42%
CH7	409	4/15/1986	9/17/1992	0	555	27,600	167	41%
CH6	354	4/15/1988	9/30/1994	0	136	4,400	192	54%
ULI	371	1/20/1988	9/30/1994	0	524	12,089	340	92%
ULO	369	1/20/1988	9/30/1994	0	135	6,100	224	61%
CH2	94	4/15/1986	2/5/1988	8	417	2,800	88	94%
CL3	281	3/31/1988	9/30/1994	0	210	20,000	156	56%
CL2	341	3/31/1988	12/20/1994	0	371	24,000	217	64%

For comparison to the geometric mean criterion, geometric means were calculated for every possible 30-day period included in the dataset, based on all individual observations within that 30-day period. The results are summarized Tables 3-2 to 3-10 and Figures 3-2 to 3-10. The tables include the monthly average, median, minimum, maximum, and 25th and 75th percentiles of all calculated geometric means. The tables also present a ratio and percentage of the number of 30-day geometric means included in each month that exceed the 20 FC/100 mL criterion ("Exceedances: Count" and "Percentage of Exceedances"). The highest levels of bacteria in Chester Creek generally occur during the summer months (July to September), possibly due to the increased rain events and resulting storm water runoff. Freezing

[1] The data used for this study are based on a report provided by ADEC to Tetra Tech during a site visit in 2000. The data were not available electronically and therefore had to be manually input to a database to allow for analysis and modeling. The data were evaluated for quality assurance purposes to screen for data entry errors but no other testament can be made as to the quality of the data.

temperatures during October and November decrease surface runoff, resulting in lower in-stream bacteria counts. Slight increases in bacteria during December and January are likely due to occasional periods of above-freezing temperatures and runoff-producing thaw. Runoff from the spring break-up and thaw result in increasing bacteria counts from March to April. A brief discussion of seasonal patterns at each site follows. The sites are discussed moving from upstream to downstream locations.

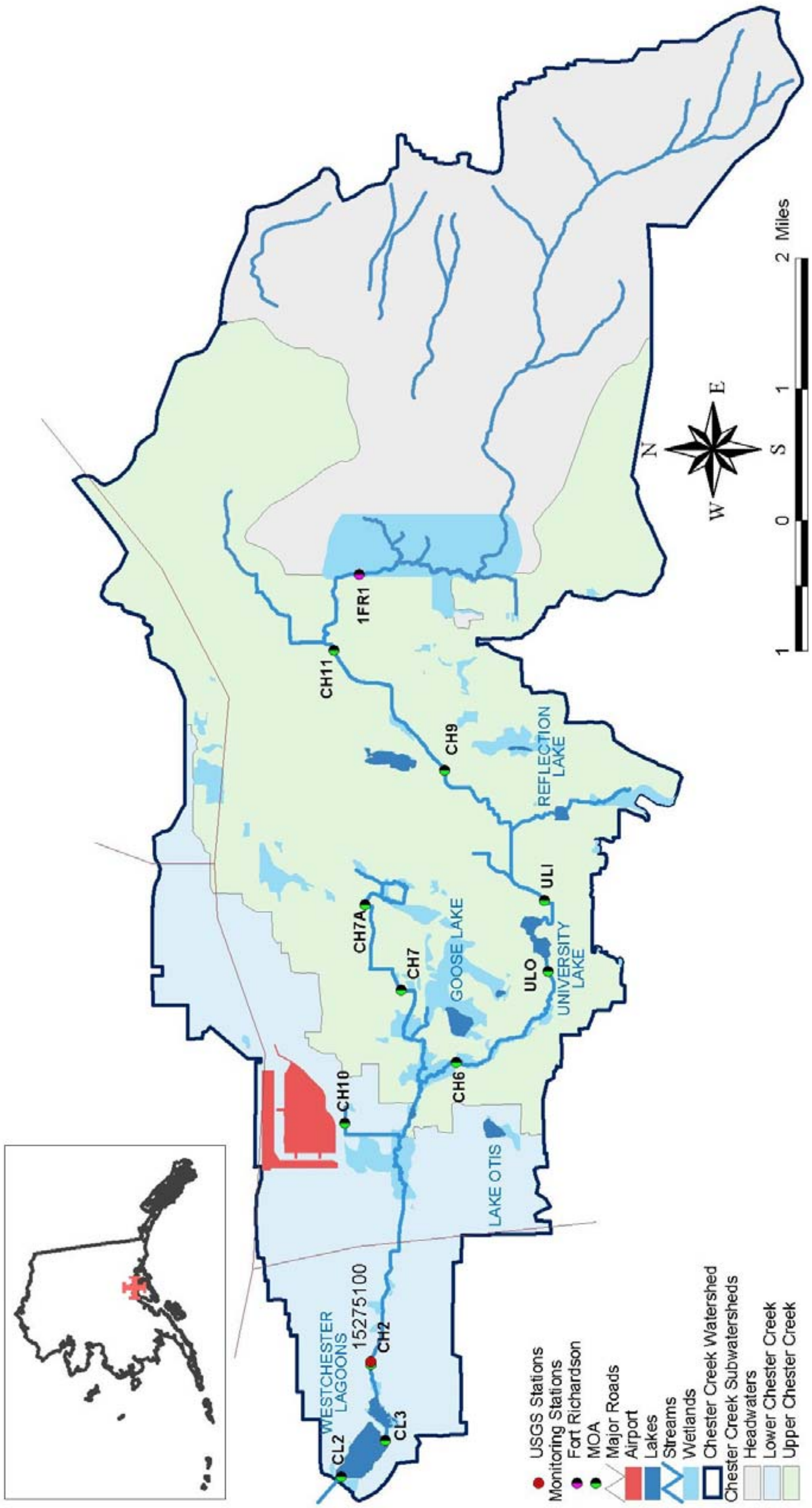


Figure 3-1. Location of MOA monitoring stations and modeling units.

3.3.1 Station CH11, South Fork Chester Creek, Upper Chester Creek Subwatershed

Station CH11 is located on the South Fork of the Chester Creek drainage and is the most upstream sampling station. Although it drains a predominantly forested watershed, the area immediately upstream includes land cover classified by MOA as mobile home parks and multi-family homes. There are also approximately 10 storm water outfalls upstream of the station. Sampling data are available for the period March 16, 1993 to December 20, 1994 and the results are summarized in Table 3-2 and Figure 3-2.

Counts of fecal coliform at station CH11 appear to have a bimodal distribution, with peaks during late winter and late summer. Counts increase steadily from May to September and then begin to decrease during the winter. Most calculated 30-day geometric means exceed the water quality standard.

Table 3-2. Summary statistics of geometric means calculated using observed fecal coliform data at station CH11. Data cover the period March 16, 1993 to December 20, 1994.

Month	Average[1]	Median[1]	Min[1]	Max[1]	25th[1]	75th[1]	Exceedances: Count[2]	Percentage of Exceedances[3]
Jan	27	28	15	35	23	35	4:5	80%
Feb	217	217	87	347	152	282	2:2	100%
Mar	144	97	34	300	66	199	3:3	100%
Apr	115	122	92	131	107	127	3:3	100%
May	59	51	43	98	45	63	6:6	100%
Jun	149	133	79	247	93	201	8:8	100%
Jul	470	153	101	1076	140	839	7:7	100%
Aug	513	511	242	937	385	574	9:9	100%
Sep	495	482	86	944	333	644	15:15	100%
Oct	402	402	346	458	374	430	2:2	100%
Nov	63	63	63	63	63	63	1:1	100%
Dec	33	42	0	47	30	45	3:4	75%

[1] Average, median, minimum, maximum and 25th and 75th percentile values of all 30-day geometric means calculated for the month (i.e., using samples within the month).
[2] Ratio of number of calculated 30-day geometric means that exceed the water quality criterion to the number of calculated 30-day geometric means in the month.
[3] Percentage of all calculated 30-day geometric means for the month that exceed the water quality criterion.

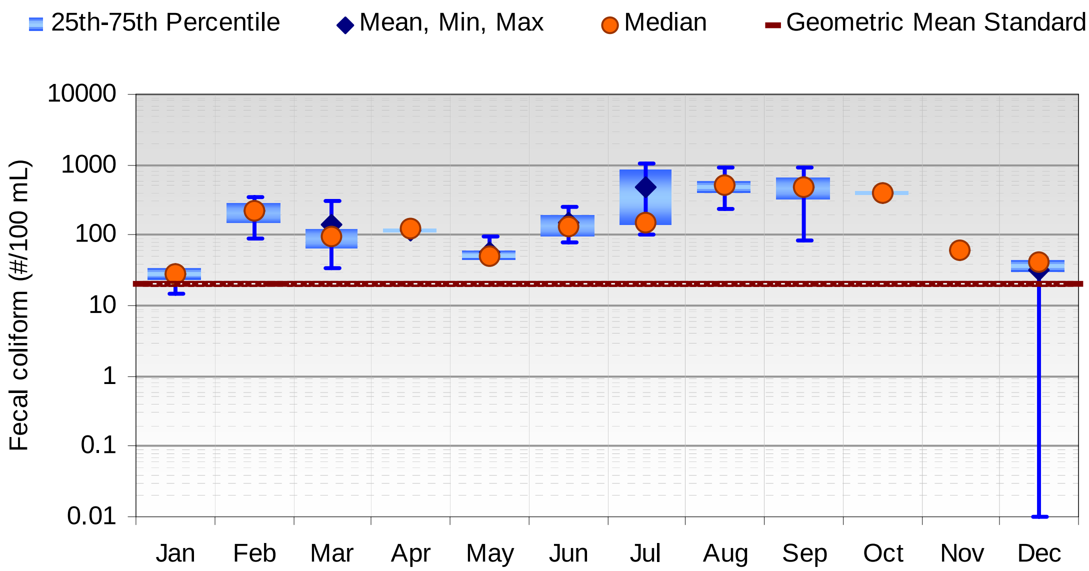


Figure 3-2. Summary of calculated monthly geometric means of fecal coliform at station CH11.

3.3.2 Station CH9, South Fork Chester Creek, Upper Chester Creek Subwatershed

Station CH9 is located downstream of station CH11 in the upper Chester Creek watershed and drains an area consisting primarily of single family homes. Data are available for the period April 15, 1986 to September 30, 1994 and the results are summarized in Table 3-3 and Figure 3-3.

Many fecal coliform data are available for station CH9 and almost all calculated 30-day geometric means are above the water quality standard. Counts rise during the spring and summer and then begin to decrease in September.

Table 3-3. Summary statistics of geometric means calculated using observed fecal coliform data at station CH9. Data cover the period April 15, 1986 to September 30, 1994.

Month	Average[1]	Median[1]	Min[1]	Max[1]	25th[1]	75th[1]	Exceedances: Count[2]	Percentage of Exceedances[3]
Jan	60	59	9	138	21	85	26:34	76%
Feb	121	76	12	302	43	219	32:36	89%
Mar	168	175	14	340	111	208	44:46	96%
Apr	221	227	82	440	160	260	36:36	100%
May	129	97	28	397	64	187	34:34	100%
Jun	183	189	44	399	105	242	35:35	100%
Jul	473	404	132	1222	267	664	40:40	100%
Aug	851	680	238	2525	407	1155	40:40	100%
Sep	789	314	24	4229	204	845	45:45	100%
Oct	261	171	18	725	57	368	28:29	97%
Nov	147	111	20	452	66	184	28:28	100%
Dec	66	51	7	233	31	72	23:27	85%

[1]Average, median, minimum, maximum and 25th and 75th percentile values of all 30-day geometric means calculated for the month (i.e., using samples within the month).
[2] Ratio of number of calculated 30-day geometric means that exceed the water quality criterion to the number of calculated 30-day geometric means in the month.
[3] Percentage of all calculated 30-day geometric means for the month that exceed the water quality criterion.

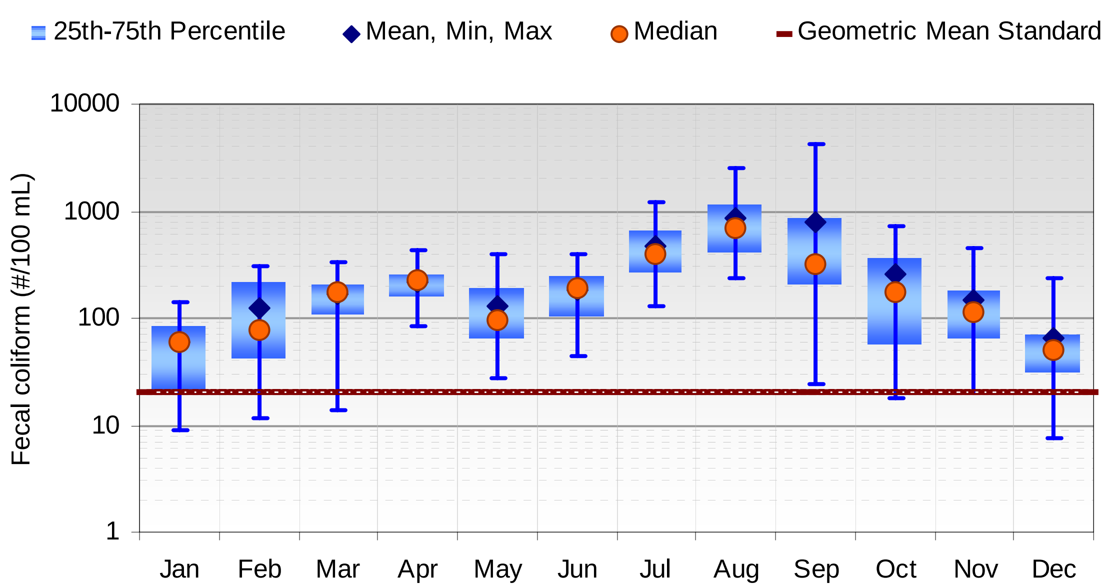


Figure 3-3. Summary of calculated monthly geometric means of fecal coliform at station CH9.

3.3.3 Station ULI (inlet to University Lake), South Fork Chester Creek, Upper Chester Creek Subwatershed

Station ULI is located at the inlet to University Lake and drains an area of multi-family homes, mobile home parks, and parks. Data are available for the period January 20, 1988 to September 30, 1994 and are summarized in Table 3-4 and Figure 3-4.

Fecal coliform counts at ULI appear to be bimodal. There is a distinct peak in the calculated 30-day geometric means in August at approximately 600 FC/ 100 mL and a slight peak in February at approximately 350 FC/ 100 mL. Counts are at their lowest point in May and increase steadily from May to August.

Table 3-4. Summary statistics of geometric means calculated using observed fecal coliform data at station ULI-351. Data cover the period January 20, 1988 to September 30, 1994.

Month	Average[1]	Median[1]	Min[1]	Max[1]	25th[1]	75th[1]	Exceedances: Count[2]	Percentage of Exceedances[3]
Jan	262	284	41	461	203	331	32:32	100%
Feb	268	320	40	489	153	366	27:27	100%
Mar	230	234	3	462	73	372	28:33	85%
Apr	196	188	10	534	88	282	28:31	90%
May	78	66	5	209	42	87	28:32	88%
Jun	173	151	32	518	102	227	29:29	100%
Jul	521	376	157	1761	248	660	37:37	100%
Aug	758	537	164	3034	355	762	35:35	100%
Sep	446	383	29	1663	166	471	37:37	100%
Oct	208	158	63	537	121	227	27:27	100%
Nov	222	207	4	524	73	335	21:26	81%
Dec	263	286	4	479	240	340	23:25	92%

[1]Average, median, minimum, maximum and 25th and 75th percentile values of all 30-day geometric means calculated for the month (i.e., using samples within the month).
[2] Ratio of number of calculated 30-day geometric means that exceed the water quality criterion to the number of calculated 30-day geometric means in the month.
[3] Percentage of all calculated 30-day geometric means for the month that exceed the water quality criterion.

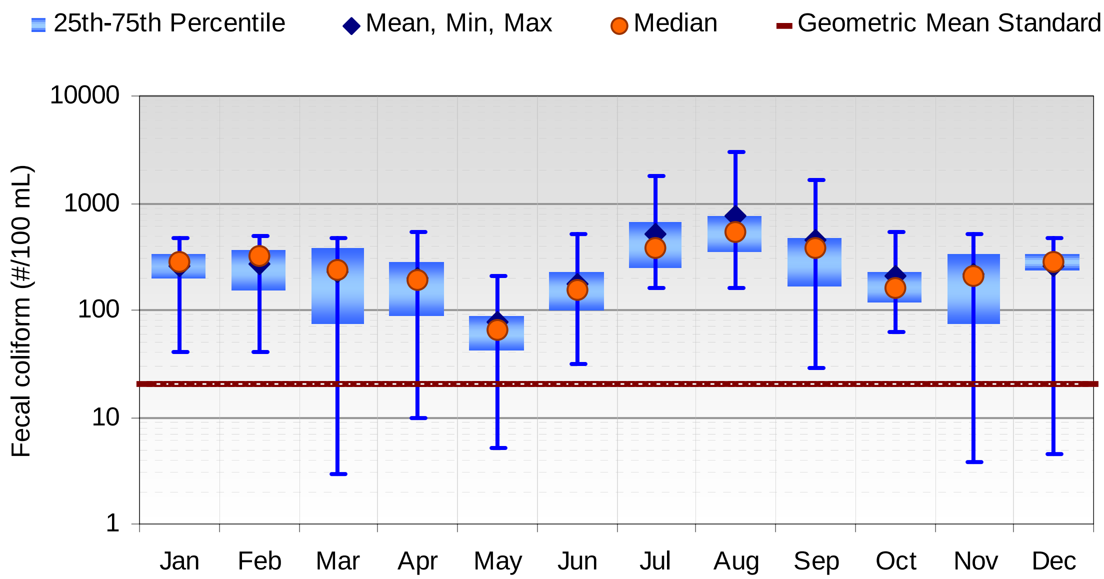


Figure 3-4. Summary of calculated monthly geometric means of fecal coliform at station ULI.

3.3.4 Station ULO (outlet of University Lake), South Fork Chester Creek, Upper Chester Creek Subwatershed

Station ULO is located at the outlet of University Lake. Data are available for the period January 20, 1988 to September 30, 1994 and are summarized in Table 3-5 and Figure 3-5.

Fecal coliform counts at the output from the lake do not appear to have a clearly defined distribution. There are slight peaks in fecal coliform counts in January, April, and August.

It is noteworthy that fecal coliform counts appear to drop significantly from station ULI-351 to ULO. The calculated 30-day geometric means are approximately 70 percent less below the lake than they are above, indicating that the lake is a net sink of bacteria.

Table 3-5. Summary statistics of geometric means calculated using observed fecal coliform data at station ULO. Data cover the period January 20, 1988 to September 30, 1994.

Month	Average[1]	Median[1]	Min[1]	Max[1]	25th[1]	75th[1]	Exceedances: Count[2]	Percentage of Exceedances[3]
Jan	72	69	0	181	13	116	20:33	61%
Feb	56	41	2	313	19	63	19:26	73%
Mar	77	49	1	800	4	100	23:32	72%
Apr	92	75	1	336	13	159	19:29	66%
May	23	20	1	72	5	37	16:32	50%
Jun	31	27	1	74	11	46	19:29	66%
Jul	55	50	11	126	41	67	35:37	95%
Aug	74	62	10	229	45	93	30:35	86%
Sep	118	40	6	634	13	138	22:37	59%
Oct	100	51	17	418	33	127	26:27	96%
Nov	92	70	0	224	47	142	26:27	96%
Dec	89	83	1	247	57	117	22:25	88%

[1]Average, median, minimum, maximum and 25th and 75th percentile values of all 30-day geometric means calculated for the month (i.e., using samples within the month).
[2] Ratio of number of calculated 30-day geometric means that exceed the water quality criterion to the number of calculated 30-day geometric means in the month.
[3] Percentage of all calculated 30-day geometric means for the month that exceed the water quality criterion.

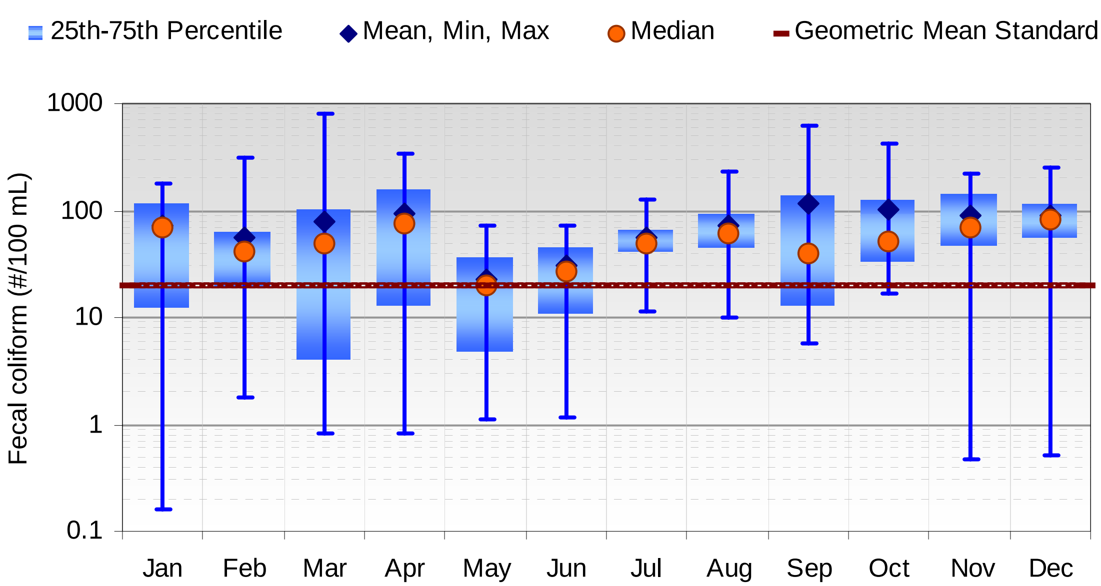


Figure 3-5. Summary of calculated monthly geometric means of fecal coliform at station ULO.

3.3.5 Station CH6, Downstream of Station ULO, South Fork Chester Creek, Upper Chester Creek Subwatershed

Station CH6 is located on the South Fork of Chester Creek in the upper Chester Creek subwatershed and drains an area consisting of parks and single-family detached homes. Data are available for the period April 15, 1988 to September 30, 1994 and the results are summarized in Table 3-6 and Figure 3-6.

Most calculated 30-day geometric means at station CH6 are above the standard. Average geometric means vary from 24 to 117 FC/100ml with the highest counts in April and September. Counts drop from April to May and then slowly increase during the summer.

Table 3-6. Summary statistics of geometric means calculated using observed fecal coliform data at station CH6. Data cover the period April 15, 1988 to September 30, 1994.

Month	Average[1]	Median[1]	Min[1]	Max[1]	25th[1]	75th[1]	Exceedances: Count[2]	Percentage of Exceedances[3]
Jan	63	63	15	145	33	92	24:29	83%
Feb	58	43	4	295	19	70	18:24	75%
Mar	50	30	4	212	16	60	16:25	64%
Apr	117	111	20	337	37	183	25:26	96%
May	24	24	7	48	13	32	17:29	59%
Jun	31	30	6	68	17	42	22:31	71%
Jul	53	48	15	130	35	66	33:35	94%
Aug	53	41	11	185	27	76	28:34	82%
Sep	103	68	6	654	13	103	25:37	68%
Oct	69	59	16	209	32	90	26:27	96%
Nov	57	43	29	174	37	62	28:28	100%
Dec	65	70	13	122	30	91	28:29	97%

[1] Average, median, minimum, maximum and 25th and 75th percentile values of all 30-day geometric means calculated for the month (i.e., using samples within the month).
[2] Ratio of number of calculated 30-day geometric means that exceed the water quality criterion to the number of calculated 30-day geometric means in the month.
[3] Percentage of all calculated 30-day geometric means for the month that exceed the water quality criterion.

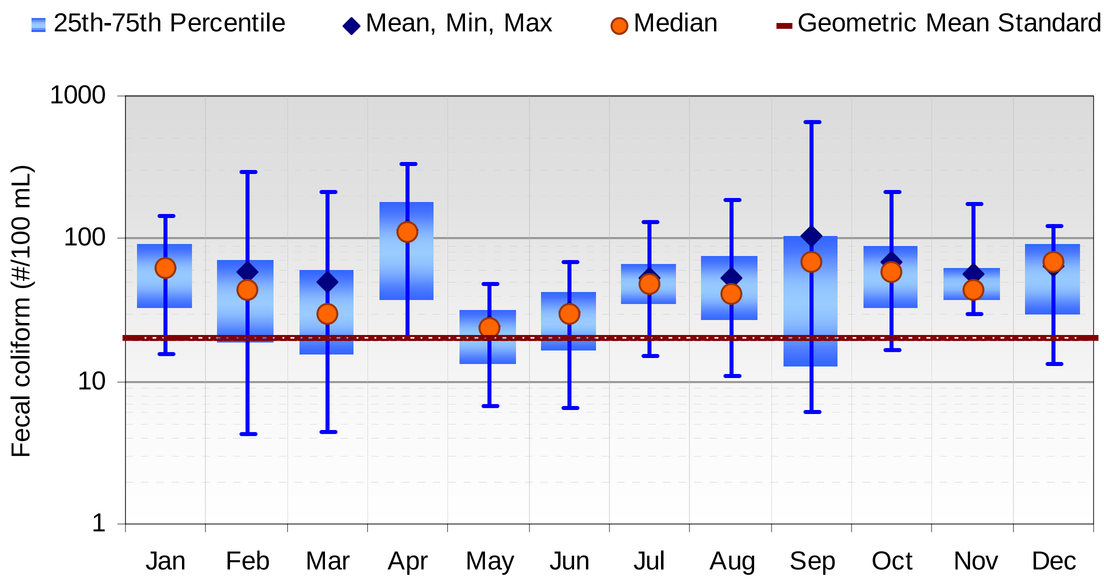


Figure 3-6. Summary of calculated monthly geometric means of fecal coliform at station CH6.

3.3.6 Station CH7A, Middle Fork Chester Creek, Upper Chester Creek Subwatershed

Station CH7A is located on the Middle Fork of Chester Creek in the upper Chester Creek subwatershed and drains an area consisting of parks, wetlands, and multi-family homes. Data are available for the period December 16, 1987 to September 30, 1994 and the results are summarized in Table 3-7 and Figure 3-7.

Many fecal coliform data are available for station CH7A. Most samples during the winter and early spring are above the 20 FC/100 mL standard whereas values during the rest of the year are both above and below the standard. A significant decrease in fecal coliform counts occurs between April and May, possibly due to greater flows associated with snowmelt.

Table 3-7. Summary statistics of geometric means calculated using observed fecal coliform data at station CH7A. Data cover the period December 16, 1987 to September 30, 1994.

Month	Average[1]	Median[1]	Min[1]	Max[1]	25th[1]	75th[1]	Exceedances: Count[2]	Percentage of Exceedances[3]
Jan	80	22	1	359	10	40	19:36	53%
Feb	80	42	1	445	16	69	20:29	69%
Mar	97	86	6	287	44	134	28:34	82%
Apr	245	216	28	672	81	385	30:30	100%
May	38	15	2	143	9	45	14:31	45%
Jun	33	21	1	101	5	59	16:30	53%
Jul	35	17	3	140	10	58	14:34	41%
Aug	24	13	1	117	3	26	12:34	35%
Sep	12	8	0	104	5	12	4:36	11%
Oct	17	10	0	71	5	24	9:29	31%
Nov	32	12	0	188	4	50	10:26	38%
Dec	70	5	0	510	3	18	6:26	23%

[1]Average, median, minimum, maximum and 25th and 75th percentile values of all 30-day geometric means calculated for the month (i.e., using samples within the month).
[2] Ratio of number of calculated 30-day geometric means that exceed the water quality criterion to the number of calculated 30-day geometric means in the month.
[3] Percentage of all calculated 30-day geometric means for the month that exceed the water quality criterion.

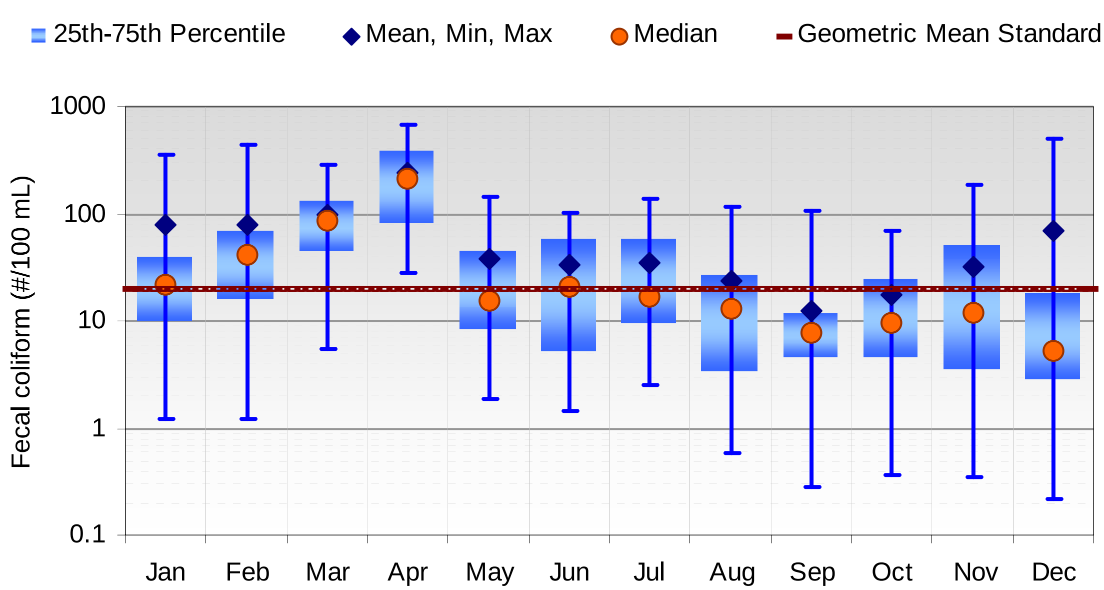


Figure 3-7. Summary of calculated monthly geometric means of fecal coliform at station CH7A.

3.3.7 Station CH7, Downstream of Station CH7A, Middle Fork Chester Creek, Upper Chester Creek Subwatershed

Station CH7 is located on the Middle Fork of Chester Creek downstream of station CH7A in the upper Chester Creek subwatershed. The station represents a drainage area consisting of primarily multi-family homes. Data are available for the period April 15, 1986 to September 30, 1994 and the results are summarized in Table 3-8 and Figure 3-8.

Calculated 30-day geometric means at station CH7 usually exceeded the 20 FC/ 100 mL standard but dropped below the standard in November and December. Fecal coliform distribution appears to be annually bimodal having peaks in April and August. There is a sharp drop in fecal coliform counts from April to May, similar to what is observed at station 7A. Counts drop from May to June and then increase from July through September.

Table 3-8. Summary statistics of geometric means calculated using observed fecal coliform data at station CH7. Data cover the period December 16, 1987 to September 30, 1994.

Month	Average[1]	Median[1]	Min[1]	Max[1]	25th[1]	75th[1]	Exceedances: Count[2]	Percentage of Exceedances[3]
Jan	39	22	2	185	7	39	15:28	54%
Feb	89	51	1	317	33	82	21:25	84%
Mar	110	46	3	789	13	135	25:35	71%
Apr	262	242	4	895	23	328	29:37	78%
May	57	28	1	257	7	71	22:36	61%
Jun	36	23	1	213	8	40	17:31	55%
Jul	144	50	3	1510	22	147	32:42	76%
Aug	104	76	11	323	38	155	37:40	93%
Sep	104	63	5	575	18	139	31:43	72%
Oct	39	24	2	222	10	53	18:29	62%
Nov	28	19	3	85	9	45	15:31	48%
Dec	50	13	3	258	7	51	13:33	39%

[1]Average, median, minimum, maximum and 25th and 75th percentile values of all 30-day geometric means calculated for the month (i.e., using samples within the month).
[2] Ratio of number of calculated 30-day geometric means that exceed the water quality criterion to the number of calculated 30-day geometric means in the month.
[3] Percentage of all calculated 30-day geometric means for the month that exceed the water quality criterion.

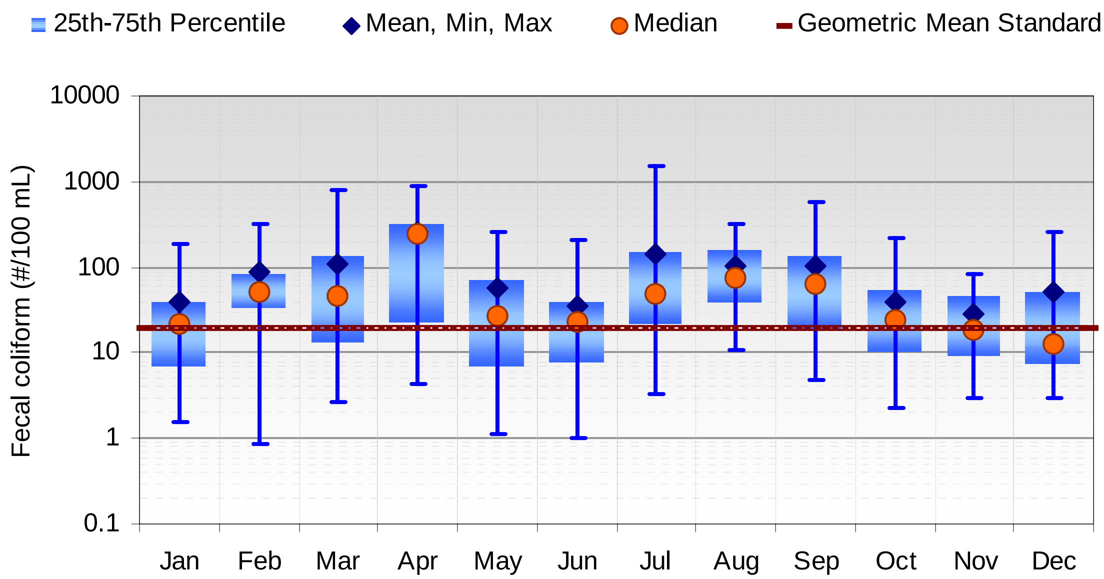


Figure 3-8. Summary of calculated monthly geometric means of fecal coliform at station CH7.

3.3.8 Station CH10, North Fork Chester Creek, Lower Chester Creek Subwatershed

Station CH10 is located on the North Fork of the Chester Creek drainage in the lower Chester Creek subwatershed and drains an area consisting of single family homes, multi-family homes, and commercial/transportation land uses. There are two storm water outfalls located near the sampling station. Data are available for the period March 16, 1993 to September 30, 1994 and the results are summarized in Table 3-9 and Figure 3-9.

Fecal coliform data at station CH10 appear to be highly variable, perhaps due to the limited number of samples. Calculated 30-day geometric means during the spring and summer are usually below water quality standards, while the limited data for the winter show more exceedances of the standard.

Table 3-9. Summary statistics of geometric means calculated using observed fecal coliform data at station CH10. Data cover the period March 16, 1993 to September 30, 1994.

Month	Average[1]	Median[1]	Min[1]	Max[1]	25th[1]	75th[1]	Exceedances: Count[2]	Percentage of Exceedances[3]
Jan	29	24	17	49	20	33	3:4	75%
Feb	244	244	130	359	187	302	2:2	100%
Mar	14	14	14	14	14	14	0:1	0%
Apr	0	0	0	0	0	0	0:2	0%
May	6	0	0	28	0	1	1:5	20%
Jun	6	4	0	19	2	7	0:6	0%
Jul	4	3	1	9	2	5	0:7	0%
Aug	23	9	2	63	3	51	3:9	33%
Sep	94	36	6	454	25	75	13:15	87%
Oct	256	256	144	368	200	312	2:2	100%
Nov	6	6	6	6	6	6	0:1	0%
Dec	13	12	9	17	9	15	0:4	0%

[1]Average, median, minimum, maximum and 25th and 75th percentile values of all 30-day geometric means calculated for the month (i.e., using samples within the month).
[2] Ratio of number of calculated 30-day geometric means that exceed the water quality criterion to the number of calculated 30-day geometric means in the month.
[3] Percentage of all calculated 30-day geometric means for the month that exceed the water quality criterion.

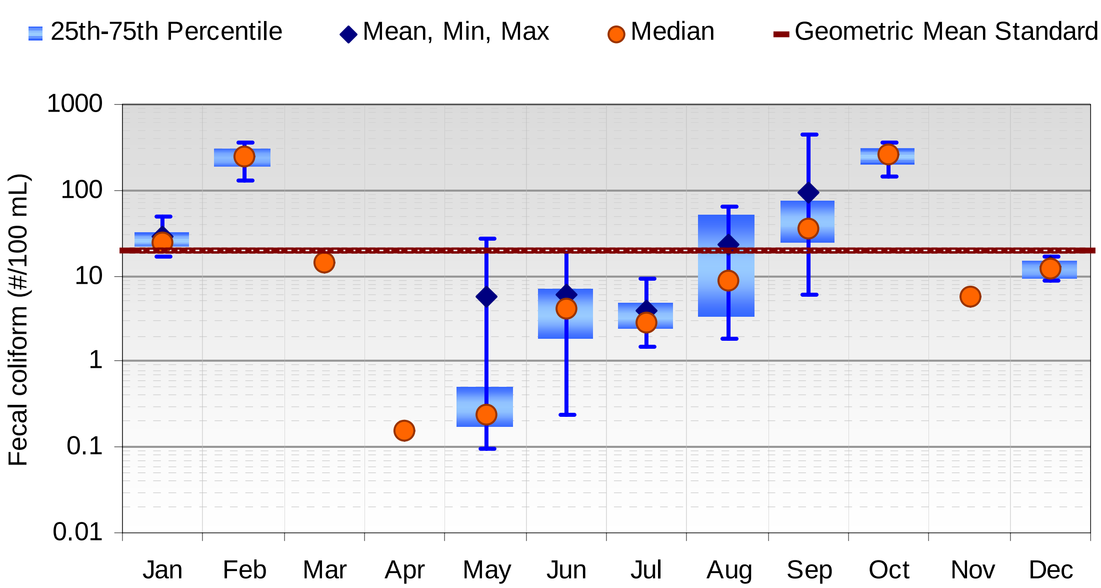


Figure 3-9. Summary of calculated monthly geometric means of fecal coliform at station CH10.

3.3.9 Station CH2, Chester Creek, Lower Chester Creek Subwatershed

Station CH2 is located on Chester Creek in the lower Chester Creek subwatershed and drains a majority of the watershed. Data are available for the period April 15, 1986 to February 5, 1988 and are summarized in Table 3-10 and Figure 3-10.

Every calculated 30-day geometric mean at station CH2 was above the water quality standard of 20 FC/100 mL. The distribution of fecal coliform at the station is annually bimodal having peaks in April and August. A significant decrease in fecal coliform counts occurs between April and May, as is observed at many of the other stations in the watershed.

Table 3-10. Summary statistics of geometric means calculated using observed fecal coliform data at station CH2. Data cover the period April 15, 1986 to February 5, 1988.

Month	Average[1]	Median[1]	Min[1]	Max[1]	25th[1]	75th[1]	Exceedances: Count[2]	Percentage of Exceedances[3]
Jan	106	97	79	151	87	116	4:4	100%
Feb	117	122	85	140	113	124	6:6	100%
Mar	285	257	207	408	226	349	8:8	100%
Apr	324	336	224	431	263	371	10:10	100%
May	188	208	106	223	175	216	10:10	100%
Jun	316	335	107	539	115	502	7:7	100%
Jul	452	416	114	764	311	673	10:10	100%
Aug	647	682	276	1026	388	895	10:10	100%
Sep	336	302	106	745	240	437	13:13	100%
Oct	90	93	78	96	89	94	4:4	100%
Nov	89	95	66	106	72	105	5:5	100%
Dec	153	52	39	640	47	124	7:7	100%

[1]Average, median, minimum, maximum and 25th and 75th percentile values of all 30-day geometric means calculated for the month (i.e., using samples within the month).
[2] Ratio of number of calculated 30-day geometric means that exceed the water quality criterion to the number of calculated 30-day geometric means in the month.
[3] Percentage of all calculated 30-day geometric means for the month that exceed the water quality criterion.

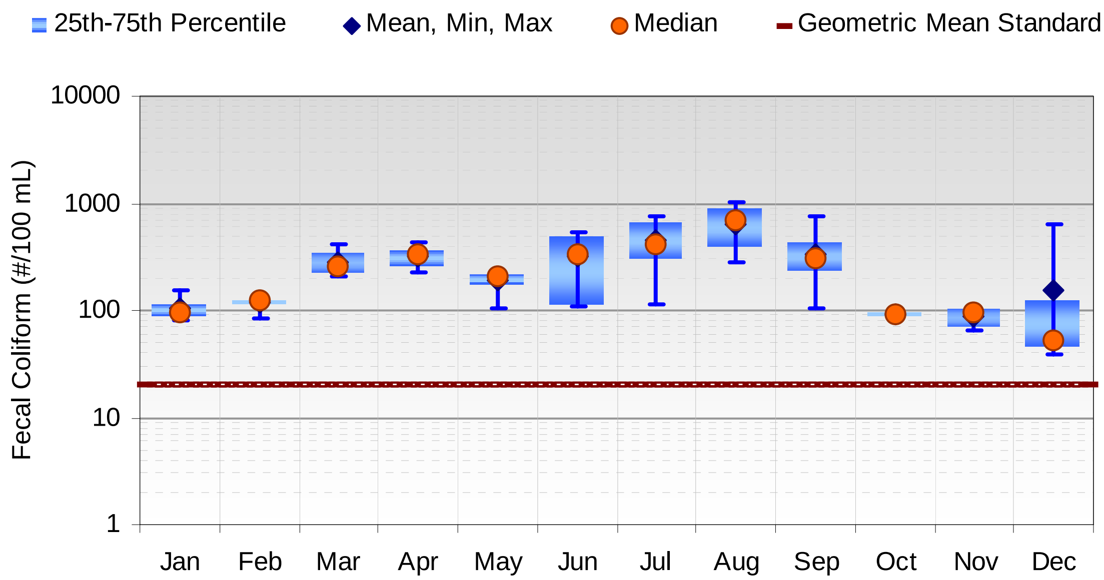


Figure 3-10. Summary of calculated monthly geometric means of fecal coliform at station CH2.

3.3.10 Station CL3, Near Inlet from Chester Creek to Westchester Lagoon

Station CL3 is located in the southeastern edge of the Westchester Lagoon, to the west of Minnesota Avenue. The site drains nearly the entire Chester Creek watershed. Forest cover characterizes the immediate area surrounding the monitoring site. Data are available for the period March 31, 1988 to September 30, 1994 and the results are summarized in Table 3-11 and Figure 3-11.

All calculated 30-day geometric means at station CL3 are above the standard. Average monthly geometric means range from 14 to 287 FC/ 100 mL with the highest geometric means occurring in March and April. Average geometric means decline from May through July, and then increase during August and September, and decline again from October through February. The greatest variability in monthly geometric means occurs in January.

Table 3-11. Summary Statistics of geometric mean calculated using observed fecal coliform data at Station CL3. Data cover the period March, 31 1988 to September 30, 1994.

Month	Average[1]	Median[1]	Min[1]	Max[1]	25th[1]	75th[1]	Exceedances: Count[2]	Percent of Exceedences[3]
Jan	33	36	0	73	26	40	24:29	83%
Feb	47	43	18	83	32	60	9:10	90%
Mar	112	83	40	404	57	126	14:14	100%
Apr	287	161	36	808	68	605	17:17	100%
May	78	25	5	332	15	95	13:22	59%
Jun	14	16	3	30	7	19	5:21	24%
Jul	55	30	6	257	14	70	21:32	66%
Aug	89	61	6	283	19	129	22:32	69%
Sep	96	66	3	431	24	122	24:31	77%
Oct	59	64	1	145	32	84	20:24	83%
Nov	43	50	0	123	7	56	18:25	72%
Dec	35	35	3	68	24	45	18:24	75%

[1]Average, median, minimum, maximum and 25th and 75th percentile values of all 30-day geometric means calculated for the month (i.e., using samples within the month).
[2] Ratio of number of calculated 30-day geometric means that exceed the water quality criterion to the number of calculated 30-day geometric means in the month.
[3] Percentage of all calculated 30-day geometric means for the month that exceed the water quality criterion.

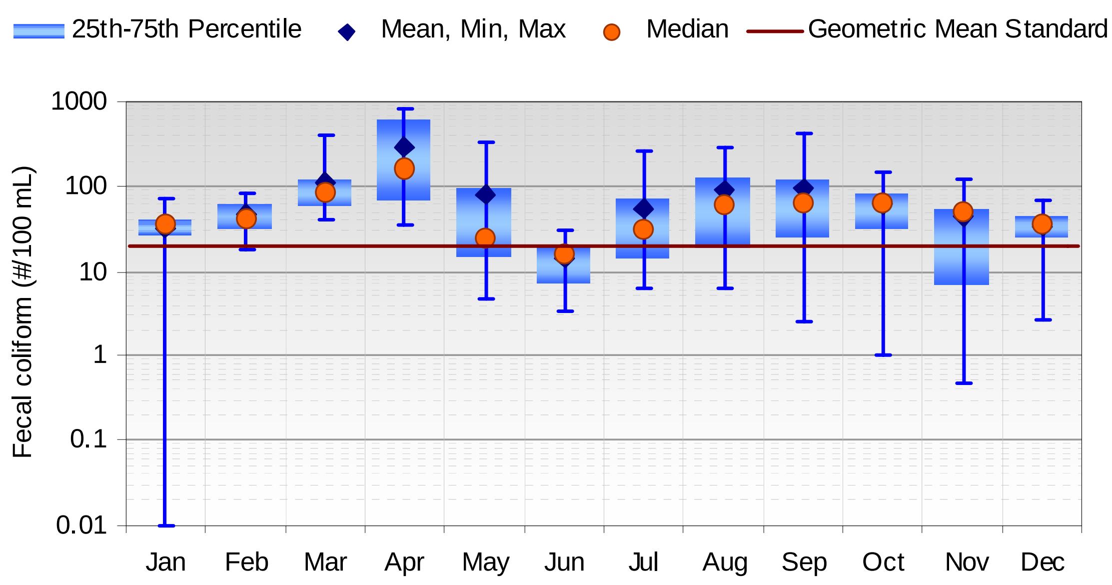


Figure 3-11. Summary of calculated monthly geometric means of fecal coliform at station CL3.

3.3.11 Station CL2, Near Outlet into Cook Inlet

Station CL2 is located at the outlet of Westchester Lagoon, adjacent to the weir and the conveyance pipe used to discharge into the inlet. The site drains the entire Chester Creek watershed. Data are available for the period March 31, 1988 to December 20, 1994, and the results are summarized in Table 3-12 and Figure 3-12.

Most of the calculated 30-day geometric means at station CL3 are above the standard. Average monthly geometric means vary between 28 and 231 FC/100 mL. Monthly average geometric means peak in April and remain high during May, then decrease rapidly in June. Mean monthly geometric means increase rapidly in July and remain high through August, September, and October. Minimum average geometric means occur in February, June, and January, respectively.

Table 3-12. Summary Statistics of geometric mean calculated using observed fecal coliform data at Station CL2. Data cover the period March, 31 1988 to December 20, 1994.

Month	Average[1]	Median[1]	Min[1]	Max[1]	25th[1]	75th[1]	Exceedances: Count[2]	Percent of Exceedences[3]
Jan	58	55	1	127	23	88	22:28	79%
Feb	28	15	4	61	13	48	8:17	47%
Mar	58	33	13	167	15	103	12:22	55%
Apr	231	197	9	754	130	276	25:26	96%
May	144	93	3	573	22	161	25:32	78%
Jun	46	28	2	231	20	62	23:30	77%
Jul	195	68	15	1435	40	205	33:35	94%
Aug	178	91	12	1205	24	252	27:35	77%
Sep	168	79	2	855	12	300	24:39	62%
Oct	129	74	10	356	49	251	24:28	86%
Nov	79	79	19	221	43	99	26:27	96%
Dec	59	70	2	97	32	84	18:23	78%

[1] Average, median, minimum, maximum and 25th and 75th percentile values of all 30-day geometric means calculated for the month (i.e., using samples within the month).
[2] Ratio of number of calculated 30-day geometric means that exceed the water quality criterion to the number of calculated 30-day geometric means in the month.
[3] Percentage of all calculated 30-day geometric means for the month that exceed the water quality criterion.

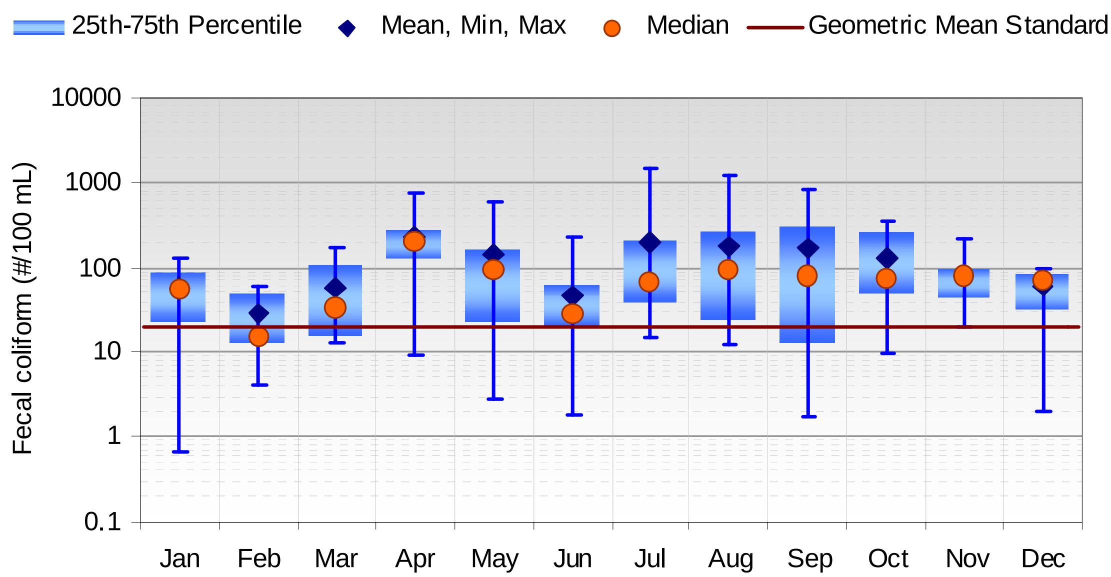


Figure 3-12. Summary of calculated monthly geometric means of fecal coliform at station CL2.

A statistical summary of all fecal coliform monitoring stations in the Chester Creek watershed is presented in Figure 3-13. The figure shows significant variability in observed fecal coliform counts for all monitoring stations, and that mean fecal coliform counts exceed the geometric mean standard of 20 per 100 mL at all stations. Similarly, median fecal coliform counts exceed the geometric mean standard at all stations except CH10.

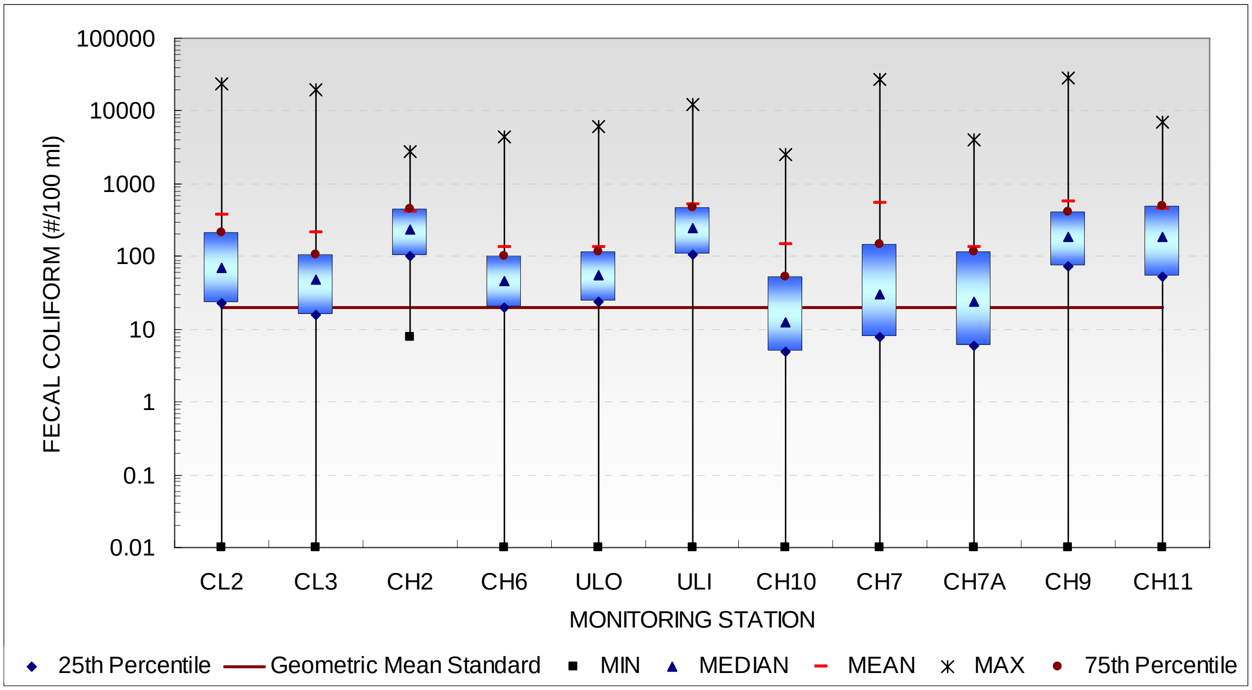


Figure 3-13. Summary of calculated monthly geometric means of fecal coliform for all monitoring stations.

4.0 POLLUTANT SOURCES

The identification of sources is important to the successful implementation of a TMDL and the control of pollutant loading to a stream. Characterizing watershed sources can provide information on the relative magnitude and influence of each source and its impact on in-stream water quality conditions. This section discusses the potential sources of fecal coliform to Chester Creek, University Lake and Westchester Lagoon.

4.1 Point Sources, Nonpoint Sources, and Natural Sources

The Alaska 303(d) impaired waters list identifies urban runoff as the primary source of fecal coliform to Chester Creek, University Lake, and Westchester Lagoon. Snowmelt and rainfall transport bacteria that is deposited and accumulated on the surface of residential and urban areas. Likely sources of the accumulated bacteria are waterfowl, domestic animals (e.g., cats and dogs) and native animals (e.g., moose, bear, etc.). Animals can deposit fecal matter directly into the watershed streams or on the land surface where it is available for overland transport in surface runoff. MOA (1990) concludes that pet and waterfowl feces appear to the major sources of fecal coliform for runoff in the Anchorage area. Additionally, cracked or leaking sanitary sewer lines, failing on site septic systems, and indigent people living near the creek may also contribute fecal coliform bacteria to Chester Creek

Wildlife may be a considerable source of fecal coliform to Chester Creek, University Lake, and Westchester Lagoon, both through direct deposition and deposition on watershed surfaces; however, it is difficult to estimate fecal coliform contributions from wildlife in the Anchorage area. It is not feasible to isolate wildlife populations for the Chester Creek watershed due to the mobility and large home ranges of the wildlife throughout the area. Additionally, while fecal coliform production of many agricultural animals has been researched, there is little or no information on the bacteria production rates of wildlife species native to the Anchorage area.

Although the information is not available to quantify the direct loading from wildlife sources in the watershed, Alaska Department of Fish and Game (ADF&G) provided qualitative estimates of wildlife populations in the Anchorage area that are used to provide general background on the types of animals that may be contributing to the fecal coliform impairments in the area. The following summarizes the information provided by ADF&G (Rick Sinnott, personal communication, 1/30/03):

- Approximately 200 to 300 moose live in the Anchorage Bowl, not including moose that live solely in Fort Richardson or Chugach State Park, and as many as 1,000 moose are in the Anchorage Bowl in winter.
- About 2,000 Canada geese inhabit the Anchorage Bowl. Most of these geese are located west of Lake Otis Boulevard and north of Tudor Road (i.e., Fish Creek area) in grassy parks, school grounds, and athletic fields in April and July-October and in bogs, ponds, and lakes in May-July.
- Thousands more Canada and other geese fly through the area in spring and fall, primarily in the Anchorage Coastal Wildlife Refuge (located on the Turnagain Arm and including Potter Marsh).
- Anchorage may contain 2,000 or more mallards in the winter, with most located in open creeks (Ship Creek and Chester Creek).
- Anchorage also has several thousand pigeons, primarily downtown and midtown.
- At most, there are 100 to 150 beavers in the Anchorage Bowl.
- Latest counts showed no more than 6 brown bears and 30-40 black bears in the Anchorage Bowl.

Septic systems have the potential to contribute fecal coliform to receiving waters through surface breakouts and subsurface malfunctions. Failing septic systems located in close proximity to receiving waterbodies are more likely to impact in-stream conditions. The majority of septic systems in the Anchorage area are located more than 100 feet away from any streams and the majority of the houses (more than 95 percent) in the Chester Creek watershed are connected to city sewer and do not use onsite septic systems. Additionally, 99 to 100 percent of homes built close to the stream are connected to city sewer (Kevin Kleweno, ADEC, Division of Environmental Health, Drinking Water & Wastewater Program, personal communication to Timothy Stevens, ADEC, January 31, 2003). Therefore, DEC believes septic systems have no or insignificant contribution of fecal coliform to Chester Creek.

An ongoing water quality study conducted by the University of Alaska on the spatial, temporal, and phase distribution of fecal coliform in Chester Creek indicates the number of indigent people living near the creek has been drastically reduced by an intensive city wide effort to remove homeless camps from city parks and greenbelts. As a result of this ongoing action the potential for fecal coliform contribution by indigent people has been eliminated as a significant source of fecal coliform impacting Chester Creek.

The University of Alaska study also investigated the potential of leaking sewer lines to contribute fecal coliform to Chester Creek. Based on selection criteria and field observations two sewer line stream crossings were chosen for sampling and analysis. Ground water and surface water samples were collected above and below the stream crossings for analysis. Preliminary data indicate these sewer lines are not contributing fecal coliform to Chester Creek.

Storm water is traditionally considered a nonpoint source, carrying pollutants to receiving waters through surface runoff. However, when storm water is permitted and carried through conveyances to discrete discharges to streams, it is considered a point source. Unlike most constant point sources (e.g., waste water treatment plant (WWTP) discharges), storm water is precipitation-driven and impacts the receiving stream during times of surface runoff. The MOA is subject to an NPDES storm water permit that covers all of the storm drains in the Chester Creek watershed and therefore the storm water runoff that occurs within the MOS is considered a point source for regulatory purposes. Storm water runoff that occurs outside of the MOA boundaries is considered a nonpoint source.

5.0 TECHNICAL APPROACH

Developing TMDLs requires a combination of technical analysis, practical understanding of important watershed processes, and interpretation of watershed loadings and receiving water responses to those loadings. In identifying the technical approach for development of fecal coliform TMDL for Chester Creek, University Lake, and Westchester Lagoon, the following core set of principles was identified and applied:

- ***The TMDLs must be based on scientific analysis and reasonable and acceptable assumptions.*** All major assumptions have been made based on available data and in consultation with appropriate agency staff.

- ***The TMDLs must use the best available data.*** All available data in the watershed were reviewed and were used in the analysis where possible or appropriate.

- ***Methods should be clear and as simple as possible to facilitate explanation to stakeholders.*** All methods and major assumptions used in the analysis are described. The TMDL document has been presented in a format accessible by a wide range of audiences, including the public and interested stakeholders.

The technical approach used to estimate the loading capacity, existing loads, and load allocations presented below relies on these principles and provides a TMDL calculation that uses the best available information to represent watershed and in-stream processes.

5.1 Modeling Approach

This section presents the hydrologic and water quality modeling approach employed to estimate in-stream fecal coliform counts and loadings in the Chester Creek watershed, including University Lake and Westchester Lagoon. A watershed model is essentially a series of algorithms applied to watershed characteristics and meteorological data to simulate naturally occurring land-based processes over an extended period of time, including hydrology and pollutant transport. Many watershed models are also capable of simulating in-stream processes using the land-based calculations as input. Once a model has been adequately set up and calibrated for a watershed it can be used to quantify the existing loading of pollutants from subwatersheds. Models can also be used to assess the potential benefits of various restoration scenarios (e.g., implementation of certain best management practices).

The relevant numeric water quality criteria for fecal coliform are presented in Section 2. Since the water quality criteria are based upon a 30-day period, a requirement of the technical approach was that it would simulate daily in-stream fecal coliform counts. Given the criteria and the urban character of the watershed, as well as previous modeling efforts made by MOA, the Storm Water Management Model (SWMM) (Huber and Dickinson, 2001) was selected to estimate fecal coliform counts in Chester Creek. SWMM simulates the quantity and quality of runoff produced by storms in urban watersheds. SWMM simulates real storm events based on rainfall and other meteorological inputs, such as evaporation and temperature, and watershed transport, storage and management practices to predict runoff quantity and quality. At the subwatershed scale, SWMM provides for evaluation of in-stream conditions, which allows for the direct comparison with relevant water quality standards.

SWMM is comprised of several computational blocks, or modules, of which the Rain, Temperature, Runoff and Transport blocks were used for the Chester Creek study. These modules essentially generate surface runoff and route it to the stream channel based on user-defined inputs such as precipitation, land use, and topography. Various hydrologic, pollutant buildup/washoff, and in-channel parameters must also be specified by the user. SWMM represents the stream network system as a series of links and nodes with the links representing stream or channel segments and nodes representing contributing subcatchment inlet points. Consequently, the model represents Chester Creek as a series of hydrologically connected subwatersheds.

Hydrologic and water quality simulations of the watershed were performed for Chester Creek. The modeling approach included continuous simulation of rainfall and runoff, as well as in-stream fecal coliform counts. Once the model was calibrated, it was used to evaluate the existing conditions in Chester Creek, University Lake, and Westchester Lagoon and to develop allocation scenarios that result in attainment of Alaska's water quality standards.

5.2 Model Configuration

As mentioned above the SWMM model was configured for the Chester Creek watershed as a series of hydrologically connected subwatersheds. Configuration of the model involved subdivision of the watershed into modeling units, followed by continuous simulation of flow and water quality for these units using meteorological and land use information. This section summarizes the configuration process and key components of the model and more detailed information is provided in Appendix A.

5.2.1 Watershed Subdivision

To simulate watershed loadings and resulting counts of fecal coliform, the Chester Creek watershed was divided into numerous modeling subcatchments using spatial (map) data and tabular data provided by MOA. The modeling subcatchments for the lower and upper Chester Creek subwatersheds are shown in and Figures 5-1 and 5-3, respectively. Figures 5-2 and 5-4 display the impervious land cover classes found in the lower and upper Chester Creek subwatersheds, respectively. Hydrology and fecal coliform for the headwaters subwatershed of the Chester Creek basin was not simulated in SWMM. Estimated stream flow and observed fecal coliform concentration discharging from the headwaters subwatershed, referred to as boundary conditions, were instead used as input into the model.

5.2.2 Watershed Parameters

Required input data for each subcatchment include area, imperviousness, slope, Manning's roughness coefficient, a conceptual subcatchment width (total width of overland flow), depression storage, and infiltration parameters. These data have been computed and estimated by MOA for SWMM modeling applications of Chester Creek. The MOA SWMM parameter values were compiled for each land cover class within each subcatchment in the Chester Creek watershed. The land cover classes reflect the degree of imperviousness for a given cover type. Watershed parameters were lumped, that is spatially weighted or averaged, for each modeling subcatchment. Since information about the storm drain network's hydraulic characteristics (such as pipe diameter and roughness characteristics) were not available, the Runoff block was set up to "route" runoff to each subcatchment outlet.

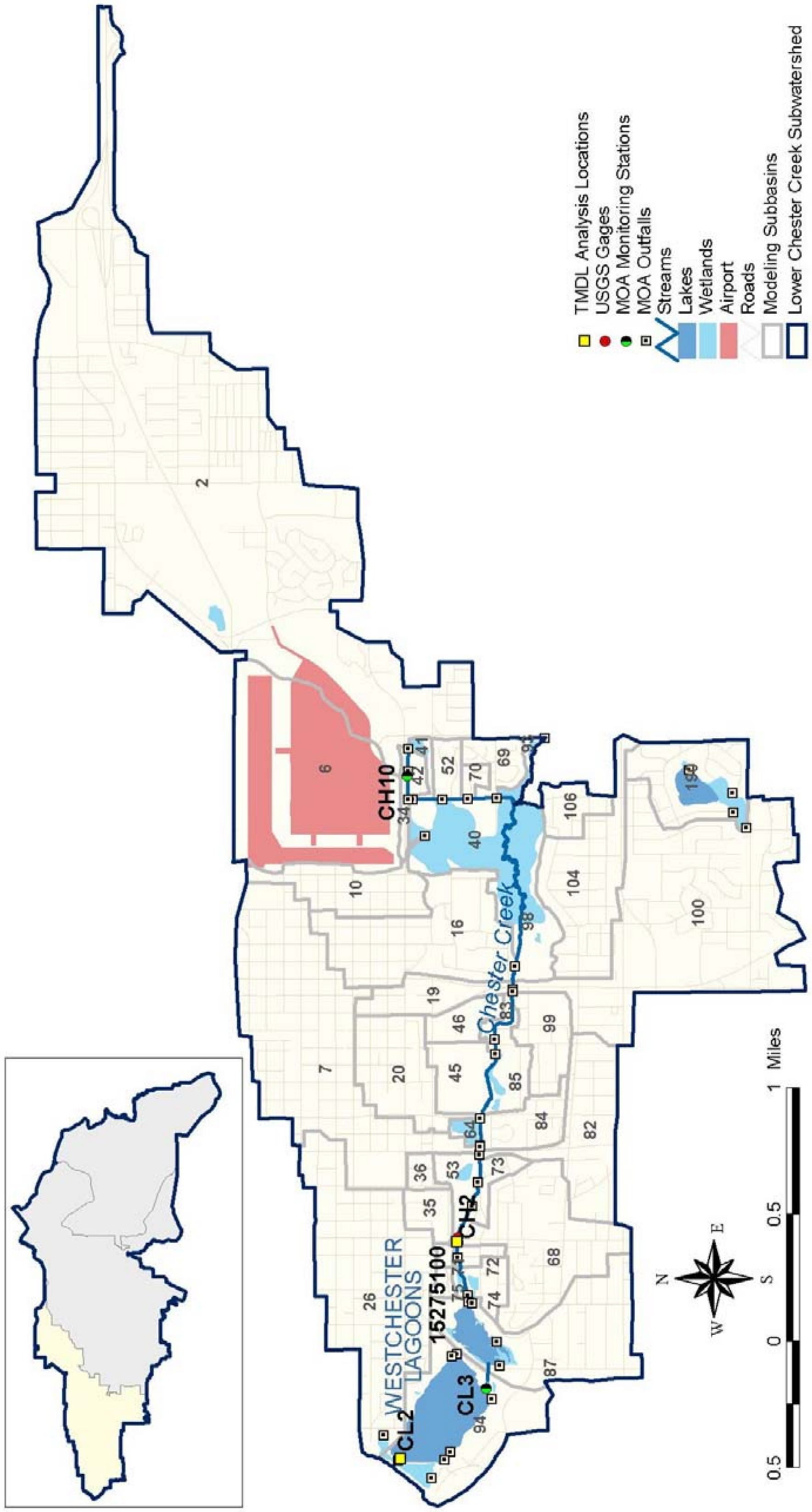


Figure 5-1. SWMM subcatchments in the lower Chester Creek subwatershed.

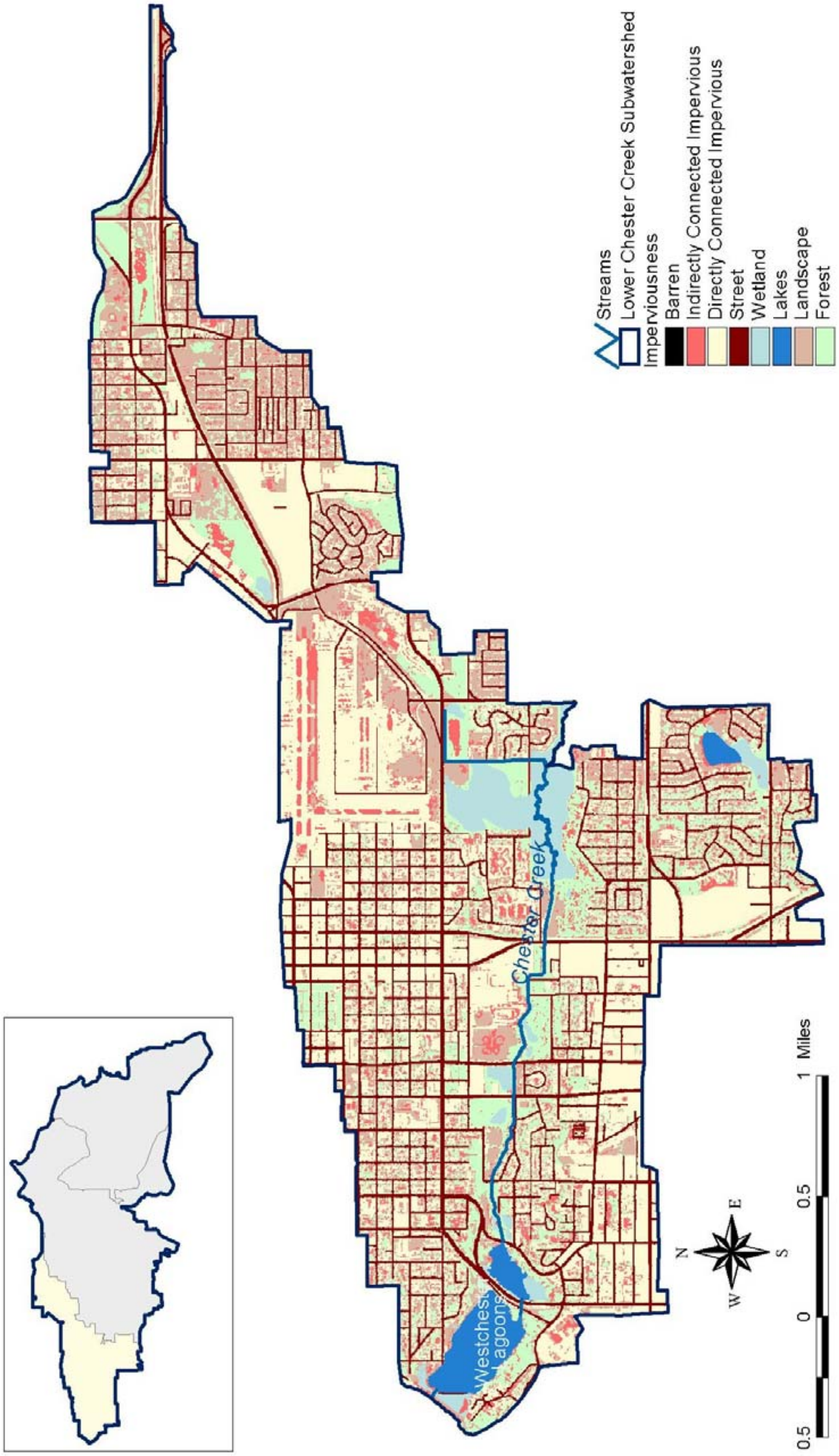


Figure 5-2. Imperviousness within the lower Chester Creek subwatershed.

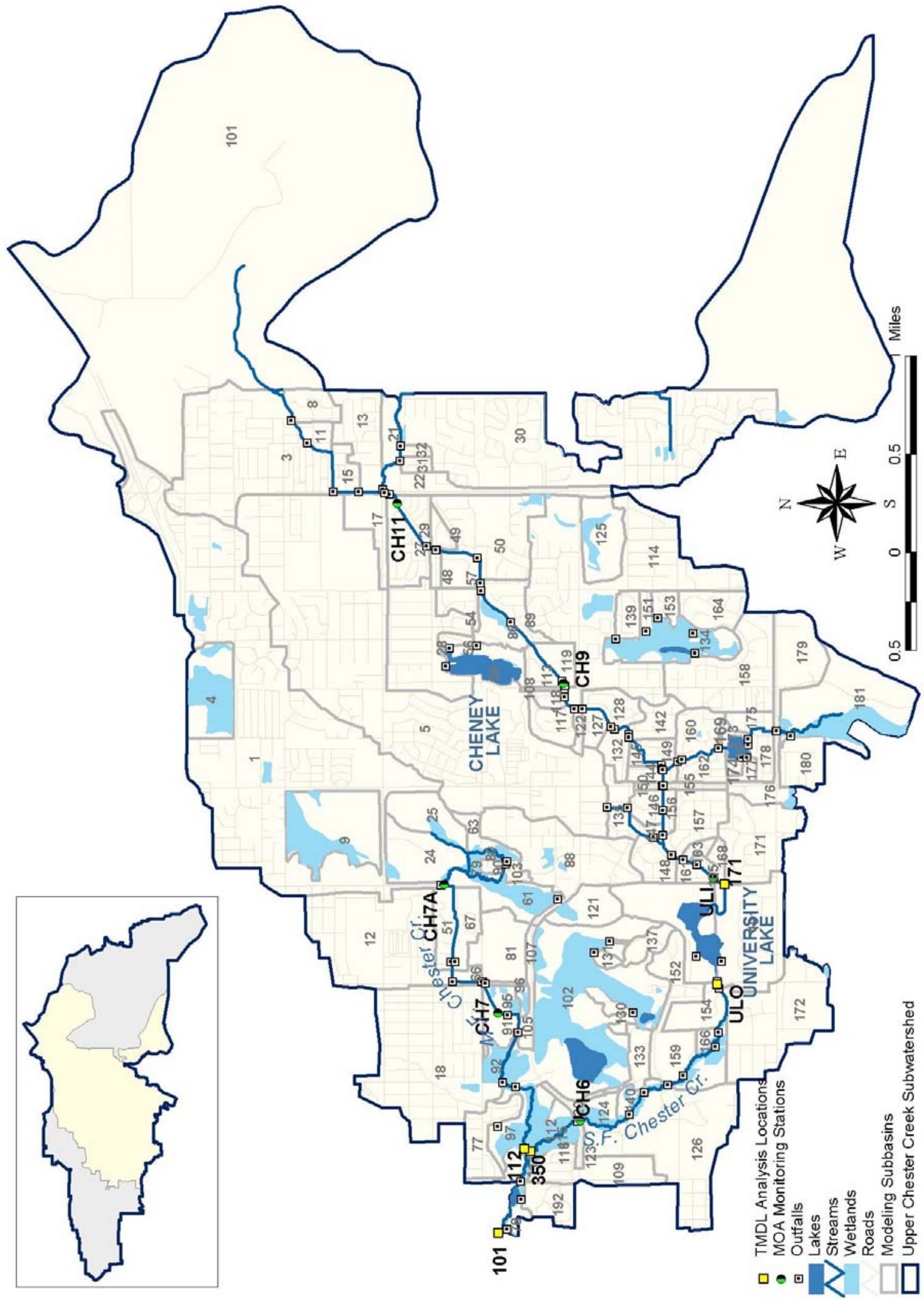


Figure 5-3. SWMM subcatchments in the upper Chester Creek subwatershed.

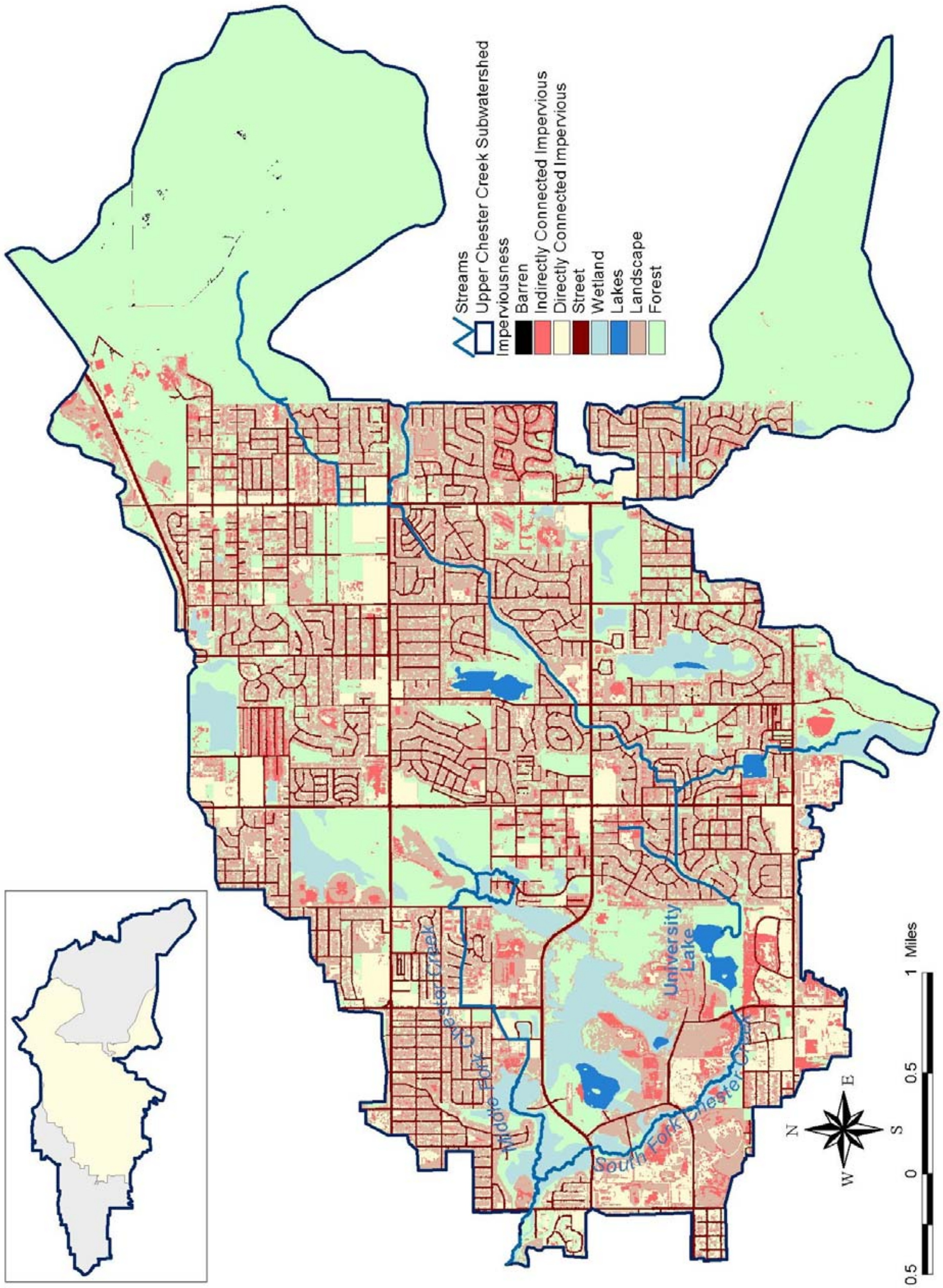


Figure 5-4. Imperviousness within the upper Chester Creek subwatershed.

5.2.3 Meteorological Data

Daily precipitation and temperature data, available from the National Climatic Data Center (NCDC) weather station at the Ted Stevens International Airport from 1952 through 2003, were used for the Chester Creek watershed SWMM modeling.

5.3 Model Calibration

After the model was configured, calibration was performed at multiple locations in the watershed. Calibration is the adjustment or fine-tuning of model parameters to reproduce observations. Model calibration focused on two main areas: hydrology and water quality. Upon completion of the calibration at selected locations, a calibrated data set containing parameter values for modeled sources and pollutants was developed. This data set was applied to areas for which calibration data were not available.

5.3.1 Hydrologic Calibration

Hydrology was the first model component calibrated. The hydrologic calibration involved a comparison of model results to in-stream flow observations recorded at the USGS stream gage (15275100) located near Arctic Boulevard (see Figure 3-1). This is the only operative stream gage in the entire Chester Creek watershed. This gage recorded daily mean flow from June 17, 1966 through September 30, 1993, and from October 1, 1998 to September 30, 2000. The stream gage was not operational from October 1, 1993 to September 30, 1998. The period of hydrologic calibration was therefore selected as July 1, 1987 to September 30, 1993. This period is deemed sufficient to calibrate the hydrologic response of Chester Creek to rainfall events.

Key considerations addressed during the hydrologic calibration included the high-flow/low-flow distribution, storm flows, and seasonal variation. The calibration involved the adjustment of surface runoff and depression storage parameters within the range of accepted values. The results of the hydrologic calibration are presented in Appendix A. The model adequately captures baseflow conditions, most storm events, and snowmelt events. The model over predicts several periods of streamflow, possibly due to rainfall that was recorded at the weather station that did not actually occur in the watershed.

5.3.2 Water Quality Calibration

After hydrology had been sufficiently calibrated, water quality calibration was performed. The approach taken to calibrate water quality focused on matching trends identified during the water quality analysis summarized in Section 3.0. Daily average in-stream counts estimated by the model were compared to observed data collected at several locations within the watershed (see Table 3-1 and Figure 5-5). Modeled versus observed in-stream fecal coliform counts were directly compared during calibration. The water quality calibration consisted of executing the watershed model, comparing water quality time-series output to available water quality observation data, and adjusting the model water quality parameters within the range of acceptable values. The following fecal coliform monitoring station data were used in the water quality calibration: CH7, CH9, ULO, ULI, CH6, CH2, CL3, and CL2.

The calibrated parameters characterize the buildup and washoff of fecal coliform for individual land uses in the Chester Creek watershed. Fecal coliform buildup is dependent upon the accumulation rate and the time allotted for constituent storage. The landscape impervious cover class was assigned the greatest fecal build-up rate, followed by forest, wetland, lake, indirectly connected impervious, directly connected impervious, and street cover types. Additionally, a monthly street sweeping time interval with a fifty percent efficiency (based on the MOA SWMM input data), was assumed for streets, directly connected impervious and indirectly connected impervious land covers during April, May, and June. Washoff is a nonlinear function of fecal coliform storage, surface runoff, and parameters that describe fecal susceptibility to washoff. High concentration peaks may occur when enough time has elapsed for significant buildup, which then becomes part of the runoff and pollutant load of the next storm event. A thorough presentation of the SWMM water quality model parameters, and the calibration results, are given in Appendix A.

5.4 Model Application

After hydrologic and water quality calibration were completed, the model was run for a five-year period, January 1, 1996 through December 31, 2000, to determine existing and allowable fecal counts. This five-year period was chosen because it includes below average (1998), average (1996; 2000), and above average (1997) total annual rainfalls.

Output from the model was evaluated at seven "analysis points" within the watershed. These points were selected to represent water quality within the various subwatersheds as well as University Lake and Westchester Lagoon. The purpose of evaluating water quality at multiple sites is to identify the load reductions that are necessary to ensure that water quality standards are met throughout the watershed (rather than just at its most downstream point). The results of the analysis and the various TMDL components are presented in Section 6.0 for Chester Creek, Section 7.0 for University Lake, and Section 8.0 for Westchester Lagoon.

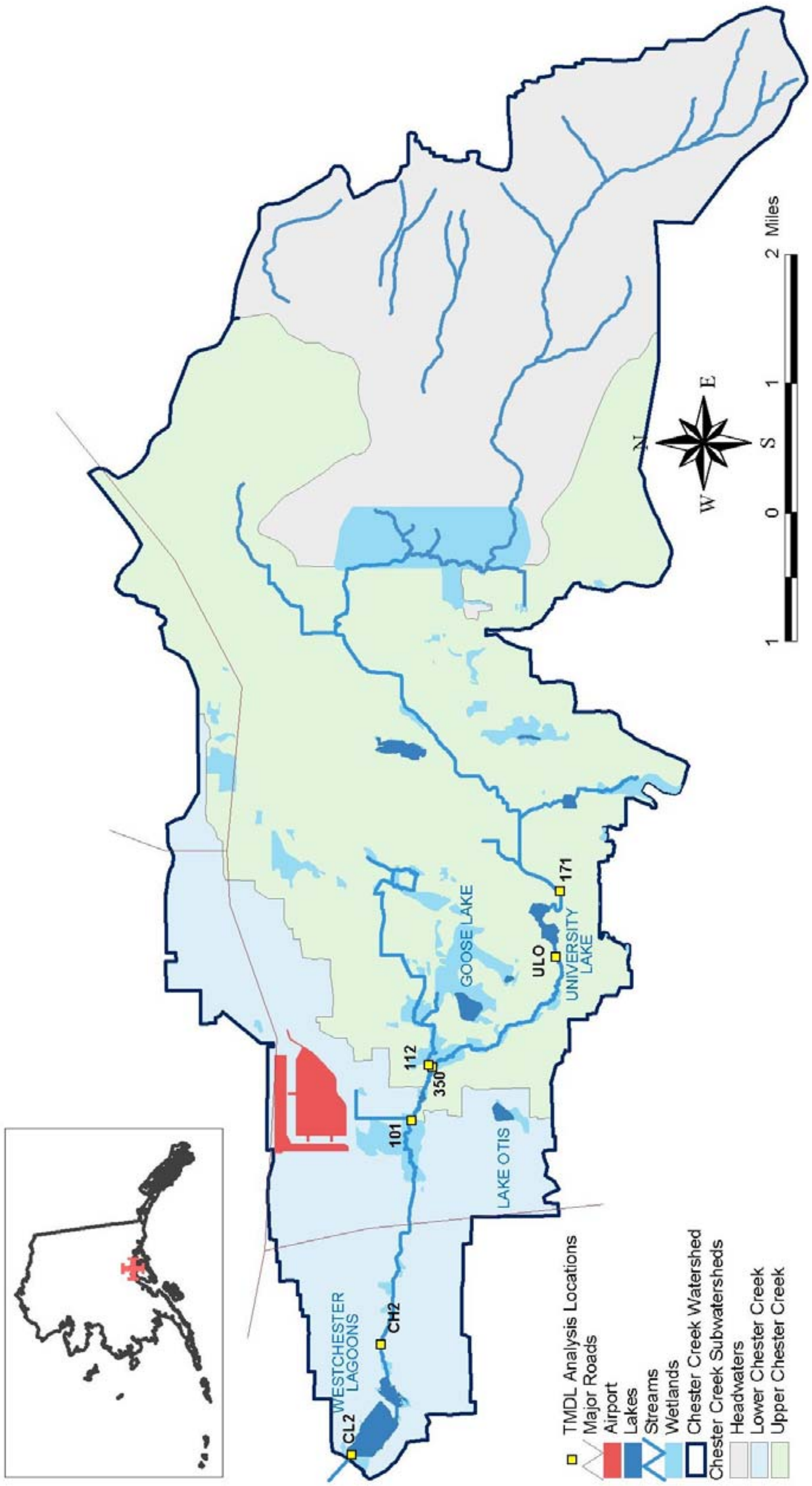


Figure 5-5. TMDL analysis point locations for the Chester Creek, University Lake and Westchester Lagoon TMDLs.

6.0 CHESTER CREEK ALLOCATION ANALYSIS

One purpose in developing a TMDL is to determine a water's loading capacity, or the greatest amount of loading that a water can receive without violating water quality standards [40 CFR §130.2(f)]. The loading capacity is then allocated to the sum of individual waste load allocations (WLAs) for point sources and load allocations (LAs) for nonpoint sources and natural background loads. In addition, the TMDL must also include a margin of safety (MOS), either implicitly or explicitly, that accounts for the uncertainty in the relationship between pollutant loads and the quality of the receiving waterbody. Conceptually, this definition can be denoted by the equation

TMDL = Loading Capacity = Σ WLAs + Σ LAs + MOS

The following sections describe how these components were derived for the Chester Creek TMDL.

6.1 Identification of Loading Capacity

The calibrated SWMM model was used to determine the existing and allowable loads of fecal coliform for the Chester Creek TMDL analysis points 112, 171, 350, 101, and CH2 (see Figures 5-1, 5-3, and 5-5). The SWMM model was also used to assess the effectiveness of various implementation scenarios that are described in more detail below. The results of the TMDL and implementation modeling scenarios for the five TMDL assessment points are presented graphically in Figures 6-1 through 6-10. For each TMDL assessment point, existing fecal coliform loads and the three scenario loads are compared to both the 30-day geometric mean standard of 20 FC/100 mL and to the 10 percent not-to-exceed standard of 40 FC/100 mL. Monthly loading capacities were then identified for each assessment point that will result in meeting both components of the standard, as discussed in more detail below.

The 30-day geometric mean standard of 20 FC/100 mL is expressed as a daily allowable load that varies according to daily flow volume. Figures 6-1, 6-3, 6-5, 6-7, and 6-9 show that the loading capacity varies seasonally, with the greatest capacity typically present in the summer months (higher flows), and the lowest capacity typically present in the winter months (lower flows). The figures also indicate that existing loads usually exceed the loading capacity, although this does not hold true for certain months at certain assessment points.

It should also be noted that Figure 6-7 shows that the loading capacity at TMDL assessment point 101 is much less variable than the other assessment points. This is due to the fact assessment point 101 is located in very close proximity to the confluence of the North Fork of Chester Creek with the main stem of Chester Creek and therefore experiences a relatively constant base flow with some attenuation of storm flows. Consequently, the loading capacity, which is dependent on stream flow, is less variable over time.

The 10 percent not-to-exceed standard of 40 FC/100 mL is graphically expressed as the percentage of daily simulated fecal coliform counts that exceed the standard in a particular 30-day period. Figures 6-2, 6-6, and 6-8, representing TMDL analysis points 112, 350, and 101, respectively, show that simulated daily fecal coliform counts generally meet the not-to-exceed standard during winter months. However, during the remainder of the year, simulated fecal coliform counts greatly exceed the standard. Figure 6-10, representing TMDL analysis point CH2, shows that simulated fecal coliform counts are almost always greater than the not-to-exceed standard. Similarly, one hundred percent of the simulated existing fecal coliform counts for TMDL analysis point 171 (South Fork Chester Creek; shown in Figure 6-4) also exceed the standard.

As mentioned previously, monthly loading capacities were identified to ensure compliance with both components of the water quality standard for the entire modeling period (January 1, 1996 through

December 31, 2000). Fecal coliform reductions required by the 30-day geometric mean standard were assessed by computing a running 30-day geometric mean for simulated daily fecal coliform loading estimated by SWMM and comparing those loads to the loading capacity derived from the 30-day geometric mean standard of 20 FC/100 mL. Reductions were calculated for those days when the existing load was greater than the loading capacity and results were summed by month.

The 10 percent not-to-exceed standard of 40 FC/100 mL was assessed by first examining the simulated daily output according to a continuously running 30-day period. The standard allows only 10 percent, or no more than 3 observations, within a 30-day period to exceed the 40 FC/100 mL threshold. Using a running 30-day assessment period covering the entire period of simulated SWMM output, daily loading values were queried and ranked. For each running 30-day period, the fourth-ranked loading value was identified, and if it exceeded the standard, reductions were calculated such that it and all subsequent non-allowable exceedances were reduced to the 40 FC/100 mL level.

Figures 6-1 through 6-10 and show that, with the exception of TMDL analysis point 101, the 30-day geometric mean standard is typically more restrictive than the 10 percent not-to-exceed standard. However, the 10 percent not-to-exceed standard is more restrictive in certain months for TMDL analysis points 112 and 101. Therefore, the summary of existing fecal coliform loads, wasteload allocations, and required reductions presented in Tables 6-1 through 6-5 are based on whichever component of the standard is most restrictive. In this way the final TMDL monthly allocations identify the reductions necessary to achieve both the 30-day geometric mean standard and the 10 percent not-to-exceed standard. Finally, it should be noted that the annual loads and percent reductions presented in Tables 6-1 through 6-5 are solely to allow comparison with other TMDL assessment points on Chester Creek. The monthly allocations present the “official” TMDL loads.

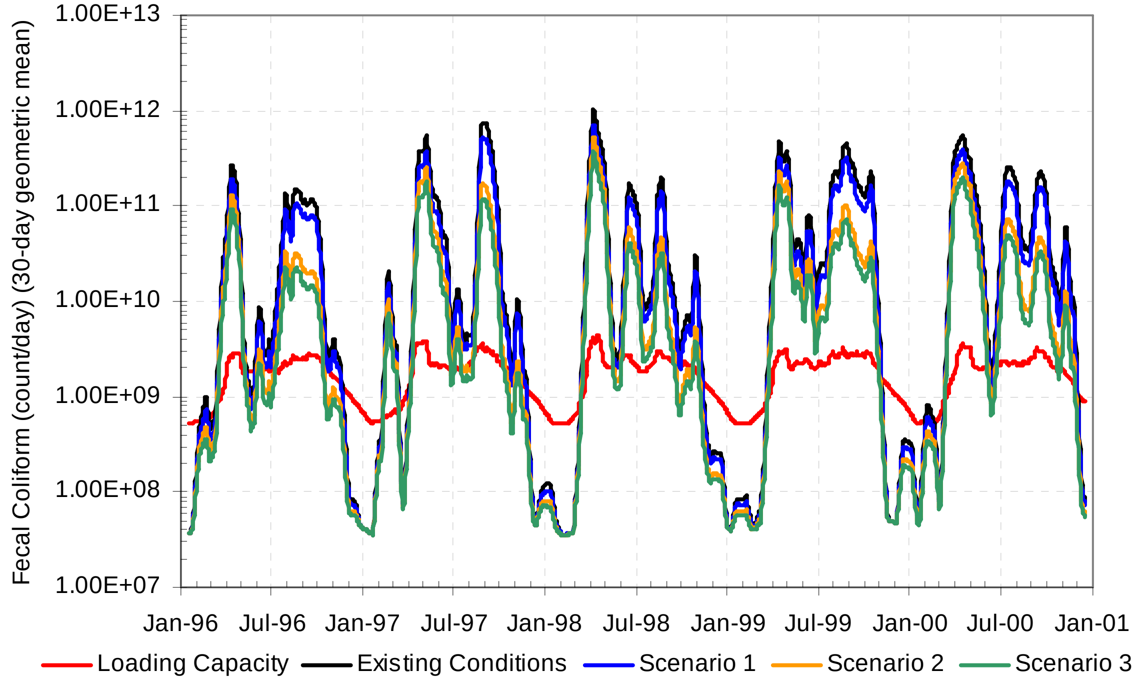


Figure 6-1. Evaluation of the 30-day geometric mean standard at TMDL analysis point 112 on the Middle Fork of Chester Creek.

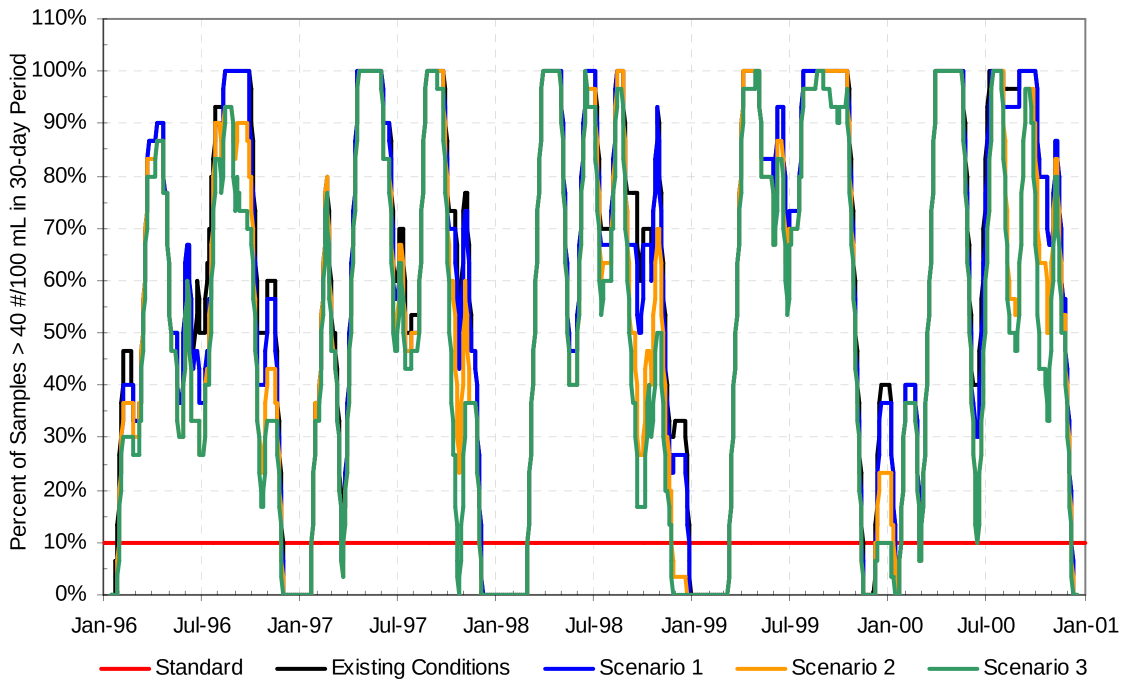


Figure 6-2. Evaluation of the 30-day not-to-exceed standard at TDML analysis point 112 on the Middle Fork of Chester Creek.

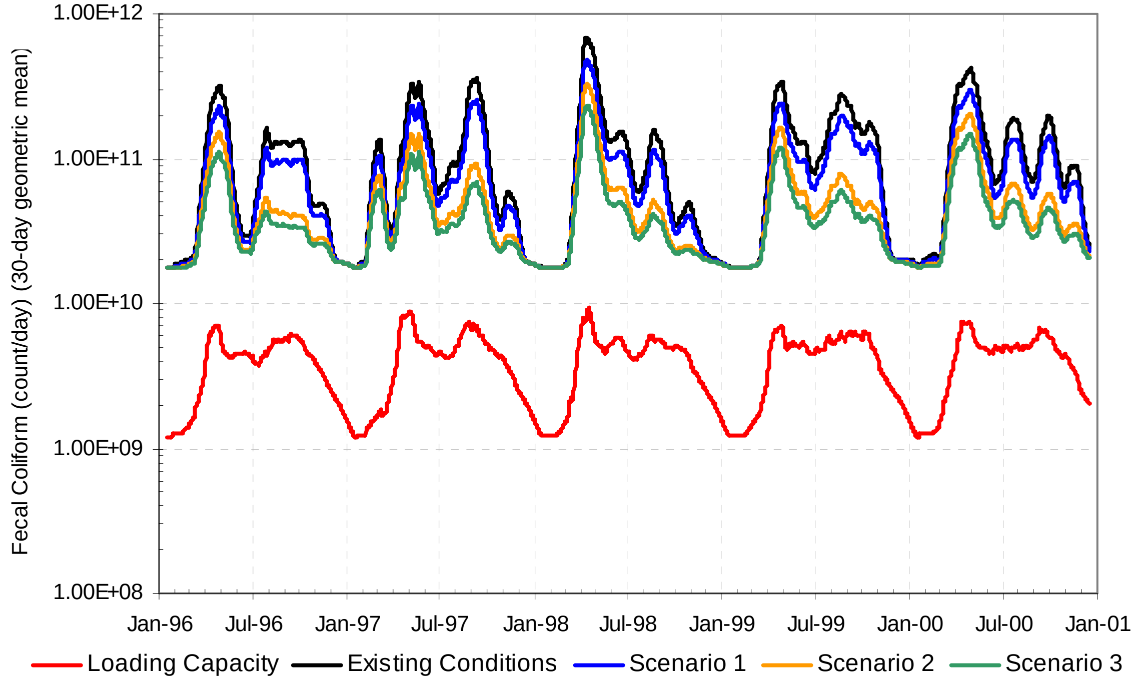


Figure 6-3. Evaluation of the 30-day geometric mean standard at TMDL analysis point 171 on the South Fork of Chester Creek.

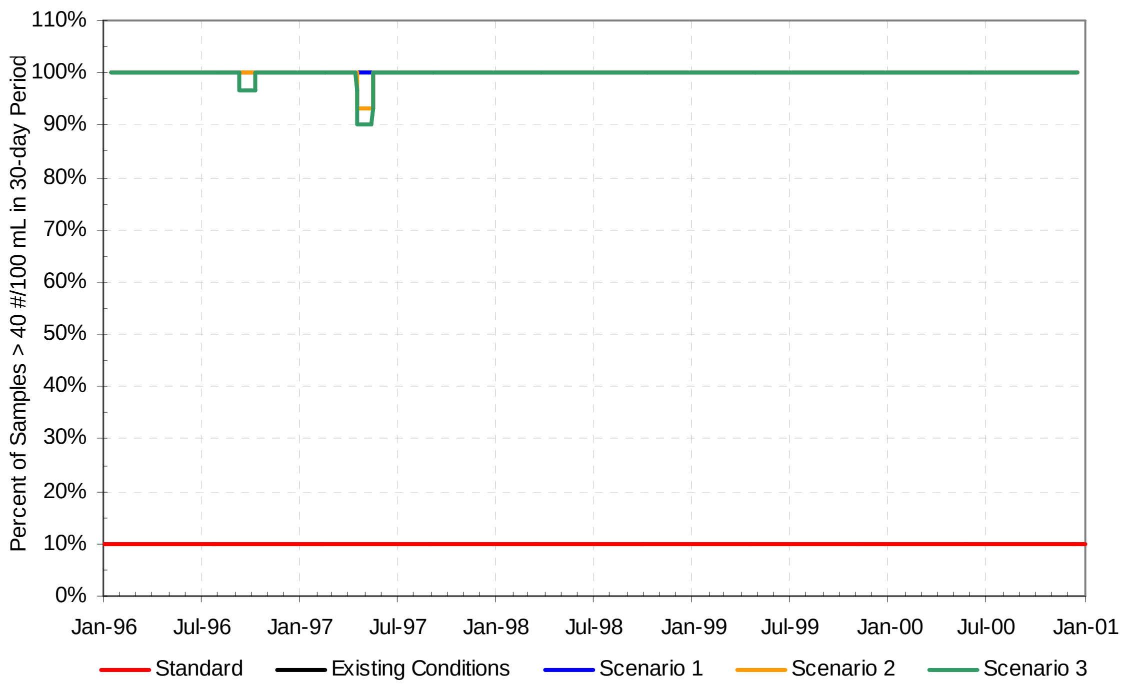


Figure 6-4. Evaluation of the 30-day not-to-exceed standard at TMDL analysis point 171 on the South Fork of Chester Creek.

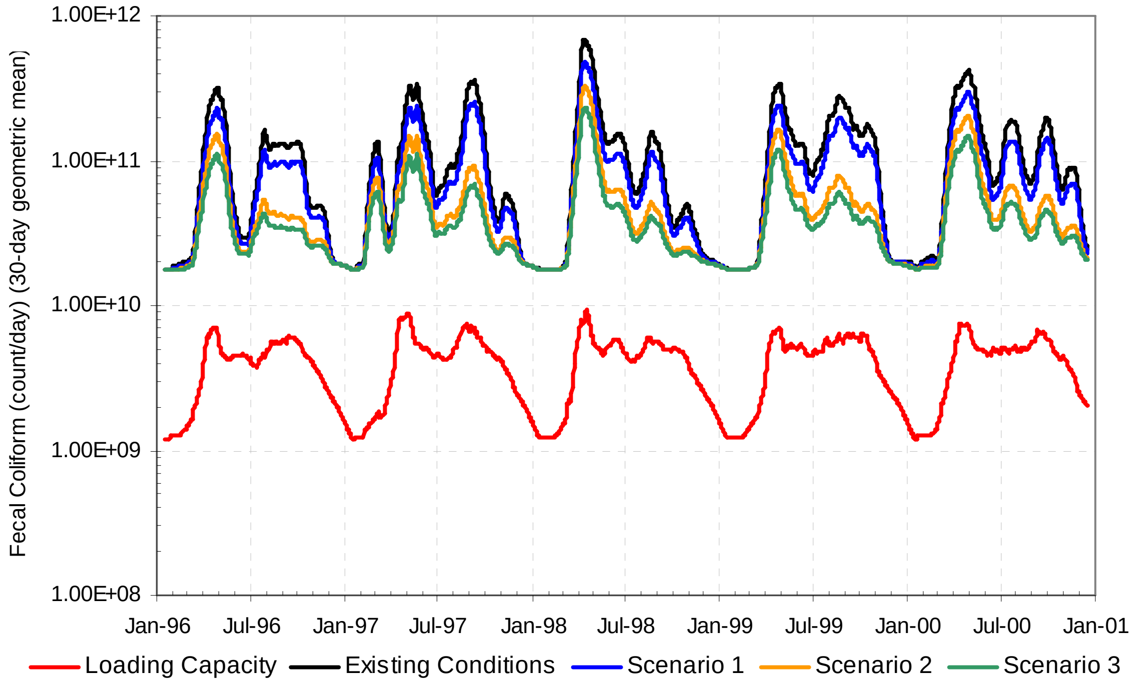


Figure 6-5. Evaluation of the 30-day geometric mean standard at TMDL analysis point 350 on the South Fork of Chester Creek.

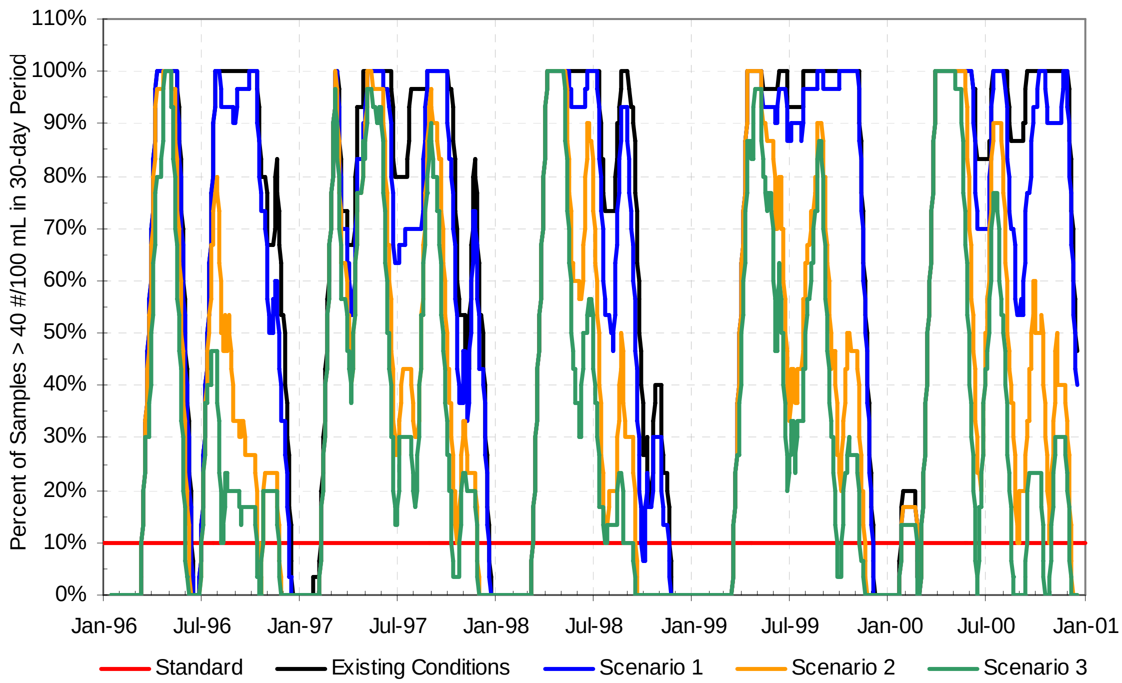


Figure 6-6. Evaluation of the 30-day not-to-exceed standard at TMDL analysis point 350 on the South Fork of Chester Creek.

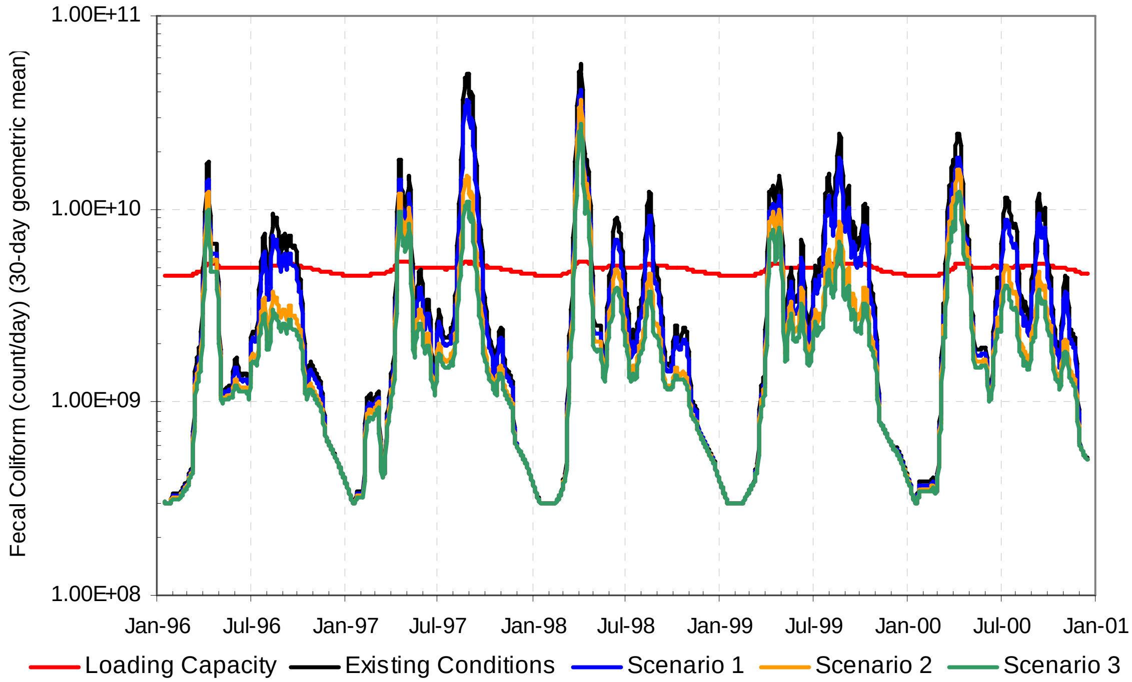


Figure 6-7. Evaluation of the 30-day geometric mean standard at TMDL analysis point 101 on Chester Creek.

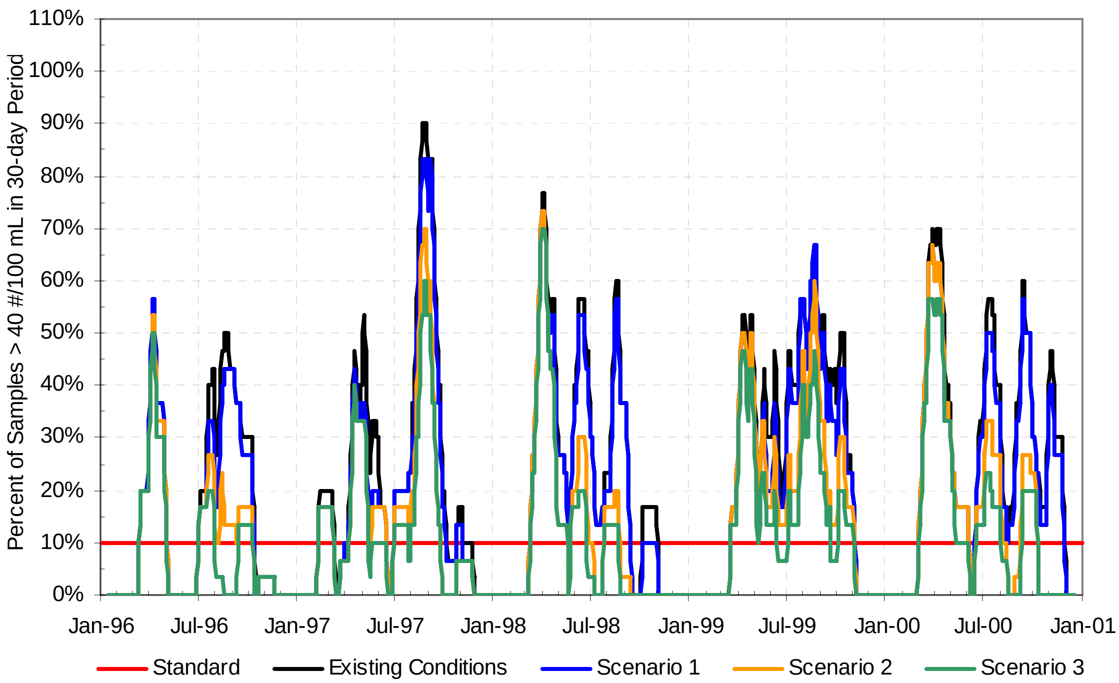


Figure 6-8. Evaluation of the 30-day not-to-exceed standard at TMDL analysis point 101 on Chester Creek.

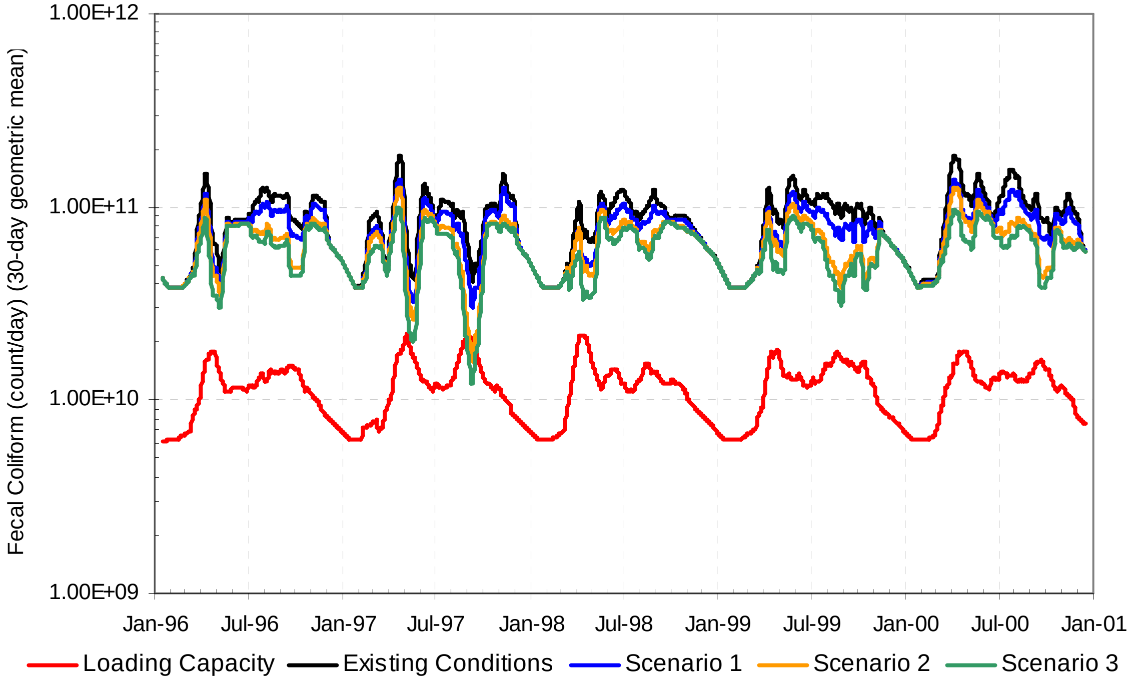


Figure 6-9. Evaluation of the 30-day geometric mean standard at TMDL analysis point CH2 on Chester Creek.

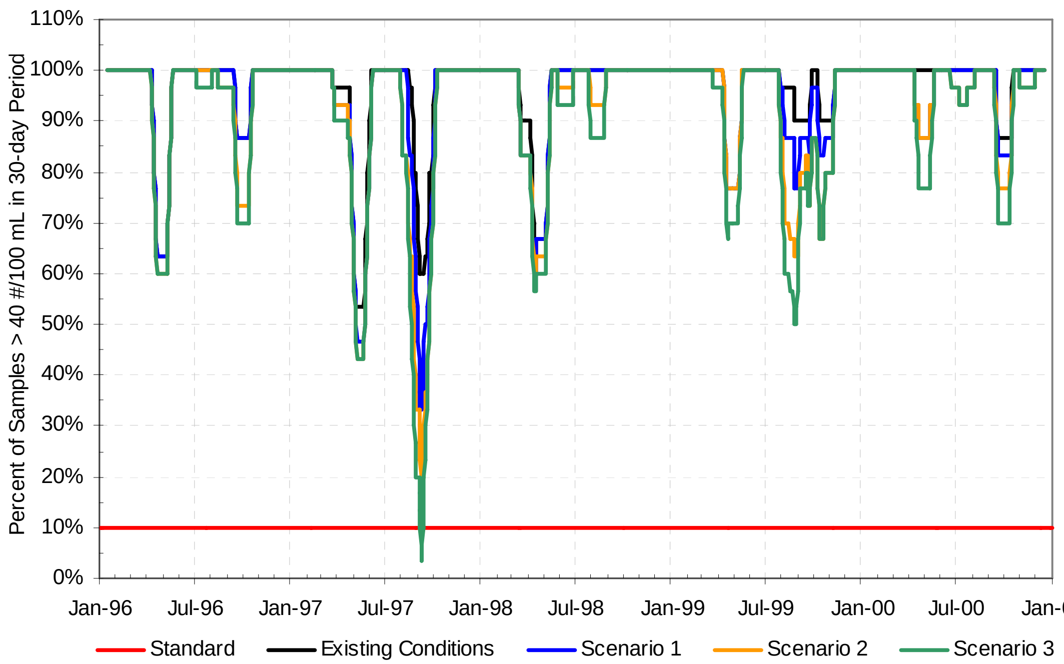


Figure 6-10. Evaluation of the 30-day not-to-exceed standard at TMDL analysis point CH2 on Chester Creek.

6.2 Load Allocation

Nonpoint sources are typically represented by loads carried to receiving waters through surface runoff resulting from precipitation events. However, because stormwater discharges in the MOA are regulated by a NPDES stormwater permit for municipal separate storm sewer systems (MS4), watershed loads delivered to Chester Creek through stormwater conveyances are addressed through the wasteload allocation component of this TMDL. Because the Chester Creek watershed includes only negligible loading from outside of the municipality that is essentially contributions from wildlife, a load allocation of zero has been set for this TMDL. In other words, all of the human sources of fecal coliform will be captured under the storm water permit and the wasteload allocation and that is why the load allocation is zero.

The rationale that loadings from outside the municipality are essentially natural background is based on previous studies (e.g., Dorava and Love, 1999; Frenzel and Couvillion, 2002), the 1988 to 1993 sampling that indicates geometric means of 5 to 8 counts/100 mL in this area, and more recent sampling at a site located on Fort Richardson. The Fort Richardson site (see Figure 3-1) has been sampled for fecal coliform 74 times over a 25-week period between July 1, 2004 and December 31, 2004 and the geometric mean of that data set is 4.38 FC/100ml. There are no known human sources of fecal coliform above the Fort Richardson site

6.3 Wasteload Allocation

The only permitted source of fecal coliform in the Chester Creek watershed is storm water runoff. The MOA is subject to an MS4 permit that regulates storm water discharges and EPA policy and regulation indicate that storm water runoff regulated by the NPDES program through an MS4 permit must be addressed through wasteload allocations in a TMDL (USEPA, 2002). Therefore, the Chester Creek TMDL establishes wasteload allocations for watershed loads of fecal coliform. The wasteload allocation is the loading capacity minus the margin of safety.

The fecal coliform wasteload allocations for Chester Creek, provided as monthly allocations for each the Chester Creek TMDL analysis points, are presented in Tables 6-1 to 6-5. As discussed previously, the tables present monthly wasteload allocations and required reductions for the most restrictive standard for each TMDL assessment point. For example, Table 6-1, representing TMDL analysis point 112, shows that the 10 percent not-to-exceed standard is more restrictive in the months of January, February, and December, and therefore, a greater level of reduction is required for these months relative to the 30-day geometric mean standard. The tables suggest that the greatest monthly fecal coliform loads to Chester Creek, and consequently the greatest required reductions, occur during the spring and summer months. The winter months represent the lowest fecal coliform loads to Chester Creek and also, therefore, require the lowest percent reductions from existing loads.

Future wasteload allocations are not established because ADEC does not anticipate any future permits for the discharge of fecal coliform to Chester Creek. Additionally, if data or information from future monitoring efforts can be used to identify and quantify stormwater or natural loads that are not delivered through the stormwater conveyances, the TMDL and its allocations will be revised accordingly.

Table 6-1. Summary of the Middle Fork Chester Creek TMDL (Analysis Point 112).

Month	Existing (FC/month)	Loading Capacity (FC/month)	Margin of Safety (FC/month)	Waste Load Allocation (FC/month)	Required Reduction
Jan	**3.11E+09**	**2.90E+09**	**2.90E+08**	**2.61E+09**	**7%**
Feb	**1.45E+12**	**4.78E+11**	**4.78E+10**	**4.30E+11**	**67%**
Mar	8.51E+11	3.21E+10	3.21E+09	2.89E+10	96%
Apr	9.58E+12	8.85E+10	8.85E+09	7.96E+10	99%
May	2.99E+12	6.75E+10	6.75E+09	6.08E+10	98%
Jun	1.10E+12	6.44E+10	6.44E+09	5.80E+10	94%
Jul	2.05E+12	6.55E+10	6.55E+09	5.90E+10	97%
Aug	5.13E+12	8.10E+10	8.10E+09	7.29E+10	98%
Sep	5.12E+12	8.07E+10	8.07E+09	7.26E+10	98%
Oct	1.15E+12	6.69E+10	6.69E+09	6.02E+10	94%
Nov	2.01E+11	4.23E+10	4.23E+09	3.81E+10	79%
Dec	**2.50E+10**	**1.80E+10**	**1.80E+09**	**1.62E+10**	**28%**
Annual	2.82E+13	6.46E+11	6.46E+10	5.81E+11	98%

Bold denotes monthly loading capacities identified using not-to-exceed standard.
Annual loads are given in FC/year.

Table 6-2. Summary of the South Fork Chester Creek TMDL (Analysis Point 171).

Month	Existing (FC/month)	Loading Capacity (FC/month)	Margin of Safety (FC/month)	Waste Load Allocation (FC/month)	Required Reduction
Jan	5.18E+11	3.63E+10	3.63E+09	3.27E+10	93%
Feb	7.55E+11	3.75E+10	3.75E+09	3.38E+10	95%
Mar	2.01E+12	7.25E+10	7.25E+09	6.53E+10	96%
Apr	9.06E+12	1.97E+11	1.97E+10	1.77E+11	98%
May	6.87E+12	1.66E+11	1.66E+10	1.49E+11	98%
Jun	2.91E+12	1.46E+11	1.46E+10	1.32E+11	95%
Jul	3.23E+12	1.43E+11	1.43E+10	1.28E+11	96%
Aug	4.75E+12	1.74E+11	1.74E+10	1.56E+11	96%
Sep	4.92E+12	1.78E+11	1.78E+10	1.60E+11	96%
Oct	2.86E+12	1.52E+11	1.52E+10	1.37E+11	95%
Nov	1.57E+12	9.81E+10	9.81E+09	8.83E+10	94%
Dec	6.37E+11	5.80E+10	5.80E+09	5.22E+10	91%
Annual	4.01E+13	1.46E+12	1.46E+11	1.31E+12	96%

Annual loads are given in FC/year.

Table 6-3. Summary of the South Fork Chester Creek TMDL (Analysis Point 350).

Month	Existing (FC/month)	Loading Capacity (FC/month)	Margin of Safety (FC/month)	Waste Load Allocation (FC/month)	Required Reduction
Jan	6.42E+10	5.71E+10	5.71E+09	5.14E+10	11%
Feb	1.32E+11	5.96E+10	5.96E+09	5.36E+10	55%
Mar	9.09E+11	1.15E+11	1.15E+10	1.04E+11	87%
Apr	4.66E+12	2.99E+11	2.99E+10	2.69E+11	94%
May	2.88E+12	2.53E+11	2.53E+10	2.27E+11	91%
Jun	1.08E+12	2.29E+11	2.29E+10	2.06E+11	79%
Jul	1.26E+12	2.28E+11	2.28E+10	2.05E+11	82%
Aug	2.28E+12	2.77E+11	2.77E+10	2.49E+11	88%
Sep	2.22E+12	2.77E+11	2.77E+10	2.49E+11	88%
Oct	1.15E+12	2.37E+11	2.37E+10	2.13E+11	79%
Nov	5.77E+11	1.55E+11	1.55E+10	1.39E+11	73%
Dec	1.28E+11	9.01E+10	9.01E+09	8.11E+10	30%
Annual	1.73E+13	2.27E+12	2.27E+11	2.05E+12	87%

Annual loads are given in FC/year.

Table 6-4. Summary of the Chester Creek TMDL (Analysis Point 101).

Month	Existing (FC/month)	Loading Capacity (FC/month)	Margin of Safety (FC/month)	Waste Load Allocation (FC/month)	Required Reduction
Jan	**9.59E+09**	**8.69E+09**	**8.69E+08**	**7.82E+09**	**9%**
Feb	**1.26E+11**	**1.04E+11**	**1.04E+10**	**9.35E+10**	**18%**
Mar	**7.76E+11**	**4.02E+11**	**4.02E+10**	**3.62E+11**	**48%**
Apr	**4.28E+12**	**1.26E+12**	**1.26E+11**	**1.13E+12**	**71%**
May	**2.69E+11**	**1.50E+11**	**1.50E+10**	**1.35E+11**	**44%**
Jun	**2.69E+11**	**1.74E+11**	**1.74E+10**	**1.56E+11**	**36%**
Jul	**4.87E+11**	**2.76E+11**	**2.76E+10**	**2.49E+11**	**43%**
Aug	**9.51E+11**	**4.09E+11**	**4.09E+10**	**3.68E+11**	**57%**
Sep	**8.30E+11**	**3.89E+11**	**3.89E+10**	**3.51E+11**	**53%**
Oct	**2.85E+11**	**1.82E+11**	**1.82E+10**	**1.64E+11**	**36%**
Nov	**1.44E+11**	**1.01E+11**	**1.01E+10**	**9.11E+10**	**30%**
Dec	1.63E+10	1.63E+10	1.63E+09	1.47E+10	0%
Annual	**8.44E+12**	**3.47E+12**	**3.47E+11**	**3.12E+12**	**59%**

Bold denotes monthly loading capacities identified using not-to-exceed standard.
Annual loads are given in FC/year.

Table 6-5. Summary of the Chester Creek TMDL (Analysis Point CH2).

Month	Existing (FC/month)	Loading Capacity (FC/month)	Margin of Safety (FC/month)	Waste Load Allocation (FC/month)	Required Reduction
Jan	1.21E+12	1.80E+11	1.80E+10	1.62E+11	85%
Feb	1.23E+12	1.85E+11	1.85E+10	1.66E+11	85%
Mar	1.98E+12	2.75E+11	2.75E+10	2.48E+11	86%
Apr	3.40E+12	5.03E+11	5.03E+10	4.53E+11	85%
May	2.84E+12	4.39E+11	4.39E+10	3.95E+11	85%
Jun	3.14E+12	3.73E+11	3.73E+10	3.35E+11	88%
Jul	3.45E+12	3.87E+11	3.87E+10	3.49E+11	89%
Aug	3.28E+12	4.58E+11	4.58E+10	4.12E+11	86%
Sep	2.69E+12	4.55E+11	4.55E+10	4.09E+11	83%
Oct	2.80E+12	3.91E+11	3.91E+10	3.52E+11	86%
Nov	2.91E+12	2.91E+11	2.91E+10	2.62E+11	90%
Dec	1.74E+12	2.13E+11	2.13E+10	1.92E+11	88%
Annual	3.07E+13	4.15E+12	4.15E+11	3.73E+12	86%

Annual loads are given in FC/year.

6.4 Margin of Safety

The margin of safety accounts for any uncertainty concerning the relationship between pollutant loading and receiving water quality and is a required component of a TMDL. The margin of safety can be implicit (e.g., incorporated into the TMDL analysis through conservative assumptions) or explicit (e.g., expressed in the TMDL as a portion of the loading) or a combination of both. For the Chester Creek TMDL, 10 percent of the loading capacity was explicitly reserved for the margin of safety.

6.5 Seasonal Variation

A TMDL must consider seasonal variation in the derivation of the allocation. By using continuous simulation (daily modeling), seasonal hydrologic and source loading variability was inherently considered. The fecal coliform counts simulated for each day of the modeling time period were compared to TMDL targets and an allocation that would meet these targets for every day was developed. Allowable loads were also specified by month. Modeling results agree with fecal coliform data collected within the Chester Creek watershed in that spring and summer months account for the greatest loading of fecal coliform to Chester Creek, and that winter months typically account for lower fecal coliform contributions to the creek.

6.6 Implementation Scenarios

Three implementation scenarios, selected with consultation with ADEC, were simulated with the calibrated SWMM model. These scenarios are:

- Scenario 1 – Public education. Informing the public about the benefits of "cleaning up" after their pets was assumed to result in a 30 percent decrease in the surface build up of fecal coliform on landscaped, street, directly connected, and indirectly connected impervious land cover types.

- Scenario 2 – Increased street sweeping frequency and efficiency. Street sweeping frequency was increased from monthly to weekly intervals and the efficiency was assumed to increase to eighty percent.

- Scenario 3 – A combination of Scenario 1 and Scenario 2.

Tables 6-6 through 6-15, and Figures 6-11 through 6-20 summarize the results of the implementation scenarios for each of the analysis points in Chester Creek. Table elements in bold type denote that the 10 percent no-to-exceed standard applies for the given month. The tables show that a combination of education and increased street sweeping frequency and efficiency (TMDL scenario 3) could have a significant impact in reducing fecal coliform loading to Chester Creek. Simulation results suggest that an annual percent reduction ranging from 74 percent at analysis point 112 to 29 percent at analysis point CH2 is possible with the implementation of TMDL scenario 3. For each TMDL analysis point, additional reduction in fecal coliform beyond that provided by the TMDL scenarios is required (see Tables 6-7, 6-9, 6-11, 6-13, and 6-15). For example, as presented in Table 6-15, TMDL analysis point CH2 requires an additional 58 percent reduction in fecal coliform on an annual basis to comply with the 30-day geometric mean standard. Significant additional monthly reductions are required at this site to meet water quality standards.

The tables also show decreasing fecal coliform reductions moving downstream in the watershed. This is due to the greater occurrence of lakes and wetlands in the middle to lower portion of the watershed and therefore a greater contribution of fecal coliform contribution from waterfowl relative to the upper portion of the basin. Since the scenarios simulate changes only to the urbanized areas in the watershed they do not impact loadings from wetlands, lakes or forested areas.

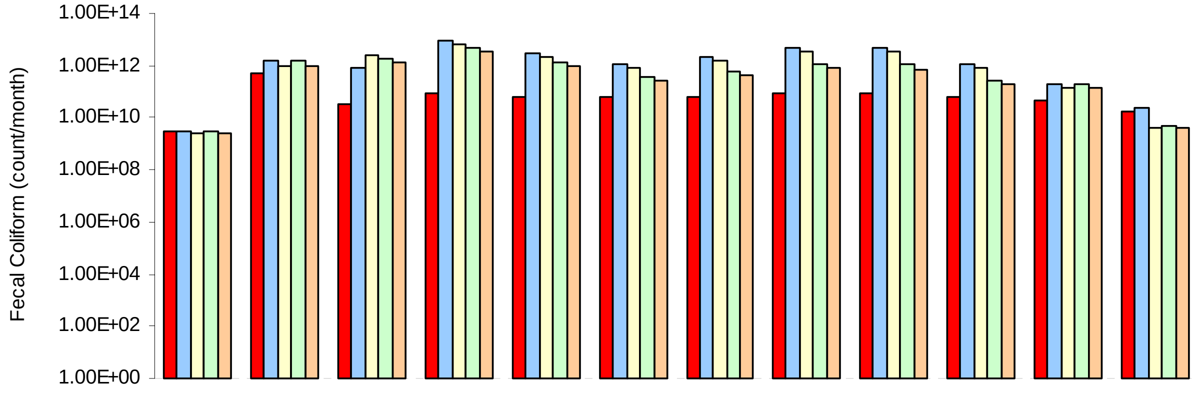
Table 6-6. Implementation Scenarios for TMDL Analysis Point 112, Middle Fork Chester Creek.

Scenario 1 Month	Existing (FC/month)	Post-Scenario (FC/month)	Percent Reduction
January	**3.11E+09**	**2.52E+09**	**19%**
February	**1.45E+12**	**1.01E+12**	**30%**
March	8.51E+11	6.06E+11	29%
April	9.58E+12	6.69E+12	30%
May	2.99E+12	2.10E+12	30%
June	1.10E+12	7.78E+11	29%
July	2.05E+12	1.45E+12	30%
August	5.13E+12	3.60E+12	30%
September	5.12E+12	3.58E+12	30%
October	1.15E+12	8.13E+11	29%
November	2.01E+11	1.47E+11	27%
December	**2.50E+10**	**1.78E+10**	**29%**
Annual	2.82E+13	1.98E+13	30%
Scenario 2 **Month**	**Existing (FC/month)**	**Post-Scenario (FC/month)**	**Percent Reduction**
January	**3.11E+09**	**3.11E+09**	**0%**
February	**1.45E+12**	**1.45E+12**	**0%**
March	8.51E+11	4.49E+11	47%
April	9.58E+12	4.87E+12	49%
May	2.99E+12	1.43E+12	52%
June	1.10E+12	3.92E+11	64%
July	2.05E+12	5.78E+11	72%
August	5.13E+12	1.20E+12	77%
September	5.12E+12	1.06E+12	79%
October	1.15E+12	2.50E+11	78%
November	2.01E+11	2.01E+11	0%
December	**2.50E+10**	**2.50E+10**	**0%**
Annual	2.82E+13	1.04E+13	63%
Scenario 3 **Month**	**Existing (FC/month)**	**Post-Scenario (FC/month)**	**Percent Reduction**
January	**3.11E+09**	**2.52E+09**	**19%**
February	**1.45E+12**	**1.01E+12**	**30%**
March	8.51E+11	3.21E+11	62%
April	9.58E+12	3.40E+12	64%
May	2.99E+12	1.00E+12	66%
June	1.10E+12	2.78E+11	75%
July	2.05E+12	4.10E+11	80%
August	5.13E+12	8.46E+11	84%
September	5.12E+12	7.43E+11	85%
October	1.15E+12	1.78E+11	85%
November	2.01E+11	1.47E+11	27%
December	**2.50E+10**	**1.78E+10**	**29%**
Annual	2.82E+13	7.33E+12	74%

Table 6-7. Summary of TMDL Scenarios for TMDL Analysis Point 112, Middle Fork Chester Creek.

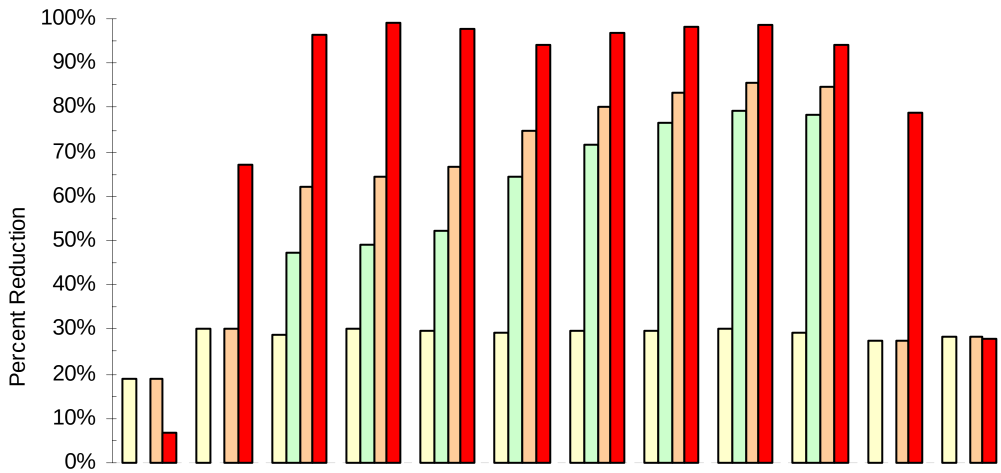
Month	Required Reduction	Scenario 1 Reduction	Scenario 2 Reduction	Scenario 3 Reduction	Additional Reduction
Jan	**7%**	**19%**	**0%**	**19%**	**0%**
Feb	**67%**	**30%**	**0%**	**30%**	**37%**
Mar	96%	29%	47%	62%	34%
Apr	99%	30%	49%	64%	35%
May	98%	30%	52%	66%	31%
Jun	94%	29%	64%	75%	19%
Jul	97%	30%	72%	80%	17%
Aug	98%	30%	77%	84%	15%
Sep	98%	30%	79%	85%	13%
Oct	94%	29%	78%	85%	10%
Nov	79%	27%	0%	27%	52%
Dec	**28%**	**29%**	**0%**	**29%**	**0%**
Annual	98%	30%	63%	74%	24%

Bold type indicates that the 10 percent not-to-exceed standard applies for the month.
Annual loads are given in FC/year.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Loading Capacity	2.90E+09	4.78E+11	3.21E+10	8.85E+10	6.75E+10	6.44E+10	6.55E+10	8.10E+10	8.07E+10	6.69E+10	4.23E+10	1.80E+10
Existing Conditions	3.11E+09	1.45E+12	8.51E+11	9.58E+12	2.99E+12	1.10E+12	2.05E+12	5.13E+12	5.12E+12	1.15E+12	2.01E+11	2.50E+10
Scenario 1	2.52E+09	1.01E+12	2.70E+12	6.69E+12	2.10E+12	7.78E+11	1.45E+12	3.60E+12	3.58E+12	8.13E+11	1.47E+11	4.19E+09
Scenario 2	3.11E+09	1.45E+12	1.93E+12	4.87E+12	1.43E+12	3.92E+11	5.78E+11	1.20E+12	1.06E+12	2.50E+11	2.01E+11	4.88E+09
Scenario 3	2.52E+09	1.01E+12	1.35E+12	3.40E+12	1.00E+12	2.78E+11	4.10E+11	8.46E+11	7.43E+11	1.78E+11	1.47E+11	4.19E+09

Figure 6-11. Comparison of monthly loading capacities evaluated by the most restrictive standard to existing loads and TMDL scenario loads at TMDL analysis point 112 on the Middle Fork of Chester Creek.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Scenario 1	19%	30%	29%	30%	30%	29%	30%	30%	30%	29%	27%	29%
Scenario 2	0%	0%	47%	49%	52%	64%	72%	77%	79%	78%	0%	0%
Scenario 3	19%	30%	62%	64%	66%	75%	80%	84%	85%	85%	27%	29%
Required Reduction	7%	67%	96%	99%	98%	94%	97%	98%	98%	94%	79%	28%

Figure 6-12. Comparison of monthly loading reductions provided by the TMDL scenarios and loading reductions required by the most restrictive standard at TMDL analysis point 112 on the Middle Fork of Chester Creek.

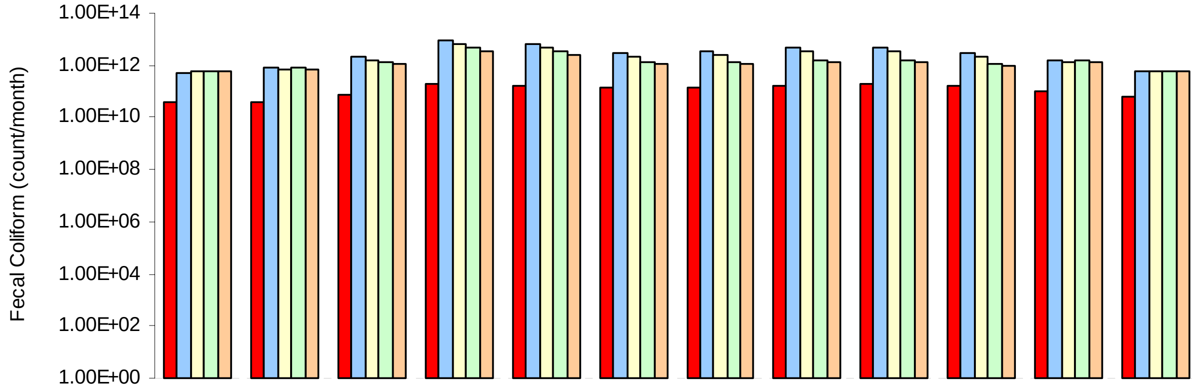
Table 6-8. Implementation Scenarios for TMDL Analysis Point 171, South Fork Chester Creek.

Scenario 1			
Month	**Existing (FC/month)**	**Post-Scenario (FC/month)**	**Percent Reduction**
January	5.18E+11	5.14E+11	1%
February	7.55E+11	6.93E+11	8%
March	2.01E+12	1.64E+12	18%
April	9.06E+12	6.50E+12	28%
May	6.87E+12	4.97E+12	28%
June	2.91E+12	2.22E+12	24%
July	3.23E+12	2.46E+12	24%
August	4.75E+12	3.50E+12	26%
September	4.92E+12	3.60E+12	27%
October	2.86E+12	2.20E+12	23%
November	1.57E+12	1.30E+12	17%
December	6.37E+11	6.12E+11	4%
Annual	4.01E+13	3.02E+13	25%
Scenario 2			
Month	**Existing (FC/month)**	**Post-Scenario (FC/month)**	**Percent Reduction**
January	5.18E+11	5.18E+11	0%
February	7.55E+11	7.55E+11	0%
March	2.01E+12	1.36E+12	32%
April	9.06E+12	4.50E+12	50%
May	6.87E+12	3.24E+12	53%
June	2.91E+12	1.42E+12	51%
July	3.23E+12	1.39E+12	57%
August	4.75E+12	1.61E+12	66%
September	4.92E+12	1.52E+12	69%
October	2.86E+12	1.19E+12	58%
November	1.57E+12	1.57E+12	0%
December	6.37E+11	6.37E+11	0%
Annual	4.01E+13	1.95E+13	51%
Scenario 3			
Month	**Existing (FC/month)**	**Post-Scenario (FC/month)**	**Percent Reduction**
January	5.18E+11	5.14E+11	1%
February	7.55E+11	6.93E+11	8%
March	2.01E+12	1.16E+12	42%
April	9.06E+12	3.29E+12	64%
May	6.87E+12	2.44E+12	65%
June	2.91E+12	1.17E+12	60%
July	3.23E+12	1.15E+12	64%
August	4.75E+12	1.29E+12	73%
September	4.92E+12	1.22E+12	75%
October	2.86E+12	1.02E+12	64%
November	1.57E+12	1.30E+12	17%
December	6.37E+11	6.12E+11	4%
Annual	4.01E+13	1.57E+13	61%

Table 6-9. Summary of TMDL Scenarios for TMDL Analysis Point 171, South Fork Chester Creek.

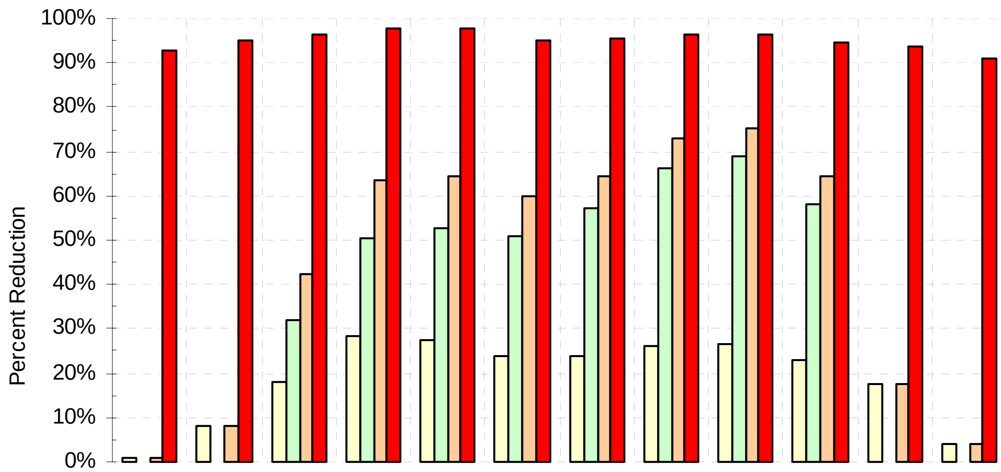
Month	Required Reduction	Scenario 1 Reduction	Scenario 2 Reduction	Scenario 3 Reduction	Additional Reduction
January	93%	1%	0%	1%	92%
February	95%	8%	0%	8%	87%
March	96%	18%	32%	42%	54%
April	98%	28%	50%	64%	34%
May	98%	28%	53%	65%	33%
June	95%	24%	51%	60%	35%
July	96%	24%	57%	64%	31%
August	96%	26%	66%	73%	23%
September	96%	27%	69%	75%	21%
October	95%	23%	58%	64%	30%
November	94%	17%	0%	17%	76%
December	91%	4%	0%	4%	87%
Annual	96%	25%	51%	61%	36%

Annual loads are given in FC/year.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Loading Capacity	3.63E+10	3.75E+10	7.25E+10	1.97E+11	1.66E+11	1.46E+11	1.43E+11	1.74E+11	1.78E+11	1.52E+11	9.81E+10	5.80E+10
Existing Conditions	5.18E+11	7.55E+11	2.01E+12	9.06E+12	6.87E+12	2.91E+12	3.23E+12	4.75E+12	4.92E+12	2.86E+12	1.57E+12	6.37E+11
Scenario 1	5.58E+11	6.93E+11	1.64E+12	6.50E+12	4.97E+12	2.22E+12	2.46E+12	3.50E+12	3.60E+12	2.20E+12	1.30E+12	6.12E+11
Scenario 2	5.60E+11	7.55E+11	1.36E+12	4.50E+12	3.24E+12	1.42E+12	1.39E+12	1.61E+12	1.52E+12	1.19E+12	1.57E+12	6.37E+11
Scenario 3	5.58E+11	6.93E+11	1.16E+12	3.29E+12	2.44E+12	1.17E+12	1.15E+12	1.29E+12	1.22E+12	1.02E+12	1.30E+12	6.12E+11

Figure 6-13. Comparison of monthly loading capacities evaluated by the most restrictive standard to existing loads and TMDL scenario loads at TMDL analysis point 171 on the South Fork of Chester Creek.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Scenario 1	1%	8%	18%	28%	28%	24%	24%	26%	27%	23%	17%	4%
Scenario 2	0%	0%	32%	50%	53%	51%	57%	66%	69%	58%	0%	0%
Scenario 3	1%	8%	42%	64%	65%	60%	64%	73%	75%	64%	17%	4%
Required Reduction	93%	95%	96%	98%	98%	95%	96%	96%	96%	95%	94%	91%

Figure 6-14. Comparison of monthly loading reductions provided by the TMDL scenarios and loading reductions required by the most restrictive standard at TMDL analysis point 171 on the South Fork of Chester Creek.

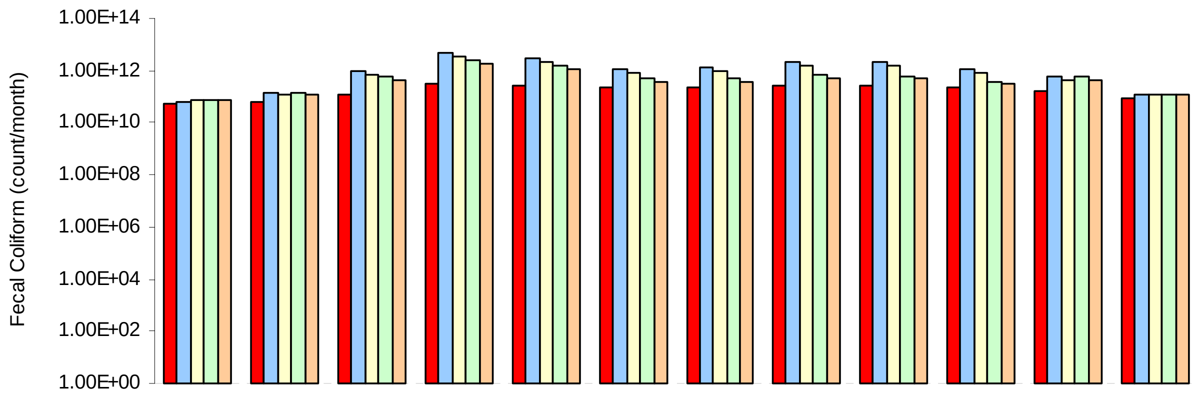
Table 6-10. Implementation Scenarios for TMDL Analysis Point 350, South Fork Chester Creek.

Scenario 1			
Month	**Existing (FC/month)**	**Post-Scenario (FC/month)**	**Percent Reduction**
January	6.42E+10	6.34E+10	1%
February	1.32E+11	1.15E+11	13%
March	9.09E+11	6.97E+11	23%
April	4.66E+12	3.31E+12	29%
May	2.88E+12	2.04E+12	29%
June	1.08E+12	7.96E+11	27%
July	1.26E+12	9.28E+11	26%
August	2.28E+12	1.63E+12	28%
September	2.22E+12	1.59E+12	28%
October	1.15E+12	8.44E+11	26%
November	5.77E+11	4.45E+11	23%
December	1.28E+11	1.16E+11	10%
Annual	1.73E+13	1.26E+13	27%
Scenario 2			
Month	**Existing (FC/month)**	**Post-Scenario (FC/month)**	**Percent Reduction**
January	6.42E+10	6.42E+10	0%
February	1.32E+11	1.32E+11	0%
March	9.09E+11	5.92E+11	35%
April	4.66E+12	2.63E+12	44%
May	2.88E+12	1.45E+12	50%
June	1.08E+12	4.96E+11	54%
July	1.26E+12	4.95E+11	61%
August	2.28E+12	7.03E+11	69%
September	2.22E+12	6.17E+11	72%
October	1.15E+12	3.94E+11	66%
November	5.77E+11	5.77E+11	0%
December	1.28E+11	1.28E+11	0%
Annual	1.73E+13	8.19E+12	53%
Scenario 3			
Month	**Existing (FC/month)**	**Post-Scenario (FC/month)**	**Percent Reduction**
January	6.42E+10	6.34E+10	1%
February	1.32E+11	1.15E+11	13%
March	9.09E+11	4.64E+11	49%
April	4.66E+12	1.89E+12	59%
May	2.88E+12	1.05E+12	63%
June	1.08E+12	3.84E+11	65%
July	1.26E+12	3.87E+11	69%
August	2.28E+12	5.31E+11	77%
September	2.22E+12	4.68E+11	79%
October	1.15E+12	3.17E+11	72%
November	5.77E+11	4.45E+11	23%
December	1.28E+11	1.16E+11	10%
Annual	1.73E+13	6.16E+12	64%

Table 6-11. Summary of TMDL Scenarios for TMDL Analysis Point 350 on the South Fork Chester Creek.

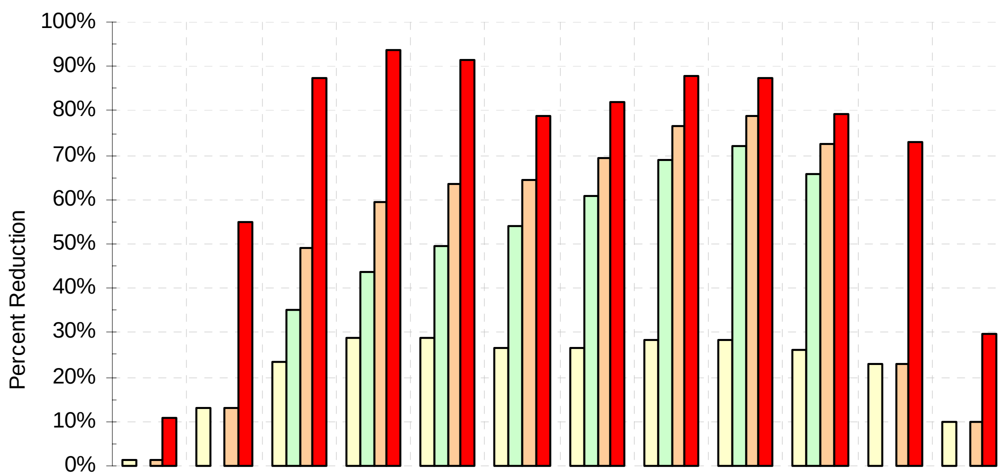
Month	Required Reduction	Scenario 1 Reduction	Scenario 2 Reduction	Scenario 3 Reduction	Additional Reduction
January	11%	1%	0%	1%	10%
February	55%	13%	0%	13%	42%
March	87%	23%	35%	49%	38%
April	94%	29%	44%	59%	34%
May	91%	29%	50%	63%	28%
June	79%	27%	54%	65%	14%
July	82%	26%	61%	69%	13%
August	88%	28%	69%	77%	11%
September	88%	28%	72%	79%	9%
October	79%	26%	66%	72%	7%
November	73%	23%	0%	23%	50%
December	30%	10%	0%	10%	20%
Annual	87%	27%	53%	64%	22%

Annual loads are given in FC/year.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Loading Capacity	5.71E+10	5.96E+10	1.15E+11	2.99E+11	2.53E+11	2.29E+11	2.28E+11	2.77E+11	2.77E+11	2.37E+11	1.55E+11	9.01E+10
Existing Conditions	6.42E+10	1.32E+11	9.09E+11	4.66E+12	2.88E+12	1.08E+12	1.26E+12	2.28E+12	2.22E+12	1.15E+12	5.77E+11	1.28E+11
Scenario 1	6.83E+10	1.15E+11	6.97E+11	3.31E+12	2.04E+12	7.96E+11	9.28E+11	1.63E+12	1.59E+12	8.44E+11	4.45E+11	1.16E+11
Scenario 2	6.88E+10	1.32E+11	5.92E+11	2.63E+12	1.45E+12	4.96E+11	4.95E+11	7.03E+11	6.17E+11	3.94E+11	5.77E+11	1.28E+11
Scenario 3	6.83E+10	1.15E+11	4.64E+11	1.89E+12	1.05E+12	3.84E+11	3.87E+11	5.31E+11	4.68E+11	3.17E+11	4.45E+11	1.16E+11

Figure 6-15. Comparison of monthly loading capacities evaluated by the most restrictive standard to existing loads and TMDL scenario loads at TMDL analysis point 350 on the South Fork of Chester Creek.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Scenario 1	1%	13%	23%	29%	29%	27%	26%	28%	28%	26%	23%	10%
Scenario 2	0%	0%	35%	44%	50%	54%	61%	69%	72%	66%	0%	0%
Scenario 3	1%	13%	49%	59%	63%	65%	69%	77%	79%	72%	23%	10%
Required Reduction	11%	55%	87%	94%	91%	79%	82%	88%	88%	79%	73%	30%

Figure 6-16. Comparison of monthly loading reductions provided by the TMDL scenarios and loading reductions required by the most restrictive standard at TMDL analysis point 350 on the South Fork of Chester Creek.

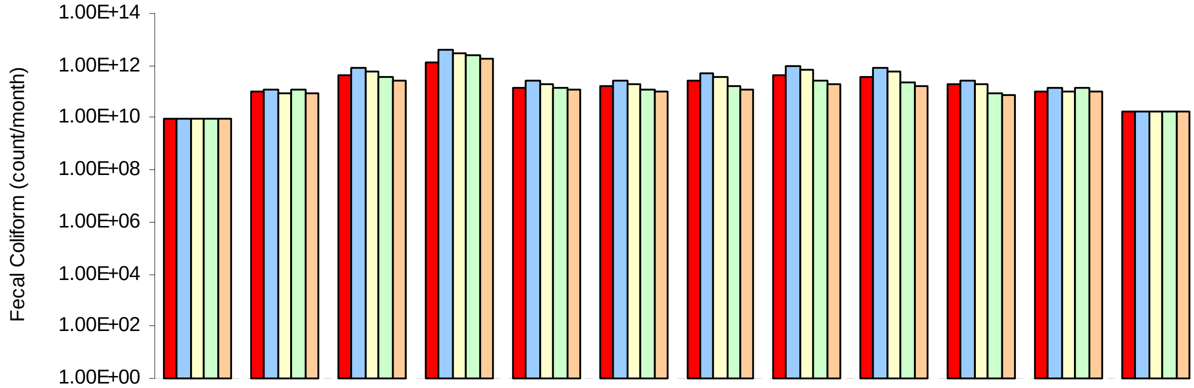
Table 6-12. Implementation Scenarios for TMDL Analysis Point 101 on Chester Creek.

Month	Existing (FC/month)	Post-Scenario (FC/month)	Percent Reduction
Scenario 1			
Month	**Existing (FC/month)**	**Post-Scenario (FC/month)**	**Percent Reduction**
January	**9.59E+09**	**9.58E+09**	**0%**
February	**1.26E+11**	**9.07E+10**	**28%**
March	**7.76E+11**	**5.45E+11**	**30%**
April	**4.28E+12**	**2.99E+12**	**30%**
May	**2.69E+11**	**1.96E+11**	**27%**
June	**2.69E+11**	**1.97E+11**	**27%**
July	**4.87E+11**	**3.48E+11**	**29%**
August	**9.51E+11**	**6.73E+11**	**29%**
September	**8.30E+11**	**5.89E+11**	**29%**
October	**2.85E+11**	**2.08E+11**	**27%**
November	**1.44E+11**	**1.07E+11**	**26%**
December	1.46E+10	1.45E+10	1%
Annual	**8.44E+12**	**5.97E+12**	**29%**
Scenario 2			
Month	**Existing (FC/month)**	**Post-Scenario (FC/month)**	**Percent Reduction**
January	**9.59E+09**	**9.59E+09**	**0%**
February	**1.26E+11**	**1.26E+11**	**0%**
March	**7.76E+11**	**3.87E+11**	**50%**
April	**4.28E+12**	**2.58E+12**	**40%**
May	**2.69E+11**	**1.48E+11**	**45%**
June	**2.69E+11**	**1.22E+11**	**55%**
July	**4.87E+11**	**1.69E+11**	**65%**
August	**9.51E+11**	**2.72E+11**	**71%**
September	**8.30E+11**	**2.18E+11**	**74%**
October	**2.85E+11**	**8.43E+10**	**70%**
November	**1.44E+11**	**1.44E+11**	**0%**
December	1.46E+10	1.46E+10	0%
Annual	**8.44E+12**	**4.27E+12**	**49%**
Scenario 3			
Month	**Existing (FC/month)**	**Post-Scenario (FC/month)**	**Percent Reduction**
January	**9.59E+09**	**9.58E+09**	**0%**
February	**1.26E+11**	**9.07E+10**	**28%**
March	**7.76E+11**	**2.74E+11**	**65%**
April	**4.28E+12**	**1.81E+12**	**58%**
May	**2.69E+11**	**1.12E+11**	**58%**
June	**2.69E+11**	**9.45E+10**	**65%**
July	**4.87E+11**	**1.26E+11**	**74%**
August	**9.51E+11**	**1.99E+11**	**79%**
September	**8.30E+11**	**1.62E+11**	**81%**
October	**2.85E+11**	**6.83E+10**	**76%**
November	**1.44E+11**	**1.07E+11**	**26%**
December	1.46E+10	1.45E+10	1%
Annual	**8.44E+12**	**3.06E+12**	**64%**

Table 6-13. Summary of TMDL Scenarios for TMDL Analysis Point 101 on Chester Creek.

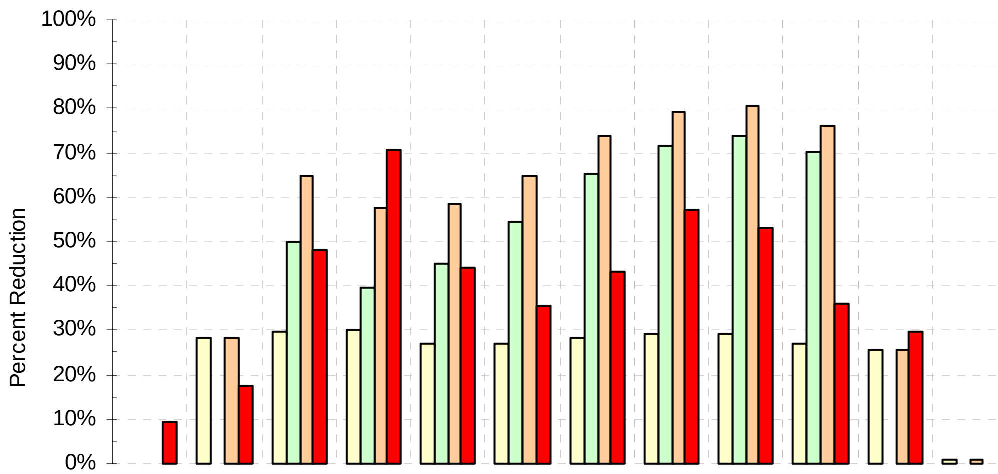
Month	Required Reduction	Scenario 1 Reduction	Scenario 2 Reduction	Scenario 3 Reduction	Additional Reduction
January	**9%**	**0%**	**0%**	**0%**	**9%**
February	**18%**	**28%**	**0%**	**28%**	**0%**
March	**48%**	**30%**	**50%**	**65%**	**0%**
April	**71%**	**30%**	**40%**	**58%**	**13%**
May	**44%**	**27%**	**45%**	**58%**	**0%**
June	**36%**	**27%**	**55%**	**65%**	**0%**
July	**43%**	**29%**	**65%**	**74%**	**0%**
August	**57%**	**29%**	**71%**	**79%**	**0%**
September	**53%**	**29%**	**74%**	**81%**	**0%**
October	**36%**	**27%**	**70%**	**76%**	**0%**
November	**30%**	**26%**	**0%**	**26%**	**4%**
December	0%	1%	0%	1%	0%
Annual	**59%**	**29%**	**49%**	**64%**	**0%**

Bold type indicates that the 10 percent not-to-exceed standard applies for the month.
Annual loads are given in FC/year.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Loading Capacity	8.69E+09	1.04E+11	4.02E+11	1.26E+12	1.50E+11	1.74E+11	2.76E+11	4.09E+11	3.89E+11	1.82E+11	1.01E+11	1.63E+10
Existing Conditions	9.59E+09	1.26E+11	7.76E+11	4.28E+12	2.69E+11	2.69E+11	4.87E+11	9.51E+11	8.30E+11	2.85E+11	1.44E+11	1.63E+10
Scenario 1	9.58E+09	9.07E+10	5.45E+11	2.99E+12	1.96E+11	1.97E+11	3.48E+11	6.73E+11	5.89E+11	2.08E+11	1.07E+11	1.62E+10
Scenario 2	9.59E+09	1.26E+11	3.87E+11	2.58E+12	1.48E+11	1.22E+11	1.69E+11	2.72E+11	2.18E+11	8.43E+10	1.44E+11	1.63E+10
Scenario 3	9.58E+09	9.07E+10	2.74E+11	1.81E+12	1.12E+11	9.45E+10	1.26E+11	1.99E+11	1.62E+11	6.83E+10	1.07E+11	1.62E+10

Figure 6-17. Comparison of monthly loading capacities evaluated by the most restrictive standard to existing loads and TMDL scenario loads at TMDL analysis point 101 on the South Fork of Chester Creek.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Scenario 1	0%	28%	30%	30%	27%	27%	29%	29%	29%	27%	26%	1%
Scenario 2	0%	0%	50%	40%	45%	55%	65%	71%	74%	70%	0%	0%
Scenario 3	0%	28%	65%	58%	58%	65%	74%	79%	81%	76%	26%	1%
Required Reduction	9%	18%	48%	71%	44%	36%	43%	57%	53%	36%	30%	0%

Figure 6-18. Comparison of monthly loading reductions provided by the TMDL scenarios and loading reductions required by the most restrictive standard at TMDL analysis point 101 on the South Fork of Chester Creek.

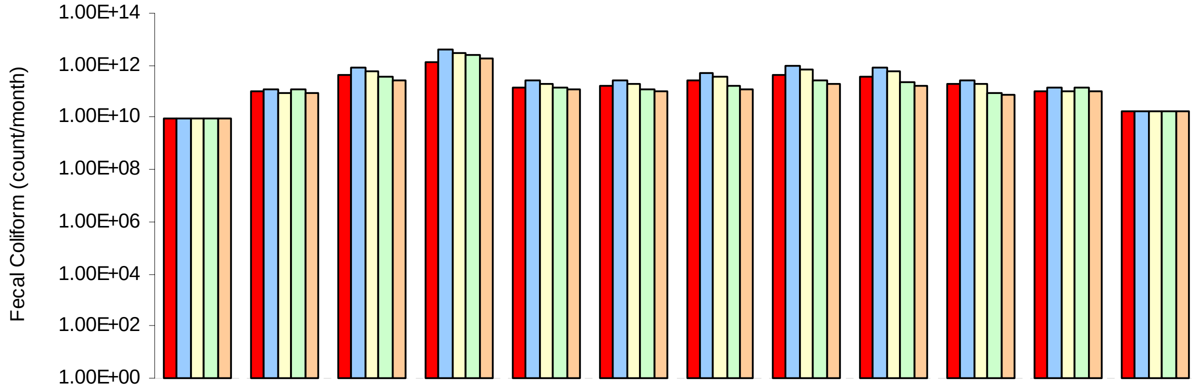
Table 6-14. Implementation Scenarios for TMDL Analysis Point CH2, Chester Creek.

Month	Existing (FC/month)	Post-Scenario (FC/month)	Percent Reduction
Scenario 1			
January	1.21E+12	1.21E+12	0%
February	1.23E+12	1.18E+12	4%
March	1.98E+12	1.78E+12	10%
April	3.40E+12	2.61E+12	23%
May	2.84E+12	2.35E+12	17%
June	3.14E+12	2.81E+12	11%
July	3.45E+12	2.96E+12	14%
August	3.28E+12	2.72E+12	17%
September	2.69E+12	2.27E+12	16%
October	2.80E+12	2.53E+12	10%
November	2.91E+12	2.66E+12	9%
December	1.74E+12	1.72E+12	1%
Annual	3.07E+13	2.68E+13	13%
Scenario 2			
Month	**Existing (FC/month)**	**Post-Scenario (FC/month)**	**Percent Reduction**
January	1.21E+12	1.21E+12	0%
February	1.23E+12	1.23E+12	0%
March	1.98E+12	1.73E+12	13%
April	3.40E+12	2.44E+12	28%
May	2.84E+12	2.13E+12	25%
June	3.14E+12	2.53E+12	20%
July	3.45E+12	2.39E+12	31%
August	3.28E+12	1.99E+12	39%
September	2.69E+12	1.65E+12	39%
October	2.80E+12	2.14E+12	24%
November	2.91E+12	2.91E+12	0%
December	1.74E+12	1.74E+12	0%
Annual	3.07E+13	2.40E+13	22%
Scenario 3			
Month	**Existing (FC/month)**	**Post-Scenario (FC/month)**	**Percent Reduction**
January	1.21E+12	1.21E+12	0%
February	1.23E+12	1.18E+12	4%
March	1.98E+12	1.58E+12	20%
April	3.40E+12	1.91E+12	44%
May	2.84E+12	1.84E+12	35%
June	3.14E+12	2.36E+12	25%
July	3.45E+12	2.18E+12	37%
August	3.28E+12	1.78E+12	46%
September	2.69E+12	1.52E+12	44%
October	2.80E+12	2.04E+12	27%
November	2.91E+12	2.66E+12	9%
December	1.74E+12	1.72E+12	1%
Annual	3.07E+13	2.19E+13	29%

Table 6-15. Summary of TMDL Scenarios for TMDL Analysis Point CH2, Chester Creek.

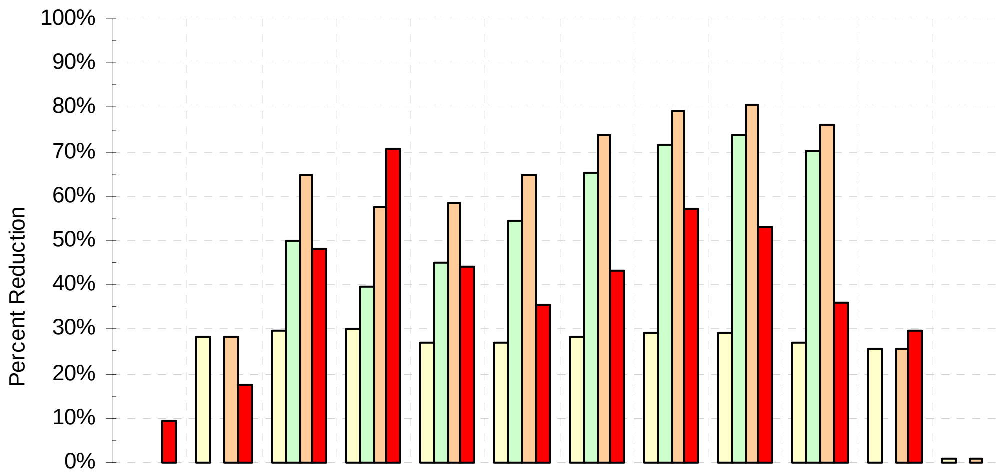
Month	Required Reduction	Scenario 1 Reduction	Scenario 2 Reduction	Scenario 3 Reduction	Additional Reduction
January	85%	0%	0%	0%	85%
February	85%	4%	0%	4%	81%
March	86%	10%	13%	20%	66%
April	85%	23%	28%	44%	42%
May	85%	17%	25%	35%	49%
June	88%	11%	20%	25%	63%
July	89%	14%	31%	37%	52%
August	86%	17%	39%	46%	40%
September	83%	16%	39%	44%	39%
October	86%	10%	24%	27%	59%
November	90%	9%	0%	9%	81%
December	88%	1%	0%	1%	87%
Annual	86%	13%	22%	29%	58%

Annual loads are given in FC/year.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Loading Capacity	8.69E+09	1.04E+11	4.02E+11	1.26E+12	1.50E+11	1.74E+11	2.76E+11	4.09E+11	3.89E+11	1.82E+11	1.01E+11	1.63E+10
Existing Conditions	9.59E+09	1.26E+11	7.76E+11	4.28E+12	2.69E+11	2.69E+11	4.87E+11	9.51E+11	8.30E+11	2.85E+11	1.44E+11	1.63E+10
Scenario 1	9.58E+09	9.07E+10	5.45E+11	2.99E+12	1.96E+11	1.97E+11	3.48E+11	6.73E+11	5.89E+11	2.08E+11	1.07E+11	1.62E+10
Scenario 2	9.59E+09	1.26E+11	3.87E+11	2.58E+12	1.48E+11	1.22E+11	1.69E+11	2.72E+11	2.18E+11	8.43E+10	1.44E+11	1.63E+10
Scenario 3	9.58E+09	9.07E+10	2.74E+11	1.81E+12	1.12E+11	9.45E+10	1.26E+11	1.99E+11	1.62E+11	6.83E+10	1.07E+11	1.62E+10

Figure 6-19. Comparison of monthly loading capacities evaluated by the most restrictive standard to existing loads and TMDL scenario loads at TMDL analysis point CH2 on the South Fork of Chester Creek.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Scenario 1	0%	28%	30%	30%	27%	27%	29%	29%	29%	27%	26%	1%
Scenario 2	0%	0%	50%	40%	45%	55%	65%	71%	74%	70%	0%	0%
Scenario 3	0%	28%	65%	58%	58%	65%	74%	79%	81%	76%	26%	1%
Required Reduction	9%	18%	48%	71%	44%	36%	43%	57%	53%	36%	30%	0%

Figure 6-20. Comparison of monthly loading reductions provided by the TMDL scenarios and loading reductions required by the most restrictive standard at TMDL analysis point CH2 on the South Fork of Chester Creek.

7.0 UNIVERSITY LAKE ALLOCATION ANALYSIS

7.1 Identification of Allowable Loads

The calibrated SWMM model was used to determine existing and allowable loads of fecal coliform for the University Lake TMDL analysis points 171 and ULO (see Figures 5-3 and 5-5). The results of the modeling runs are summarized in Figures 7-1 to 7-4 and Tables 7-1 and 7-2.

Figures 7-1 through 7-4 and Tables 7-1 and 7-2 show that the 30-day geometric mean standard is always more restrictive than the 10 percent not-to-exceed standard. Therefore the final TMDL results (presented below) are based on the reductions necessary to achieve the 30-day geometric mean standard.

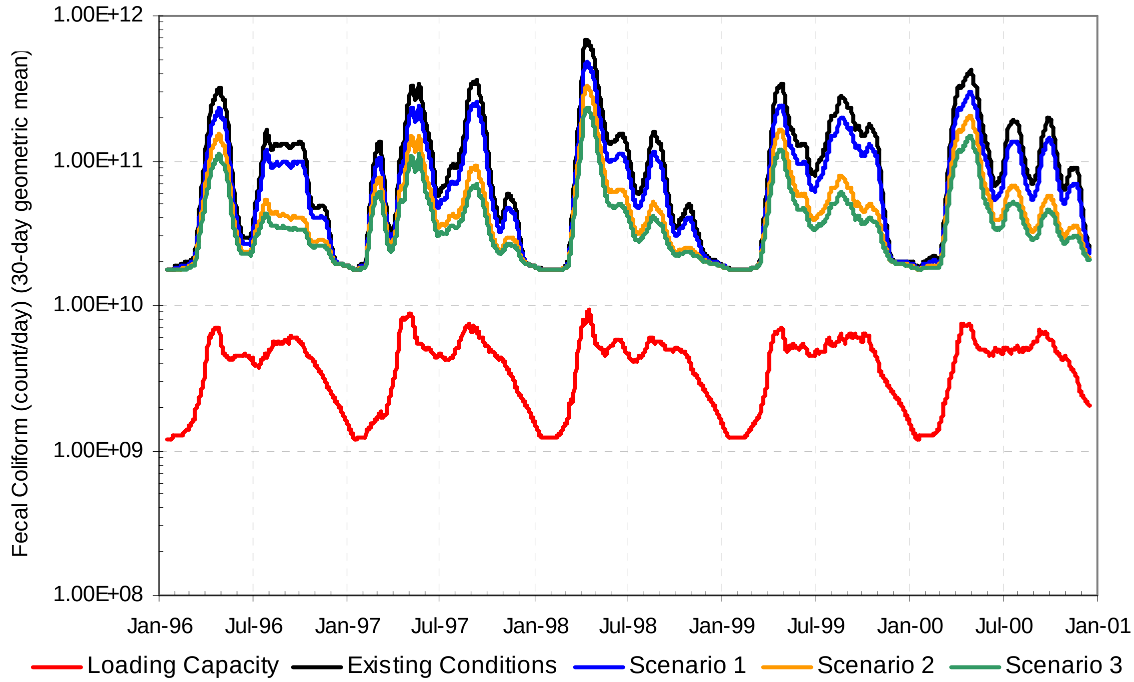


Figure 7-1. Evaluation of the 30-day geometric mean standard at TMDL analysis point 171, located just above University Lake.

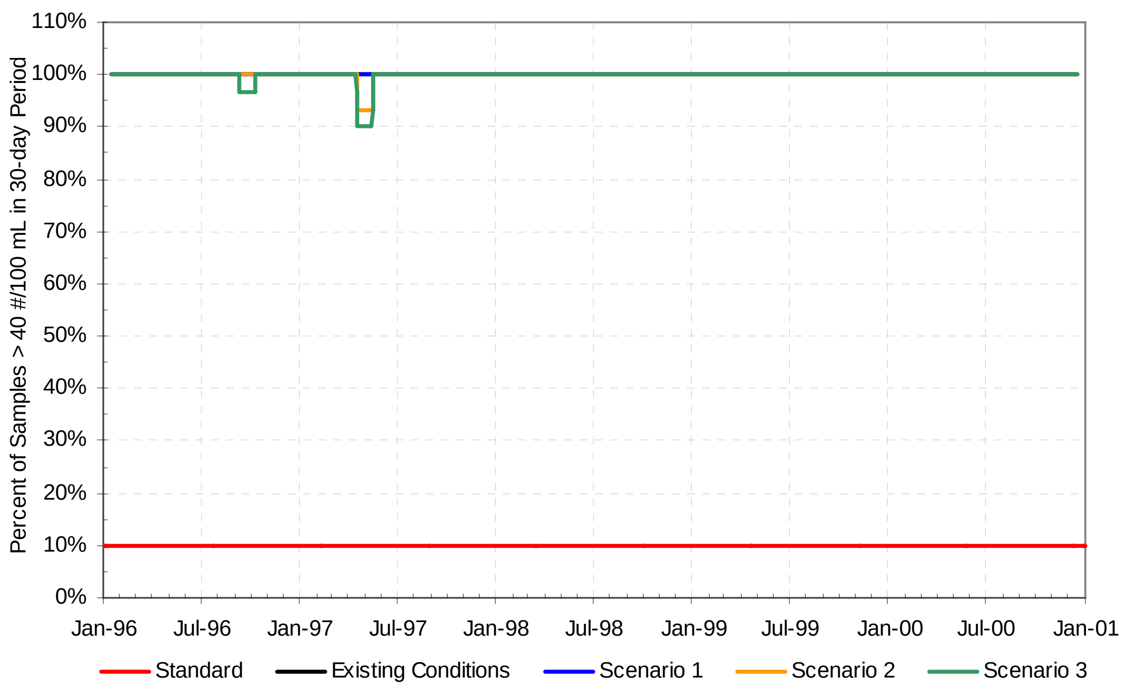


Figure 7-2. Evaluation of the 30-day not-to-exceed standard at TMDL analysis point 171, located just above University Lake.

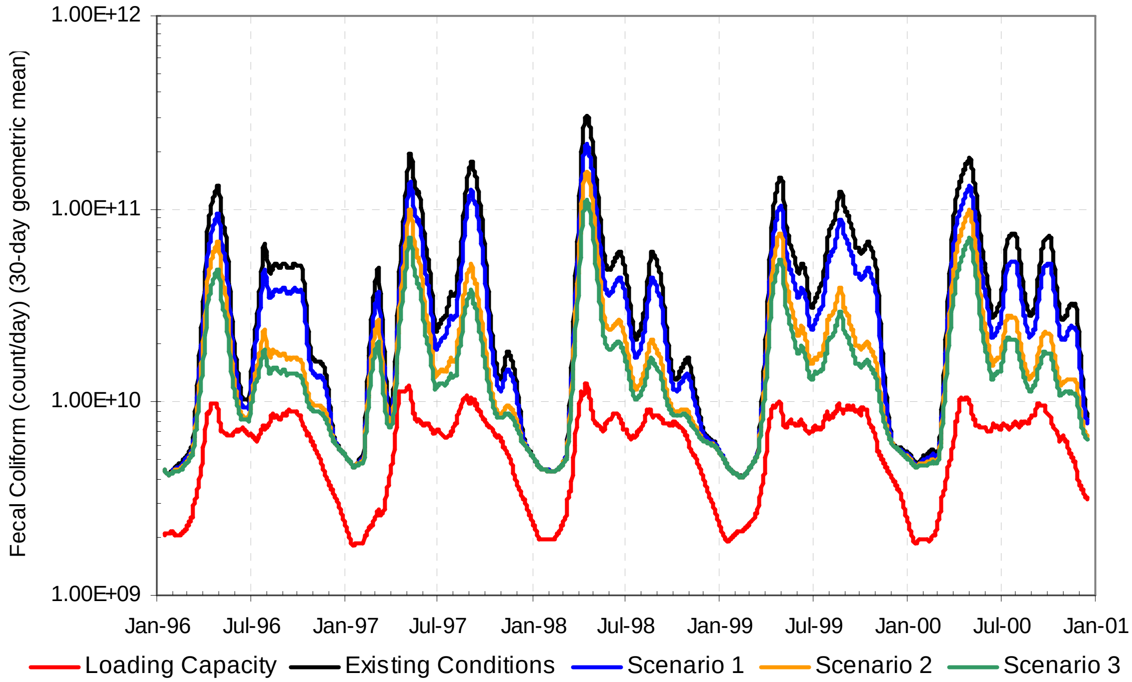


Figure 7-3. Evaluation of the 30-day geometric mean standard at TMDL analysis point ULO, located just below University Lake.

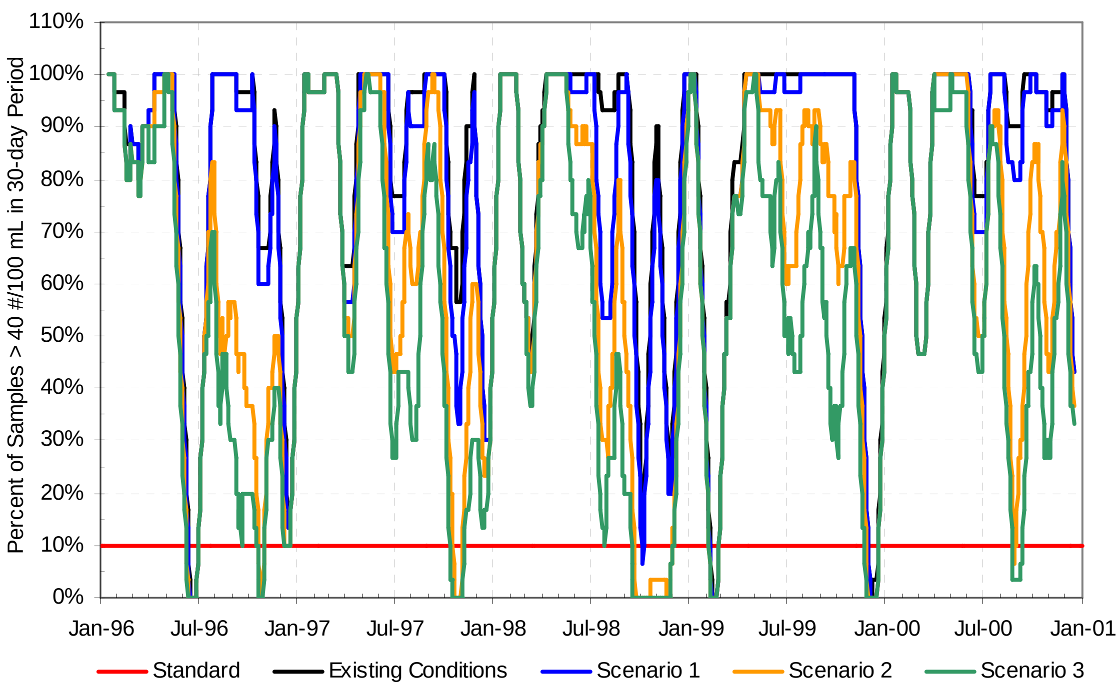


Figure 7-4. Evaluation of the 30-day not-to-exceed standard at TMDL analysis point ULO, located just below University Lake.

7.2 Load Allocation

Nonpoint sources are typically represented by loads carried to receiving waters through surface runoff resulting from precipitation events. However, because stormwater discharges in the MOA are regulated by a NPDES stormwater permit for municipal separate storm sewer systems (MS4), watershed loads delivered to Chester Creek through stormwater conveyances are addressed through the wasteload allocation component of this TMDL. Because the Chester Creek watershed includes only negligible loading from outside of the municipality that is essentially contributions from wildlife, a load allocation of zero has been set for this TMDL.

7.3 Wasteload Allocation

The only permitted source of fecal coliform in the Chester Creek watershed is storm water runoff. The MOA is subject to an MS4 permit that regulates storm water discharges and EPA policy and regulation indicate that storm water runoff regulated by the NPDES program through an MS4 permit must be addressed through wasteload allocations in a TMDL (USEPA, 2002). Therefore, the Chester Creek TMDL establishes wasteload allocations for watershed loads of fecal coliform. The wasteload allocation is the loading capacity minus the margin of safety.

The fecal coliform wasteload allocations for Chester Creek, provided as monthly allocations for the University Lake TMDL analysis points 171 and ULO, are presented in Tables 7-1 and 7-2, respectively. Table 7-1 (TMDL analysis point 171) suggests that fecal coliform loadings to University Lake are large throughout the year, and that the greatest monthly fecal coliform loads occurs during the spring and summer months. Consequently, the greatest required monthly reductions for TMDL analysis point 171 occur during spring and summer months. The winter months represent the lowest fecal coliform loads upstream of University Lake and, therefore, require the lowest percent reductions from existing loads.

Allocations are not established for future loads because ADEC does not anticipate any future permits for the discharge of fecal coliform to Chester Creek. Additionally, if data or information from future monitoring efforts can be used to identify and quantify stormwater or natural loads that are not delivered through the stormwater conveyances, the TMDL and its allocations will be revised accordingly.
The fecal coliform wasteload allocations and a margin of safety for University Lake are provided as seasonal and annual allocations for both of the University Lake TMDL analysis points and are presented in Tables 7-1 and 7-2.

Table 7-1. Summary of the University Lake TMDL, Analysis Point 171.

Month	Existing (FC/month)	Loading Capacity (FC/month)	Margin of Safety (FC/month)	Waste Load Allocation (FC/month)	Required Reduction
Jan	5.18E+11	3.63E+10	3.63E+09	3.27E+10	93%
Feb	7.55E+11	3.75E+10	3.75E+09	3.38E+10	95%
Mar	2.01E+12	7.25E+10	7.25E+09	6.53E+10	96%
Apr	9.06E+12	1.97E+11	1.97E+10	1.77E+11	98%
May	6.87E+12	1.66E+11	1.66E+10	1.49E+11	98%
Jun	2.91E+12	1.46E+11	1.46E+10	1.32E+11	95%
Jul	3.23E+12	1.43E+11	1.43E+10	1.28E+11	96%
Aug	4.75E+12	1.74E+11	1.74E+10	1.56E+11	96%
Sep	4.92E+12	1.78E+11	1.78E+10	1.60E+11	96%
Oct	2.86E+12	1.52E+11	1.52E+10	1.37E+11	95%
Nov	1.57E+12	9.81E+10	9.81E+09	8.83E+10	94%
Dec	6.37E+11	5.80E+10	5.80E+09	5.22E+10	91%
Annual	4.01E+13	1.46E+12	1.46E+11	1.31E+12	96%

Annual loads are given in FC/year.

Table 7-2. Summary of the University Lake TMDL, Analysis Point ULO.

Month	Existing (FC/month)	Loading Capacity (FC/month)	Margin of Safety (FC/month)	Waste Load Allocation (FC/month)	Required Reduction
Jan	1.35E+11	5.71E+10	5.71E+09	5.14E+10	58%
Feb	2.02E+11	5.95E+10	5.95E+09	5.36E+10	71%
Mar	5.97E+11	1.10E+11	1.10E+10	9.92E+10	82%
Apr	3.67E+12	2.80E+11	2.80E+10	2.52E+11	92%
May	3.05E+12	2.48E+11	2.48E+10	2.23E+11	92%
Jun	1.15E+12	2.25E+11	2.25E+10	2.02E+11	80%
Jul	1.24E+12	2.21E+11	2.21E+10	1.99E+11	82%
Aug	1.97E+12	2.65E+11	2.65E+10	2.39E+11	87%
Sep	2.05E+12	2.68E+11	2.68E+10	2.41E+11	87%
Oct	1.14E+12	2.32E+11	2.32E+10	2.09E+11	80%
Nov	5.60E+11	1.53E+11	1.53E+10	1.38E+11	73%
Dec	2.06E+11	9.00E+10	9.00E+09	8.10E+10	56%
Annual	1.60E+13	2.21E+12	2.21E+11	1.99E+12	86%

Annual loads are given in FC/year.

7.4 Implementation Scenarios

The same three implementation scenarios discussed above for the Chester Creek TMDL were used to assess conditions in University Lake.

Tables 7-3 through 7-6 summarize the results of the implementation scenarios for the University Lake analysis points. The tables show that a combination of education and increased street sweeping frequency and efficiency applied to all urbanized areas in the watershed has a significant impact in the reduction of fecal coliform loading to University Lake, with an annual fecal coliform percent reduction of 61 percent. However, significant additional reductions beyond TMDL scenario 3 are required for both TMDL analysis sites in order to comply with both components of the standard.

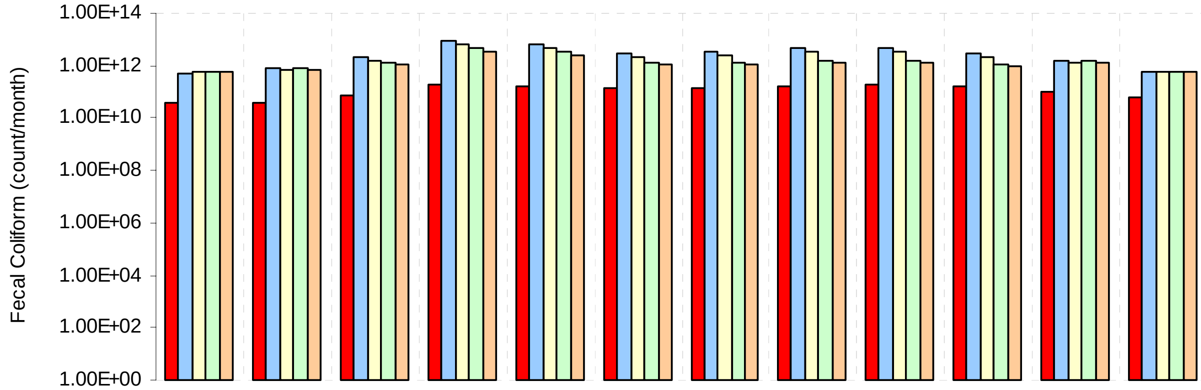
Table 7-3. Implementation Scenarios for University Lake, Analysis Point 171.

Scenario 1			
Month	**Existing (FC/month)**	**Post-Scenario (FC/month)**	**Percent Reduction**
January	5.18E+11	5.14E+11	1%
February	7.55E+11	6.93E+11	8%
March	2.01E+12	1.64E+12	18%
April	9.06E+12	6.50E+12	28%
May	6.87E+12	4.97E+12	28%
June	2.91E+12	2.22E+12	24%
July	3.23E+12	2.46E+12	24%
August	4.75E+12	3.50E+12	26%
September	4.92E+12	3.60E+12	27%
October	2.86E+12	2.20E+12	23%
November	1.57E+12	1.30E+12	17%
December	6.37E+11	6.12E+11	4%
Annual	4.01E+13	3.02E+13	25%
Scenario 2			
Month	**Existing (FC/month)**	**Post-Scenario (FC/month)**	**Percent Reduction**
January	5.18E+11	5.18E+11	0%
February	7.55E+11	7.55E+11	0%
March	2.01E+12	1.36E+12	32%
April	9.06E+12	4.50E+12	50%
May	6.87E+12	3.24E+12	53%
June	2.91E+12	1.42E+12	51%
July	3.23E+12	1.39E+12	57%
August	4.75E+12	1.61E+12	66%
September	4.92E+12	1.52E+12	69%
October	2.86E+12	1.19E+12	58%
November	1.57E+12	1.57E+12	0%
December	6.37E+11	6.37E+11	0%
Annual	4.01E+13	1.95E+13	51%
Scenario 3			
Month	**Existing (FC/month)**	**Post-Scenario (FC/month)**	**Percent Reduction**
January	5.18E+11	5.14E+11	1%
February	7.55E+11	6.93E+11	8%
March	2.01E+12	1.16E+12	42%
April	9.06E+12	3.29E+12	64%
May	6.87E+12	2.44E+12	65%
June	2.91E+12	1.17E+12	60%
July	3.23E+12	1.15E+12	64%
August	4.75E+12	1.29E+12	73%
September	4.92E+12	1.22E+12	75%
October	2.86E+12	1.02E+12	64%
November	1.57E+12	1.30E+12	17%
December	6.37E+11	6.12E+11	4%
Annual	4.01E+13	1.57E+13	61%

Table 7-4. Summary of TMDL Scenarios for University Lake, Analysis Point 171.

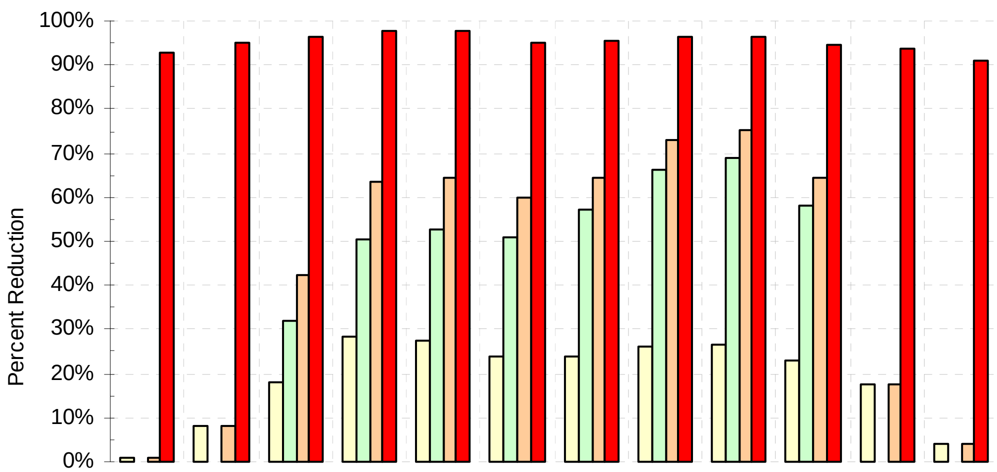
Month	Required Reduction	Scenario 1 Reduction	Scenario 2 Reduction	Scenario 3 Reduction	Additional Reduction
January	93%	1%	0%	1%	92%
February	95%	8%	0%	8%	87%
March	96%	18%	32%	42%	54%
April	98%	28%	50%	64%	34%
May	98%	28%	53%	65%	33%
June	95%	24%	51%	60%	35%
July	96%	24%	57%	64%	31%
August	96%	26%	66%	73%	23%
September	96%	27%	69%	75%	21%
October	95%	23%	58%	64%	30%
November	94%	17%	0%	17%	76%
December	91%	4%	0%	4%	87%
Annual	96%	25%	51%	61%	36%

Annual loads are given in FC/year.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Loading Capacity	3.63E+10	3.75E+10	7.25E+10	1.97E+11	1.66E+11	1.46E+11	1.43E+11	1.74E+11	1.78E+11	1.52E+11	9.81E+10	5.80E+10
Existing Conditions	5.18E+11	7.55E+11	2.01E+12	9.06E+12	6.87E+12	2.91E+12	3.23E+12	4.75E+12	4.92E+12	2.86E+12	1.57E+12	6.37E+11
Scenario 1	5.58E+11	6.93E+11	1.64E+12	6.50E+12	4.97E+12	2.22E+12	2.46E+12	3.50E+12	3.60E+12	2.20E+12	1.30E+12	6.12E+11
Scenario 2	5.60E+11	7.55E+11	1.36E+12	4.50E+12	3.24E+12	1.42E+12	1.39E+12	1.61E+12	1.52E+12	1.19E+12	1.57E+12	6.37E+11
Scenario 3	5.58E+11	6.93E+11	1.16E+12	3.29E+12	2.44E+12	1.17E+12	1.15E+12	1.29E+12	1.22E+12	1.02E+12	1.30E+12	6.12E+11

Figure 7-5. Comparison of monthly loading capacities evaluated by the most restrictive standard to existing loads and TMDL scenario loads at TMDL analysis point 171 on the South Fork of Chester Creek.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Scenario 1	1%	8%	18%	28%	28%	24%	24%	26%	27%	23%	17%	4%
Scenario 2	0%	0%	32%	50%	53%	51%	57%	66%	69%	58%	0%	0%
Scenario 3	1%	8%	42%	64%	65%	60%	64%	73%	75%	64%	17%	4%
Required Reduction	93%	95%	96%	98%	98%	95%	96%	96%	96%	95%	94%	91%

Figure 7-6. Comparison of monthly loading reductions provided by the TMDL scenarios and loading reductions required by the most restrictive standard at TMDL analysis point 171 on the South Fork of Chester Creek.

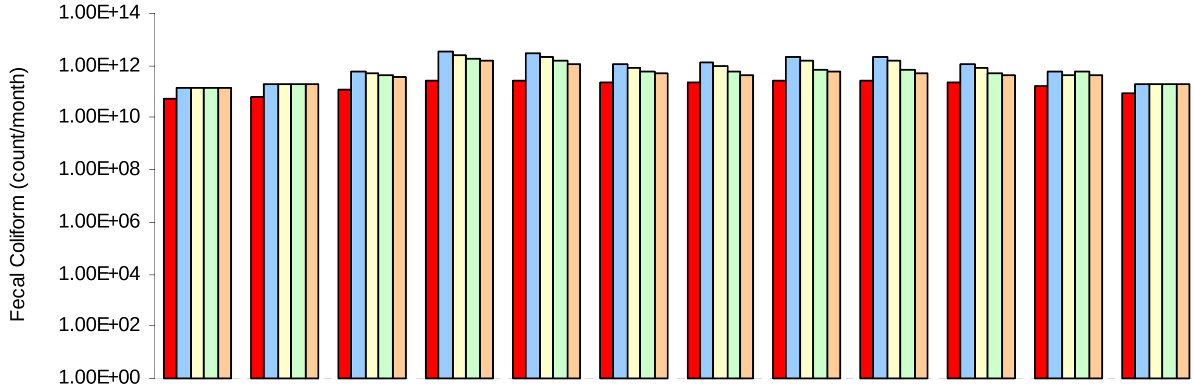
Table 7-5. Implementation Scenarios for University Lake, Analysis Point ULO.

Month	Existing (FC/month)	Post-Scenario (FC/month)	Percent Reduction
Scenario 1			
January	1.35E+11	1.34E+11	1%
February	2.02E+11	1.84E+11	9%
March	5.97E+11	4.87E+11	19%
April	3.67E+12	2.64E+12	28%
May	3.05E+12	2.20E+12	28%
June	1.15E+12	8.72E+11	24%
July	1.24E+12	9.43E+11	24%
August	1.97E+12	1.45E+12	27%
September	2.05E+12	1.50E+12	27%
October	1.14E+12	8.69E+11	24%
November	5.60E+11	4.57E+11	18%
December	2.06E+11	1.95E+11	6%
Annual	1.60E+13	1.19E+13	25%
Scenario 2			
Month	**Existing (FC/month)**	**Post-Scenario (FC/month)**	**Percent Reduction**
January	1.35E+11	1.35E+11	0%
February	2.02E+11	2.02E+11	0%
March	5.97E+11	4.12E+11	31%
April	3.67E+12	1.95E+12	47%
May	3.05E+12	1.52E+12	50%
June	1.15E+12	5.74E+11	50%
July	1.24E+12	5.59E+11	55%
August	1.97E+12	7.18E+11	64%
September	2.05E+12	6.63E+11	68%
October	1.14E+12	4.72E+11	59%
November	5.60E+11	5.60E+11	0%
December	2.06E+11	2.06E+11	0%
Annual	1.60E+13	7.90E+12	51%
Scenario 3			
Month	**Existing (FC/month)**	**Post-Scenario (FC/month)**	**Percent Reduction**
January	1.35E+11	1.34E+11	1%
February	2.02E+11	1.84E+11	9%
March	5.97E+11	3.49E+11	42%
April	3.67E+12	1.43E+12	61%
May	3.05E+12	1.13E+12	63%
June	1.15E+12	4.67E+11	59%
July	1.24E+12	4.59E+11	63%
August	1.97E+12	5.69E+11	71%
September	2.05E+12	5.27E+11	74%
October	1.14E+12	3.98E+11	65%
November	5.60E+11	4.57E+11	18%
December	2.06E+11	1.95E+11	6%
Annual	1.60E+13	6.24E+12	61%

Table 7-6. Summary of TMDL Scenarios for University Lake, Analysis Point ULO.

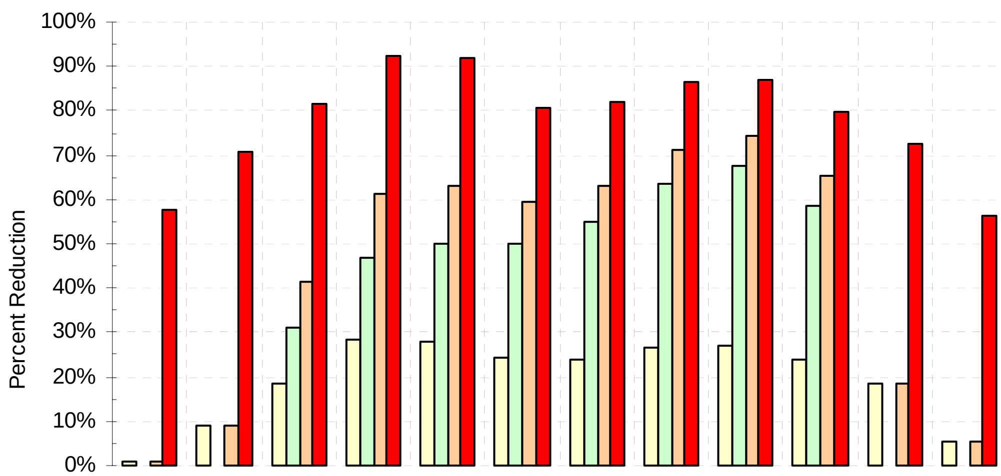
Month	Required Reduction	Scenario 1 Reduction	Scenario 2 Reduction	Scenario 3 Reduction	Additional Reduction
January	58%	1%	0%	1%	57%
February	71%	9%	0%	9%	62%
March	82%	19%	31%	42%	40%
April	92%	28%	47%	61%	31%
May	92%	28%	50%	63%	29%
June	80%	24%	50%	59%	21%
July	82%	24%	55%	63%	19%
August	87%	27%	64%	71%	15%
September	87%	27%	68%	74%	13%
October	80%	24%	59%	65%	15%
November	73%	18%	0%	18%	54%
December	56%	6%	0%	6%	51%
Annual	86%	25%	51%	61%	25%

Annual loads are given in FC/year.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Loading Capacity	5.71E+10	5.95E+10	1.10E+11	2.80E+11	2.48E+11	2.25E+11	2.21E+11	2.65E+11	2.68E+11	2.32E+11	1.53E+11	9.00E+10
Existing Conditions	1.35E+11	2.02E+11	5.97E+11	3.67E+12	3.05E+12	1.15E+12	1.24E+12	1.97E+12	2.05E+12	1.14E+12	5.60E+11	2.06E+11
Scenario 1	1.45E+11	1.84E+11	4.87E+11	2.64E+12	2.20E+12	8.72E+11	9.43E+11	1.45E+12	1.50E+12	8.69E+11	4.57E+11	1.95E+11
Scenario 2	1.46E+11	2.02E+11	4.12E+11	1.95E+12	1.52E+12	5.74E+11	5.59E+11	7.18E+11	6.63E+11	4.72E+11	5.60E+11	2.06E+11
Scenario 3	1.45E+11	1.84E+11	3.49E+11	1.43E+12	1.13E+12	4.67E+11	4.59E+11	5.69E+11	5.27E+11	3.98E+11	4.57E+11	1.95E+11

Figure 7-7. Comparison of monthly loading capacities evaluated by the most restrictive standard to existing loads and TMDL scenario loads at TMDL analysis point ULO on the South Fork of Chester Creek.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Scenario 1	1%	9%	19%	28%	28%	24%	24%	27%	27%	24%	18%	6%
Scenario 2	0%	0%	31%	47%	50%	50%	55%	64%	68%	59%	0%	0%
Scenario 3	1%	9%	42%	61%	63%	59%	63%	71%	74%	65%	18%	6%
Required Reduction	58%	71%	82%	92%	92%	80%	82%	87%	87%	80%	73%	56%

Figure 7-8. Comparison of monthly loading reductions provided by the TMDL scenarios and loading reductions required by the most restrictive standard at TMDL analysis point ULO on the South Fork of Chester Creek.

8.0 WESTCHESTER LAGOONS ALLOCATION ANALYSIS

8.1 Identification of Allowable Loads

The calibrated SWMM model was used to determine existing and allowable loads of fecal coliform for the Westchester Lagoons TMDL analysis points CH2 and CL2 (see Figures 5-1, and 5-5). The results of the modeling runs are summarized in Figures 8-1 to 8-4 and Tables 8-1 and 8-2.

Figures 8-1 through 8-4 and Tables 8-1 through 8-2 show that the 30-day geometric mean standard is typically more restrictive than the 10 percent not-to-exceed standard. However, during January and March at CL2 the 10 percent not-to-exceed standard is more restrictive. Therefore the final TMDL results (presented below) are based on the not-to-exceed reductions for these two months. All other reductions are based on meeting the 30 day geometric mean standard.

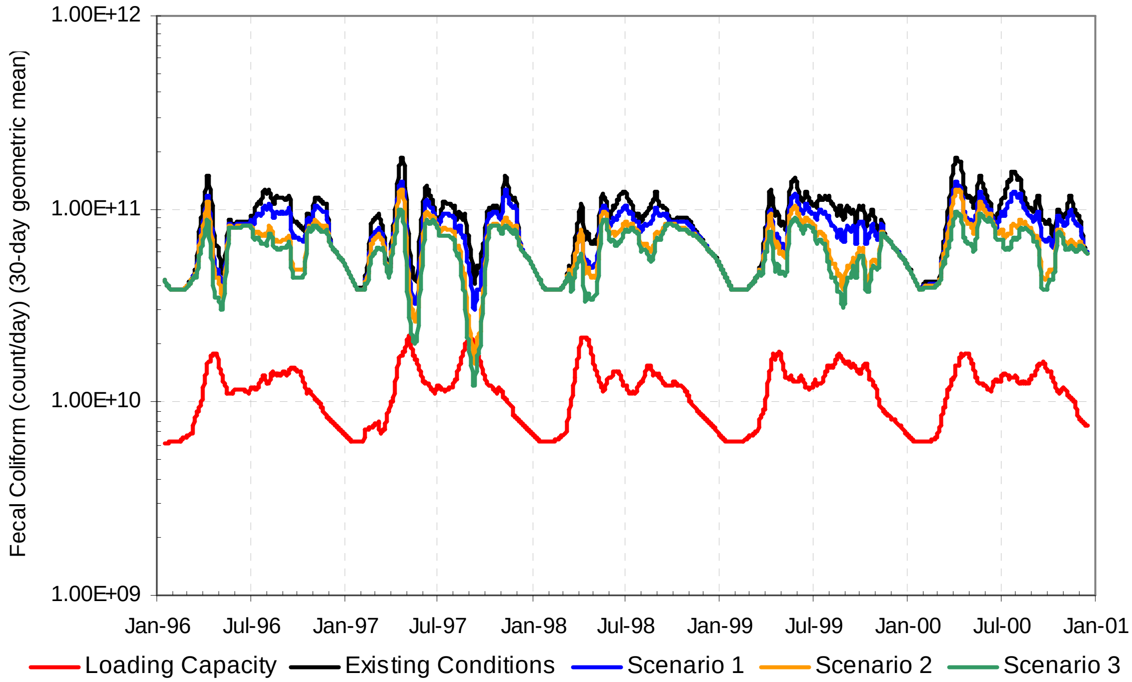


Figure 8-1. Evaluation of the 30-day geometric mean standard at TMDL analysis point CH2.

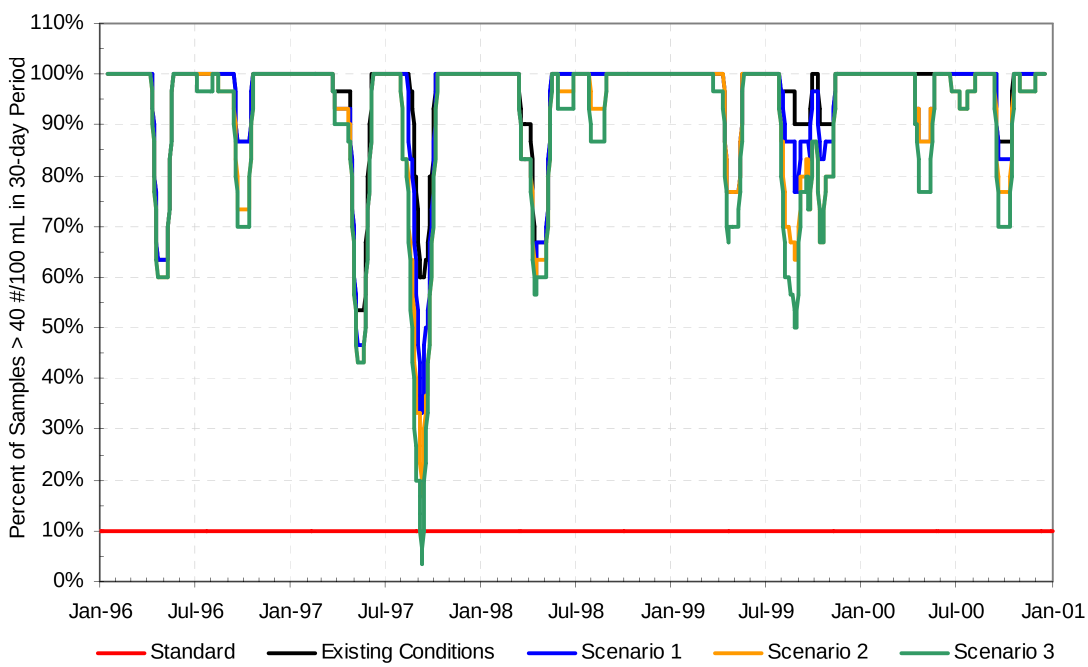


Figure 8-2. Evaluation of the 30-day not-to-exceed standard at TMDL analysis point CH2.

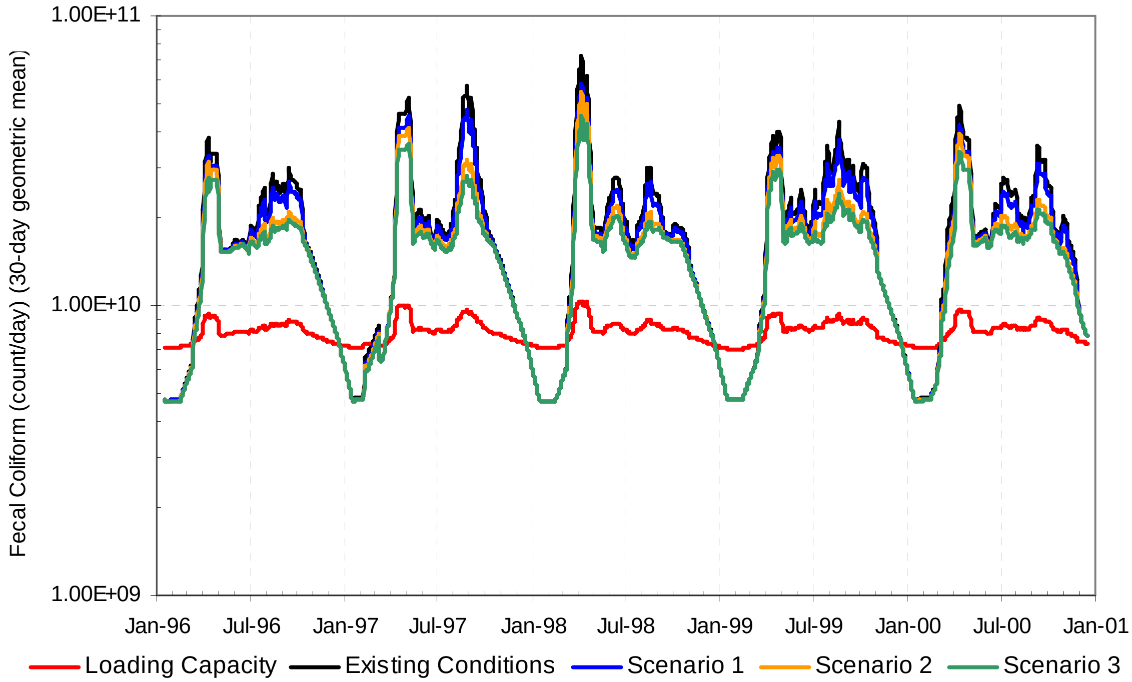


Figure 8-3. Evaluation of the 30-day geometric mean at TMDL analysis point CL2.

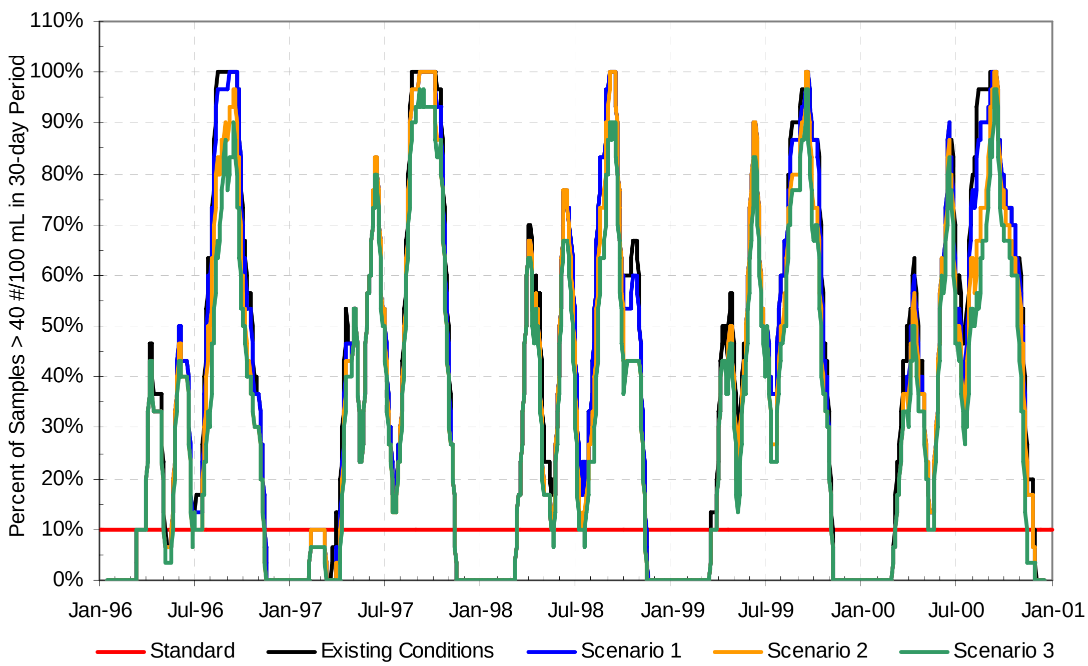


Figure 8-4. Evaluation of the not-to-exceed standard at TMDL analysis point CL2.

8.2 Load Allocation

Nonpoint sources are typically represented by loads carried to receiving waters through surface runoff resulting from precipitation events. However, because stormwater discharges in the MOA are regulated by a NPDES stormwater permit for municipal separate storm sewer systems (MS4), watershed loads delivered to Chester Creek through stormwater conveyances are addressed through the wasteload allocation component of this TMDL. Because the Chester Creek watershed includes loading from outside of the municipality that is essentially contributions from wildlife and are considered natural background, a load allocation of zero has been set for this TMDL.

8.3 Wasteload Allocation

The only permitted source of fecal coliform in the Chester Creek watershed is storm water runoff. The MOA is subject to an MS4 permit that regulates storm water discharges and EPA policy and regulation indicate that storm water runoff regulated by the NPDES program through an MS4 permit must be addressed through wasteload allocations in a TMDL (USEPA, 2002). Therefore, the Chester Creek TMDL establishes wasteload allocations for watershed loads of fecal coliform. The wasteload allocation is the loading capacity minus the margin of safety.

The fecal coliform wasteload allocations for Westchester Lagoon, provided as seasonal and annual allocations for the TMDL analysis points CH2 and CL2, are presented in Tables 8-1 and 8-2, respectively. Table 8-1 (TMDL analysis point CH2) suggests that fecal coliform loadings to Westchester Lagoon are large throughout the year, and that the greatest monthly fecal coliform loads occurs during the spring and summer months. Consequently, the greatest required monthly reductions for TMDL analysis point CH2 occur during spring and summer months. The winter months represent the lowest fecal coliform loads upstream of Westchester Lagoon and, therefore, require the lowest percent reductions from existing loads.

Allocations are not established for future loads because ADEC does not anticipate any future permits for the discharge of fecal coliform to Chester Creek. Additionally, if data or information from future monitoring efforts can be used to identify and quantify stormwater or natural loads that are not delivered through the stormwater conveyances, the TMDL and its allocations will be revised accordingly.
The fecal coliform wasteload allocations and a margin of safety for Westchester Lagoon are provided as seasonal and annual allocations for both of the Westchester Lagoon TMDL analysis points and are presented in Tables 8-1 and 8-2.

The fecal coliform wasteload and load allocations and a margin of safety for Westchester Lagoon are provided as seasonal allocations for both of the analysis points and are presented in Tables 8-1 and 8-2.

Table 8-1. Summary of the Westchester Lagoon TMDL, Analysis Point CH2.

Month	Existing (FC/month)	Loading Capacity (FC/month)	Margin of Safety (FC/month)	Waste Load Allocation (FC/month)	Required Reduction
Jan	1.21E+12	1.80E+11	1.80E+10	1.62E+11	85%
Feb	1.23E+12	1.85E+11	1.85E+10	1.66E+11	85%
Mar	1.98E+12	2.75E+11	2.75E+10	2.48E+11	86%
Apr	3.40E+12	5.03E+11	5.03E+10	4.53E+11	85%
May	2.84E+12	4.39E+11	4.39E+10	3.95E+11	85%
Jun	3.14E+12	3.73E+11	3.73E+10	3.35E+11	88%
Jul	3.45E+12	3.87E+11	3.87E+10	3.49E+11	89%
Aug	3.28E+12	4.58E+11	4.58E+10	4.12E+11	86%
Sep	2.69E+12	4.55E+11	4.55E+10	4.09E+11	83%
Oct	2.80E+12	3.91E+11	3.91E+10	3.52E+11	86%
Nov	2.91E+12	2.91E+11	2.91E+10	2.62E+11	90%
Dec	1.74E+12	2.13E+11	2.13E+10	1.92E+11	88%
Annual	3.07E+13	4.15E+12	4.15E+11	3.73E+12	86%

Annual loads are given in FC/year.

Table 8-2. Summary of the Westchester Lagoon TMDL, Analysis Point CL2.

Month	Existing (FC/month)	Loading Capacity (FC/month)	Margin of Safety (FC/month)	Waste Load Allocation (FC/month)	Required Reduction
Jan	**1.48E+11**	**1.34E+11**	**1.34E+10**	**1.21E+11**	**9%**
Feb	2.14E+11	2.14E+11	2.14E+10	1.93E+11	0%
Mar	**5.41E+11**	**3.34E+11**	**3.34E+10**	**3.01E+11**	**38%**
Apr	1.13E+12	2.80E+11	2.80E+10	2.52E+11	75%
May	6.53E+11	2.58E+11	2.58E+10	2.33E+11	60%
Jun	6.00E+11	2.49E+11	2.49E+10	2.24E+11	59%
Jul	6.64E+11	2.59E+11	2.59E+10	2.33E+11	61%
Aug	8.94E+11	2.71E+11	2.71E+10	2.44E+11	70%
Sep	8.25E+11	2.62E+11	2.62E+10	2.36E+11	68%
Oct	6.14E+11	2.58E+11	2.58E+10	2.32E+11	58%
Nov	3.79E+11	2.33E+11	2.33E+10	2.10E+11	39%
Dec	2.24E+11	2.08E+11	2.08E+10	1.87E+11	7%
Annual	6.63E+12	2.92E+12	2.92E+11	2.63E+12	56%

Bold type indicates that the 10 percent not-to-exceed standard applies for the month.
Annual loads are given in FC/year.

8.4 Implementation Scenarios

Three implementation scenarios, selected with consultation with ADEC, were simulated with the calibrated SWMM model. These scenarios are:

- Scenario 1 – Public education. Informing the public about the benefits of "cleaning up" after their pets was assumed to result in a 30 percent decrease in the surface build up of fecal coliform on landscaped, street, directly connected, and indirectly connected impervious land cover types.

- Scenario 2 – Increased street sweeping frequency and efficiency. Street sweeping frequency was increased from monthly to weekly intervals and the efficiency was assumed to increase to eighty percent efficiency.

- Scenario 3 – A combination of Scenario 1 and Scenario 2.

Tables 8-3 through 8-6 summarize the results of the implementation scenarios for the Westchester Lagoons analysis points. The tables show that a combination of education and increased street sweeping frequency and efficiency applied to all urbanized areas in the watershed has the greatest impact in the reduction of fecal coliform loading to Westchester Lagoons, with a maximum annual fecal coliform percent reduction of 29 percent for TMDL analysis point CH2.

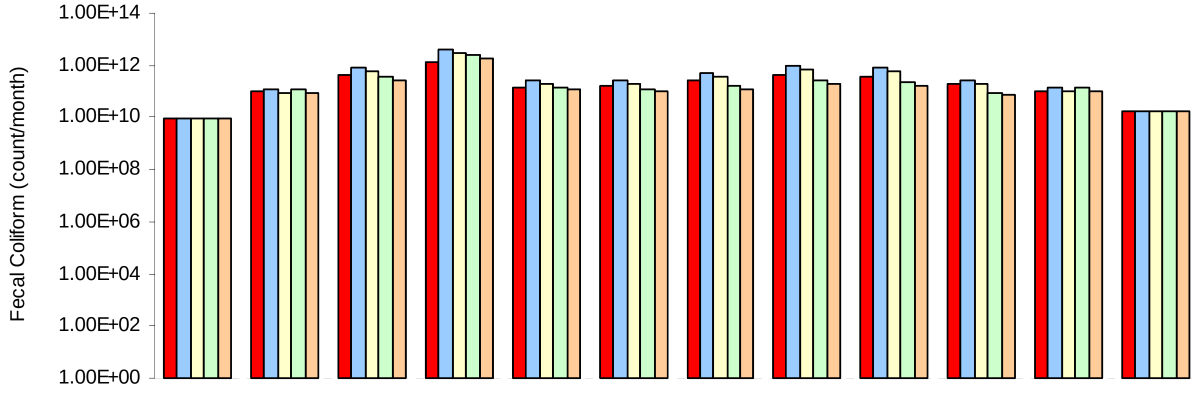
Table 8-3. Implementation Scenarios for Westchester Lagoon, TMDL Analysis Point CH2.

Scenario 1			
Month	**Existing (FC/month)**	**Post-Scenario (FC/month)**	**Percent Reduction**
January	1.21E+12	1.21E+12	0%
February	1.23E+12	1.18E+12	4%
March	1.98E+12	1.78E+12	10%
April	3.40E+12	2.61E+12	23%
May	2.84E+12	2.35E+12	17%
June	3.14E+12	2.81E+12	11%
July	3.45E+12	2.96E+12	14%
August	3.28E+12	2.72E+12	17%
September	2.69E+12	2.27E+12	16%
October	2.80E+12	2.53E+12	10%
November	2.91E+12	2.66E+12	9%
December	1.74E+12	1.72E+12	1%
Annual	3.07E+13	2.68E+13	13%
Scenario 2			
Month	**Existing (FC/month)**	**Post-Scenario (FC/month)**	**Percent Reduction**
January	1.21E+12	1.21E+12	0%
February	1.23E+12	1.23E+12	0%
March	1.98E+12	1.73E+12	13%
April	3.40E+12	2.44E+12	28%
May	2.84E+12	2.13E+12	25%
June	3.14E+12	2.53E+12	20%
July	3.45E+12	2.39E+12	31%
August	3.28E+12	1.99E+12	39%
September	2.69E+12	1.65E+12	39%
October	2.80E+12	2.14E+12	24%
November	2.91E+12	2.91E+12	0%
December	1.74E+12	1.74E+12	0%
Annual	3.07E+13	2.40E+13	22%
Scenario 3			
Month	**Existing (FC/month)**	**Post-Scenario (FC/month)**	**Percent Reduction**
January	1.21E+12	1.21E+12	0%
February	1.23E+12	1.18E+12	4%
March	1.98E+12	1.58E+12	20%
April	3.40E+12	1.91E+12	44%
May	2.84E+12	1.84E+12	35%
June	3.14E+12	2.36E+12	25%
July	3.45E+12	2.18E+12	37%
August	3.28E+12	1.78E+12	46%
September	2.69E+12	1.52E+12	44%
October	2.80E+12	2.04E+12	27%
November	2.91E+12	2.66E+12	9%
December	1.74E+12	1.72E+12	1%
Annual	3.07E+13	2.19E+13	29%

Table 8-4. Summary of TMDL Scenarios for Westchester Lagoon, TMDL Analysis Point CH2.

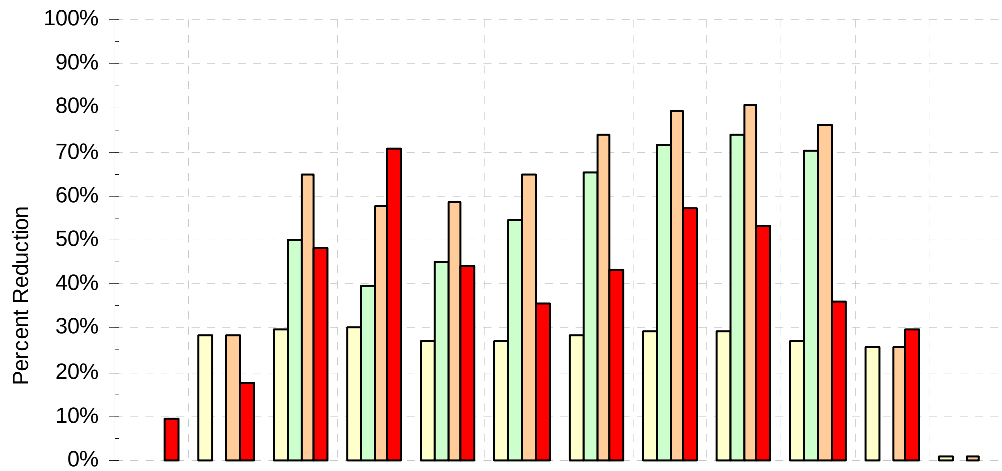
Month	Required Reduction	Scenario 1 Reduction	Scenario 2 Reduction	Scenario 3 Reduction	Additional Reduction
January	85%	0%	0%	0%	85%
February	85%	4%	0%	4%	81%
March	86%	10%	13%	20%	66%
April	85%	23%	28%	44%	42%
May	85%	17%	25%	35%	49%
June	88%	11%	20%	25%	63%
July	89%	14%	31%	37%	52%
August	86%	17%	39%	46%	40%
September	83%	16%	39%	44%	39%
October	86%	10%	24%	27%	59%
November	90%	9%	0%	9%	81%
December	88%	1%	0%	1%	87%
Annual	86%	13%	22%	29%	58%

Annual loads are given in FC/year.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Loading Capacity	8.69E+09	1.04E+11	4.02E+11	1.26E+12	1.50E+11	1.74E+11	2.76E+11	4.09E+11	3.89E+11	1.82E+11	1.01E+11	1.63E+10
Existing Conditions	9.59E+09	1.26E+11	7.76E+11	4.28E+12	2.69E+11	2.69E+11	4.87E+11	9.51E+11	8.30E+11	2.85E+11	1.44E+11	1.63E+10
Scenario 1	9.58E+09	9.07E+10	5.45E+11	2.99E+12	1.96E+11	1.97E+11	3.48E+11	6.73E+11	5.89E+11	2.08E+11	1.07E+11	1.62E+10
Scenario 2	9.59E+09	1.26E+11	3.87E+11	2.58E+12	1.48E+11	1.22E+11	1.69E+11	2.72E+11	2.18E+11	8.43E+10	1.44E+11	1.63E+10
Scenario 3	9.58E+09	9.07E+10	2.74E+11	1.81E+12	1.12E+11	9.45E+10	1.26E+11	1.99E+11	1.62E+11	6.83E+10	1.07E+11	1.62E+10

Figure 8-5. Comparison of monthly loading capacities evaluated by the most restrictive standard to existing loads and TMDL scenario loads at TMDL analysis point CH2 on the South Fork of Chester Creek.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Scenario 1	0%	28%	30%	30%	27%	27%	29%	29%	29%	27%	26%	1%
Scenario 2	0%	0%	50%	40%	45%	55%	65%	71%	74%	70%	0%	0%
Scenario 3	0%	28%	65%	58%	58%	65%	74%	79%	81%	76%	26%	1%
Required Reduction	9%	18%	48%	71%	44%	36%	43%	57%	53%	36%	30%	0%

Figure 8-6. Comparison of monthly loading reductions provided by the TMDL scenarios and loading reductions required by the most restrictive standard at TMDL analysis point CH2 on the South Fork of Chester Creek.

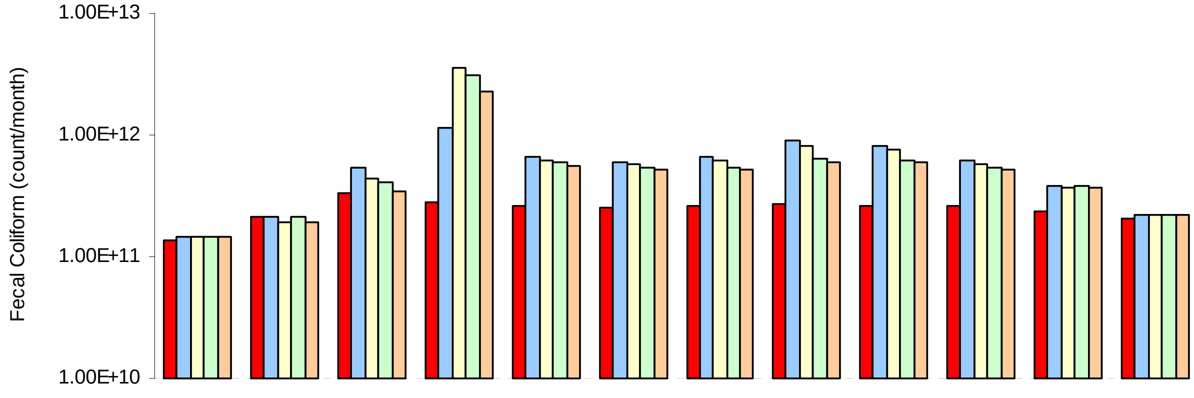
Table 8-5. Implementation Scenarios for Westchester Lagoon, Analysis Point CL2.

Scenario 1			
Month	**Existing (FC/month)**	**Post-Scenario (FC/month)**	**Percent Reduction**
January	**1.48E+11**	**1.48E+11**	**0%**
February	1.49E+11	1.47E+11	1%
March	**5.41E+11**	**4.38E+11**	**19%**
April	1.13E+12	9.97E+11	12%
May	6.53E+11	6.17E+11	6%
June	6.00E+11	5.71E+11	5%
July	6.64E+11	6.17E+11	7%
August	8.94E+11	8.02E+11	10%
September	8.25E+11	7.53E+11	9%
October	6.14E+11	5.85E+11	5%
November	3.79E+11	3.72E+11	2%
December	2.24E+11	2.23E+11	0%
Annual	6.63E+12	6.15E+12	7%
Scenario 2			
Month	**Existing (FC/month)**	**Post-Scenario (FC/month)**	**Percent Reduction**
January	**1.48E+11**	**1.48E+11**	**0%**
February	1.49E+11	1.49E+11	0%
March	**5.41E+11**	**4.03E+11**	**25%**
April	1.13E+12	9.48E+11	16%
May	6.53E+11	5.92E+11	9%
June	6.00E+11	5.37E+11	11%
July	6.64E+11	5.44E+11	18%
August	8.94E+11	6.50E+11	27%
September	8.25E+11	6.20E+11	25%
October	6.14E+11	5.31E+11	13%
November	3.79E+11	3.79E+11	0%
December	2.24E+11	2.24E+11	0%
Annual	6.63E+12	5.63E+12	15%
Scenario 3			
Month	**Existing (FC/month)**	**Post-Scenario (FC/month)**	**Percent Reduction**
January	**1.48E+11**	**1.48E+11**	**0%**
February	1.49E+11	1.47E+11	1%
March	**5.41E+11**	**3.42E+11**	**37%**
April	1.13E+12	8.43E+11	26%
May	6.53E+11	5.66E+11	13%
June	6.00E+11	5.19E+11	13%
July	6.64E+11	5.19E+11	22%
August	8.94E+11	6.07E+11	32%
September	8.25E+11	5.89E+11	29%
October	6.14E+11	5.18E+11	16%
November	3.79E+11	3.72E+11	2%
December	2.24E+11	2.23E+11	0%
Annual	6.63E+12	5.34E+12	19%

Table 8-6. Summary of TMDL Scenarios for Westchester Lagoon, TMDL Analysis Point CL2.

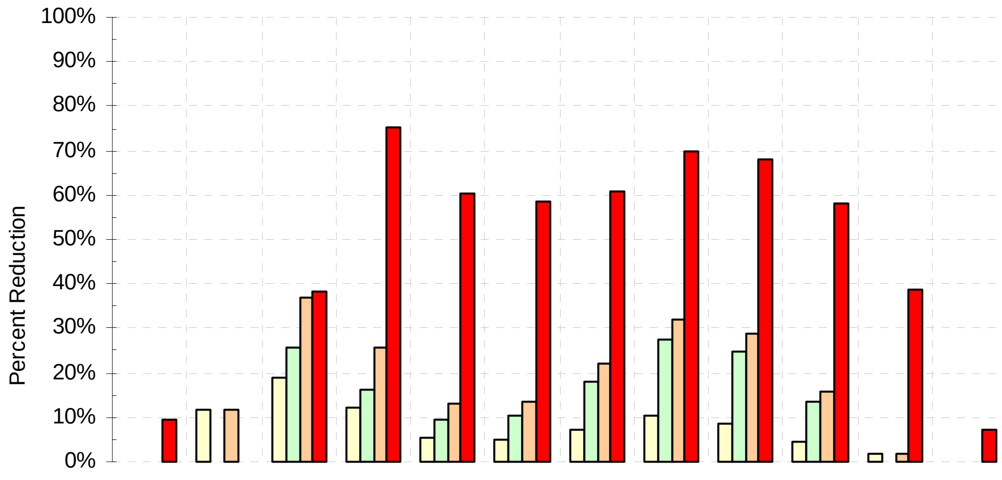
Month	Required Reduction	Scenario 1 Reduction	Scenario 2 Reduction	Scenario 3 Reduction	Additional Reduction
Jan	**9%**	**0%**	**0%**	**0%**	**9%**
Feb	0%	12%	0%	12%	0%
Mar	**38%**	**19%**	**25%**	**37%**	**1%**
Apr	75%	12%	16%	26%	50%
May	60%	6%	9%	13%	47%
Jun	59%	5%	11%	13%	45%
Jul	61%	7%	18%	22%	39%
Aug	70%	10%	27%	32%	38%
Sep	68%	9%	25%	29%	40%
Oct	58%	5%	13%	16%	42%
Nov	39%	2%	0%	2%	37%
Dec	7%	0%	0%	0%	7%
Annual	56%	7%	15%	19%	36%

Bold type indicates that the 10 percent not-to-exceed standard applies for the month.
Annual loads are given in FC/year.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Loading Capacity	1.34E+11	2.14E+11	3.34E+11	2.80E+11	2.58E+11	2.49E+11	2.59E+11	2.71E+11	2.62E+11	2.58E+11	2.33E+11	2.08E+11
Existing Conditions	1.48E+11	2.14E+11	5.41E+11	1.13E+12	6.53E+11	6.00E+11	6.64E+11	8.94E+11	8.25E+11	6.14E+11	3.79E+11	2.24E+11
Scenario 1	1.48E+11	1.90E+11	4.38E+11	3.58E+12	6.17E+11	5.71E+11	6.17E+11	8.02E+11	7.53E+11	5.85E+11	3.72E+11	2.23E+11
Scenario 2	1.48E+11	2.14E+11	4.03E+11	3.08E+12	5.92E+11	5.37E+11	5.44E+11	6.50E+11	6.20E+11	5.31E+11	3.79E+11	2.24E+11
Scenario 3	1.48E+11	1.90E+11	3.42E+11	2.27E+12	5.66E+11	5.19E+11	5.19E+11	6.07E+11	5.89E+11	5.18E+11	3.72E+11	2.23E+11

Figure 8-7. Comparison of monthly loading capacities evaluated by the most restrictive standard to existing loads and TMDL scenario loads at TMDL analysis point CL2 on Westchester Lagoon.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Scenario 1	0%	12%	19%	12%	6%	5%	7%	10%	9%	5%	2%	0%
Scenario 2	0%	0%	25%	16%	9%	11%	18%	27%	25%	13%	0%	0%
Scenario 3	0%	12%	37%	26%	13%	13%	22%	32%	29%	16%	2%	0%
Required Reduction	9%	0%	38%	75%	60%	59%	61%	70%	68%	58%	39%	7%

Figure 8-8. Comparison of monthly loading reductions provided by the TMDL scenarios and loading reductions required by the most restrictive standard at TMDL analysis point CL2 on Westchester Lagoon.

9.0 IMPLEMENTATION

According to EPA policy on addressing regulated storm water in TMDLs (USEPA, 2002), wasteload allocations can be translated to effluent limitations in the applicable permit through the use of best management practices (BMPs). The following discussion summarizes information contained in USEPA (2002).

NPDES permits must contain effluent limits and conditions consistent with the requirements and assumptions of the wasteload allocations in the relevant approved TMDL. Typically, those effluent limitations to control the discharge of pollutants are expressed in numerical form. However, because storm water discharges are due to storm events that are highly variable in frequency and duration and are not easily characterized, EPA's policy recognizes that only in rare cases will it be feasible or appropriate to establish numeric limits for municipal and small construction storm water discharges. Therefore, EPA recommends that for NPDES-regulated municipal and small construction storm water discharges effluent limits should be expressed as BMPs or other similar requirements, rather than as numeric effluent limits. The policy recognizes the need for an iterative approach to control pollutants in storm water discharges. Specifically, the policy anticipates that a suite of BMPs will be used in the initial rounds of permits and that these BMPs will be tailored in subsequent rounds.

Appropriate BMPs will be identified for implementation in the Chester Creek watershed in the relevant storm water permit. Information on the applicability of the BMPs for removal of fecal coliform and on the feasibility of implementation in the Chester Creek watershed will be taken into account when identifying BMPs.

The National Storm water Best Management Practices database (http://www.bmpdatabase.org/) provides access to BMP performance data in a standardized format for over 190 BMP studies conducted over the past fifteen years. The database was developed by the Urban Water Resources Research Council (UWRRC) of American Society of Civil Engineers (ASCE) under a cooperative agreement with the U.S. Environmental Protection Agency.

Some studies on BMP effectiveness have evaluated the ability of certain BMPs to remove fecal coliform and other bacteria. The Center for Watershed Protection has compiled a storm water treatment database containing information from studies conducted from 1990 to the present. Schueler (2000) provides a summary of the information in the database. The included studies do not provide sufficient fecal coliform data to statistically evaluate the effectiveness of BMPs in removing bacteria from urban runoff, but Schueler (2000) indicates that mean fecal coliform removal rates typically range from 65 to 75 percent from ponds and wetlands and 55 percent for filters. Schueler (2000) and SMRC (2000) also reports that water quality swales (including biofilters and wet and dry swales) consistently exported bacteria. Although it is possible that the bacteria thrive in the warm swale soils, the studies do not account for potential sources of bacteria directly to the swales, such as wildlife and domestic pets. Table 9-1 provides examples of BMP removal efficiencies for bacteria. Because information on BMP efficiency for fecal coliform is limited, information in Table 9-1 should be applied with consideration of local knowledge of the environmental conditions and BMP performance in the Anchorage area.

CWP (1997) discusses the use and effectiveness of BMPs in cold climates. Due to the characteristics such as freezing temperatures and snowmelt events, some BMPs are not appropriate or require modifications for use in cold climates. Table 9-2 provides a summary of the applicability of BMPs to colder climates.

Table 9-1. Fecal coliform removal for various BMPs.

BMP Type	Fecal Coliform Bacteria Removal (%)
Detention and Dry Extended Detention Ponds	78
Wet Ponds	70
Shallow Marsh Wetland	76
Submerged Gravel Wetland	78
Filters (excluding vertical sand filters)	37
Infiltration Basins	90
Ditches	5

Adapted from Schueler (2000) and SMRC (2000)

Table 9-2. Applicability of BMPs to cold climate conditions (CWP, 1997).

Type	BMP	Classification	Notes
Ponds	Wet Pond	□	Can be effective, but needs modifications to prevent freezing of outlet pipes. Limited by reduced treatment volume and biological activity in the permanent pool during ice cover.
	Wet ED Pond	□	Some modifications to conveyance structures needed. Extended detention storage provides treatment during the winter season.
	Dry ED Pond	□	Few modifications needed. Although this practice is easily adapted to cold climates, it is not highly recommended overall because of its relatively poor warm season performance.
Wetlands	Shallow Marsh	□	In climates where significant ice formation occurs, shallow marshes are not effective winter BMPs. Most of the treatment storage is taken up by ice, and the system is bypassed.
	Pond/Wetland System	□	Pond/Wetland systems can be effective, especially if some ED storage is provided. Modifications for both pond and wetland systems apply to these BMPs. This includes changes in wetland plant selection and planting.
	ED Wetland	□	See Wet ED Pond. Also needs modifications to wetland plant species.
Infiltration	Porous Pavement	□	This practice is restricted in cold climates. It cannot be used on any pavement that is sanded, because the pavement will clog.
	Infiltration Trench	□	Can be effective, but may be restricted by groundwater quality concerns related to infiltrating chlorides. Also, frozen ground conditions may inhibit the infiltration capacity of the ground.
	Infiltration Basin	□	See infiltration trench.

Type	BMP	Classification	Notes
Filtering Systems	Surface Sand Filter	□	Frozen ground considerations, combined with frost heave concerns, make this type of system relatively ineffective during the winter season.
	Underground Sand Filter	□	When placed below the frost line, these systems can function effectively in cold climates.
	Perimeter Sand Filter	□	See Surface Sand Filter.
	Bioretention	□	Problems functioning during the winter season because of reduced infiltration. It has some value for snow storage on parking lots, however.
	Submerged Gravel Wetlands	□	Some concerns of bypass during winter flows. Has been used in relatively cold regions with success., but not tested in a wide range of conditions.
Open Channel Systems	Grassed Channel	□	Reduced effectiveness in the winter season because of dormant vegetation and reduced infiltration. Valuable for snow storage.
	Dry Swale	□	Reduced effectiveness in the winter season because of dormant vegetation and reduced infiltration. Very valuable for snow storage and meltwater infiltration.
	Wet Swale	□	Reduced effectiveness in the winter season because of dormant vegetation. Can be valuable for snow storage.
	Vegetated Filter Strip	□	See Dry Swale.

ED: Extended Detention
□ Easily applied to cold climates; can be effective during the winter season.
□ Can be used in cold climates with significant modifications; moderately effective during the winter season.
□ Very difficult to use in cold climates. Generally not recommended.

10.0 MONITORING

Follow-up monitoring for a TMDL is important in tracking the progress of TMDL implementation and subsequent water quality response as well as in evaluating any assumptions made during TMDL development. Monitoring results can be used to support any necessary future TMDL revisions and to track BMP effectiveness. Most importantly, monitoring will track the water quality of Chester Creek to evaluate future attainment of water quality standards.

USEPA (2002) outlines EPA regulatory requirements for and provides guidance on establishing WLAs for storm water in TMDLs. The memorandum also provides information on the implementation of effluent limitations through NPDES permits consistent with the TMDL WLAs. The policy outlined affirms the appropriateness of an iterative, adaptive management BMP approach, whereby permits include effluent limits (e.g., a combination of structural and non-structural BMPs) that address storm water discharges, implement mechanisms to evaluate the performance of such controls, and make adjustments (i.e., more stringent controls or specific BMPs) as necessary to protect water quality.

USEPA (2002) indicates that where BMPs are used to implement the WLAs, the NPDES permit should require the monitoring necessary to assess if the expected load reductions attributed to BMP implementation are achieved (e.g., BMP performance data), although the permitting authority has the discretion under EPA's regulations to decide the frequency of such monitoring. EPA recommends that such permits require collecting data on the performance of the BMPs. The monitoring data can provide a basis for revised management measures and indicate any necessary adjustments to the BMPs. Any monitoring for storm water required as part of the permit should be consistent with the state's overall assessment and monitoring strategy.

11.0 PUBLIC COMMENTS AND RESPONSIVENESS SUMMARY

The fecal coliform bacteria Total Maximum Daily Load (TMDL) for the Chester Creek watershed, including University Lake and Westchester Lagoon, was developed over several years with extensive opportunity for feedback from affected parties. In 1993, Alaska's Department of Environmental Conservation (DEC) published an assessment of Chester Creek, based on consultation with the Municipality of Anchorage (MOA) and others. This assessment assembled much of the information on the watershed that was used develoing this document. In 1999, DEC developed, with the Environmental Protection Agency (EPA) and its contractor (Tetratech) and through consulting with MOA, an approach for developing fecal coliform bacteria TMDLs that would be appropriate for Anchorage area streams. Using this document, DEC consulted with the MOA, Alaska Department of Transportation (ADOT), and the University of Alaska to finalize the approach for developing the Chester Creek TMDL, along with TMDLs for six other Anchorage streams. TMDL development began in July 2002. Drafts were shared with the MOA and other key stakeholders for feedback through emails, meetings, and phone conversations. To the extent possible and relevant, DEC revised the TMDLs based on the stakeholder comments. TMDLs on the other six Anchorage Streams were submitted in May 2004. The Chester Creek TMDL was not submitted at that time as DEC determined it was more appropriate to complete it in conjunction with University Lake and Westchester Lagoon TMDLs, which did not begin development until June 2004.

DEC completed the public draft TMDL for Chester Creek, University Lake and Westchester Lagoon in March 2005. Copies were provided to the MOA, Alaska Department of Transportation and others (University of Alaska). ADEC published a public notice on these TMDLs on the State of Alaska’s website on April 7, 2005 and in the Anchorage Daily News, on April 10, 2005. A fact sheet describing the TMDL was also posted on ADEC’s website, along with the draft TMDL. The public comment period was open from April 7, 2005 through May 6, 2005, and a public meeting was held on April 22, 2005 at the Anchorage DEC office. In addition, DEC sent electronic copies of the draft TMDL to the MOA, ADOT, and all relevant federal, state, and local agencies, and the major citizen group involved with Anchorage water quality issues (Anchorage Waterways Council) which has cooperated with DEC and MOA in monitoring fecal coliform in Chester Creek and other Anchorage Streams.

The TMDL process had extensive stakeholder involvement early and throughout the process, which accounts for the limited amount of public comment received during the public notice period. The only comments received during the public notice period were via email and phone conversations from the Municipality of Anchorage. To the extent practical, these comments were addressed and incorporated into the Final TMDL. DEC responded to MOA's comments in a letter of May 2005 (included in submittal packet). As indicated in the letter, DEC revised the TMDL to better describe the process used to identify fecal coliform bacteria sources. The MOA also commented on the appropriateness of Alaska's Water Quality Standards. This comment was passed on to DEC's Standards Program for consideration in future changes to the standards. In regards to a MOA comment on load allocations, DEC responded that the TMDL assigns the maximum waste load allocation possible to the municipal storm water system, providing the Municipality the most flexibility in Best Management Practices (BMPs) implementation. In regards to a MOA comment on technical assumptions, DEC explained that the TMDL used the best data and models available; and shares the Municipality's desire to continue to improve data and models used in developing and implementing the TDML.

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APPENDIX A: SWMM CALIBRATION

Introduction

The Storm Water Management Model (SWMM) simulates real storm events based on rainfall and other meteorological inputs, such as evaporation and temperature, and watershed transport, storage and management practices to predict runoff quantity and quality. At the subwatershed scale, SWMM provides for evaluation of in-stream conditions, which allows for the direct comparison with relevant water quality standards.

SWMM is comprised of several computational blocks, or modules, of which the Rain, Temperature, Runoff and Transport blocks were used for the Chester Creek study. These modules essentially generate surface runoff and route it to the stream channel based on user-defined inputs such as precipitation, land use, and topography. Various hydrologic, pollutant buildup/washoff, and in-channel parameters must also be specified by the user. SWMM represents the stream network system as a series of links and nodes with the links representing stream or channel segments and nodes representing contributing subcatchment inlet points. Consequently, the model represents Chester Creek as a series of hydrologically connected subwatersheds.

Hydrologic and water quality simulations of the watershed were performed for Chester Creek. The modeling approach included continuous simulation of rainfall and runoff, as well as in-stream fecal coliform counts. Calibration of the Storm Water Management Model (SWMM) consisted of calibrating hydrologic response and water quality. This appendix describes the calibration of these two components.

Model Configuration

To simulate watershed loadings and resulting counts of fecal coliform, the Chester Creek watershed was divided into numerous modeling subcatchments using spatial (map) data and tabular data provided by MOA. The modeling subcatchments for the lower and upper Chester Creek subwatersheds are shown in Section 5 of the main report. Figures 5-2 and 5-4 display the impervious land cover classes found in the lower and upper Chester Creek subwatersheds, respectively. Hydrology and fecal coliform for the headwaters subwatershed of the Chester Creek basin was not simulated in SWMM. Estimated stream flow and observed fecal coliform concentration discharging from the headwaters subwatershed, referred to as boundary conditions, were instead used as input into the model.

Required input data for each subcatchment include area, imperviousness, slope, Manning's roughness coefficient, a conceptual subcatchment width (total width of overland flow), depression storage, and infiltration parameters. These data were previously estimated by MOA for SWMM modeling applications of Chester Creek. The MOA SWMM parameter values were compiled for each land cover class within each subcatchment in the Chester Creek watershed. The land cover classes reflect the degree of imperviousness for a given cover type. Watershed parameters were lumped, that is spatially weighted or averaged, for each modeling subcatchment. Since information about the storm drain network's hydraulic characteristics (such as pipe diameter and roughness characteristics) were not available, the Runoff block was set up to "route" runoff to each subcatchment outlet.

Daily precipitation and temperature data, available from the National Climatic Data Center (NCDC) weather station at the Ted Stevens International Airport from 1952 through 2003, were used for the Chester Creek watershed SWMM modeling.

Hydrologic Calibration

The hydrologic calibration involved a comparison of model results to in-stream flow observations recorded at the USGS stream gage (15275100) located near Arctic Boulevard (see Figure 3-1 in the main report). This is the only operative stream gage in the entire Chester Creek watershed. This gage recorded daily mean flow from June 17, 1966 through September 30, 1993, and from October 1, 1998 to September 30, 2000. The stream gage was not operational from October 1, 1993 to September 30, 1998. The period of hydrologic calibration was therefore selected as July 1, 1987 to September 30, 1993. This period is deemed sufficient to calibrate the hydrologic response of Chester Creek to rainfall events. The results of the hydrologic calibration are shown in Figures A-1 through A-4. Figure A-1 shows a comparison of the observed versus simulated average monthly stream flow for the calibration period, and displays a very good level of agreement (R^2 = 0.99).

Graphical comparisons of observed versus simulated mean monthly streamflow are presented in Figures A-2 and A-3. These figures show a good level of agreement between observed and simulated mean monthly streamflow. Additionally, an observed versus simulated flow duration analysis is presented in Figure A-4. With the exception of the very lowest flows, the model adequately describes flow variability within the Chester Creek watershed.

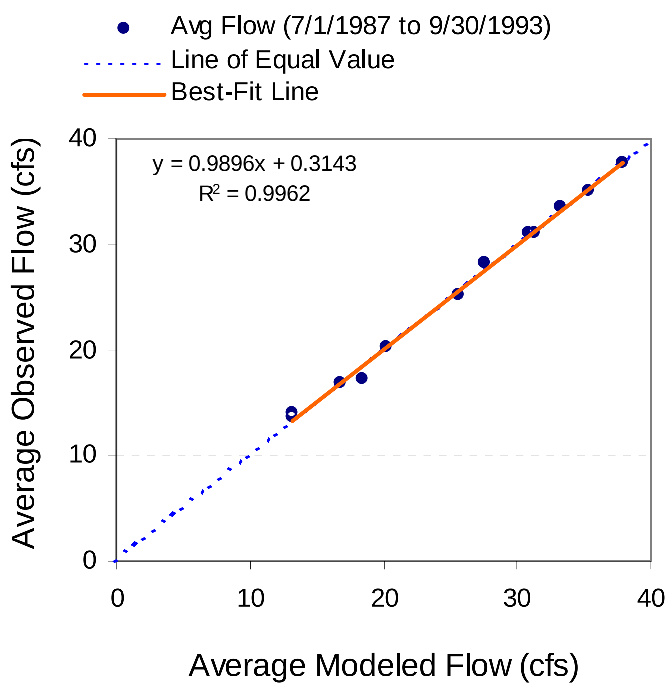


Figure A-1. Statistical comparison between observed versus simulated mean monthly stream flow, 1987 – 1993.

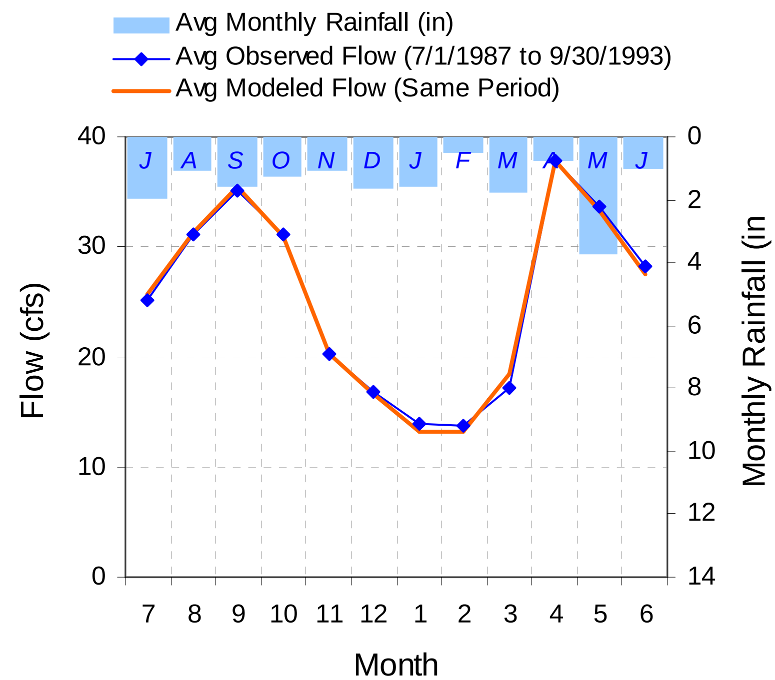


Figure A-2. Observed versus simulated mean monthly stream flow, 1987 - 1993.

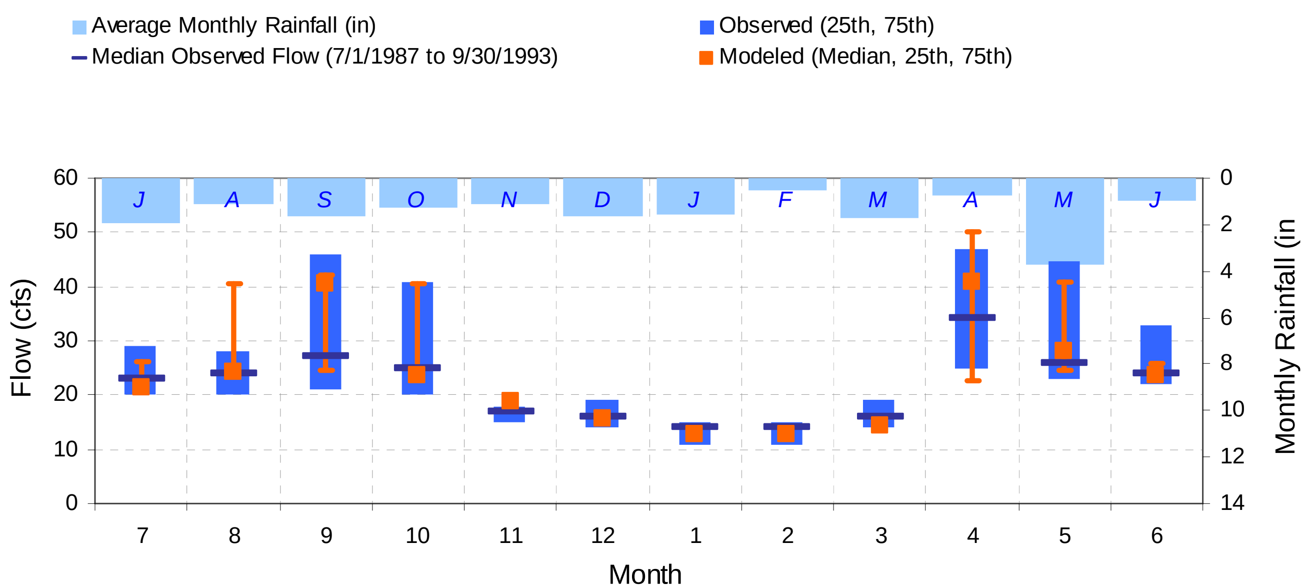


Figure A-3. Observed versus simulated 25th percentile, 75th percentile, and median monthly streamflow, 1987 - 1993.

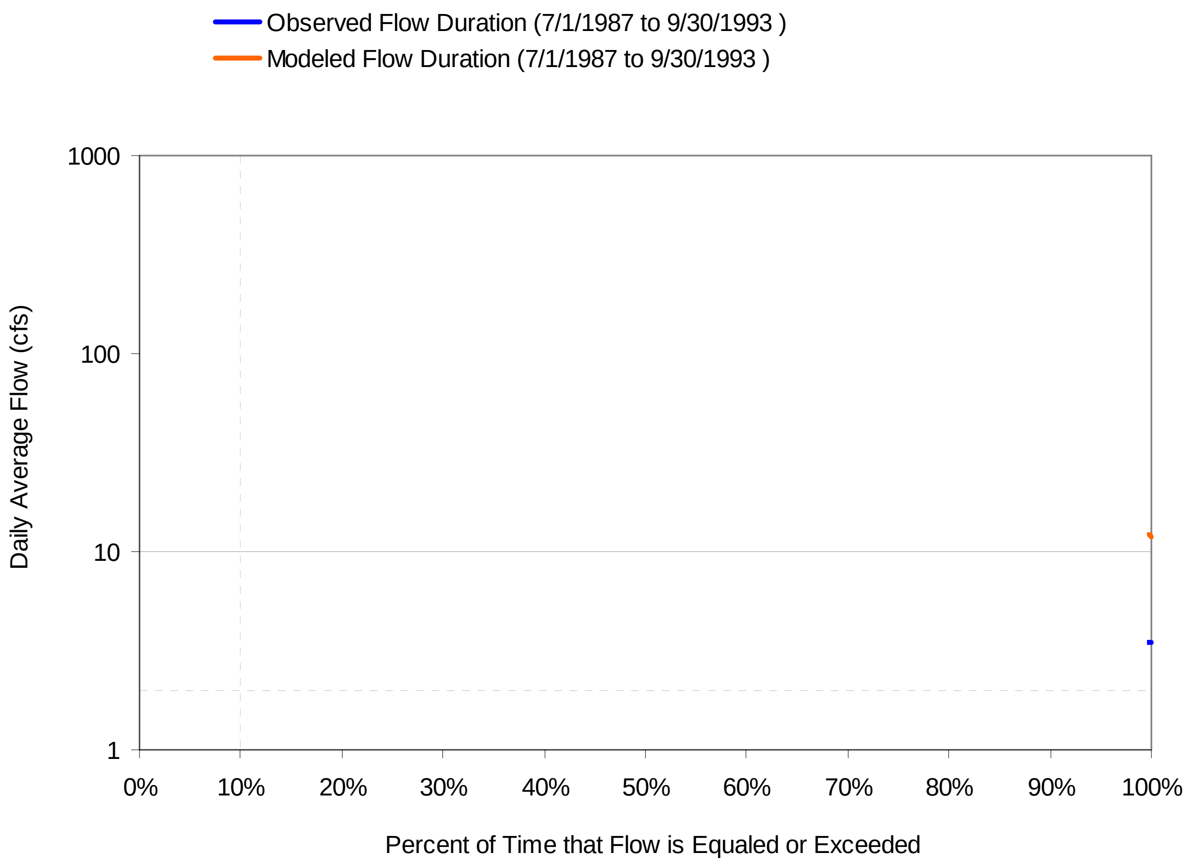


Figure A-4. Observed versus simulated flow duration, 1987 - 1993.

Seasonal and annual differences between observed versus simulated stream flow are summarized in Tables A-1 and A-2. Table A-1 shows that simulated flow for the calibration period agrees well with observed stream flow data. A statistical summary of the hydrologic calibration is presented in Table A-2. Table A-2 shows that the greatest errors occur in simulated summer storm volumes, yet these errors are within recommended calibration parameters (Lumb et al., 1994). Over all, the hydrologic calibration appears adequate in that it reflects the total water yield, annual variability, and magnitude of individual storm events in the basin. All recommended criteria are met except for the 10 percent highest flow criteria, which is underestimated by the SWMM. This error is most likely related to the precipitation record, where larger, more intense storms may have occurred somewhere within the watershed buy may not have not been recorded by the rain gage.

Table A-1. Comparison of Observed and Simulated Monthly Flow Statistics.

MONTH	OBSERVED FLOW (CFS)				MODELED FLOW (CFS)			
	MEAN	MEDIAN	25TH	75TH	MEAN	MEDIAN	25TH	75TH
Jul	25.17	23.00	20.00	29.00	25.64	21.50	21.00	26.20
Aug	31.10	24.00	20.00	28.00	31.36	24.20	23.10	40.50
Sep	35.13	27.00	21.00	46.00	35.39	40.60	24.60	42.20
Oct	31.14	25.00	20.00	40.75	30.92	23.70	23.10	40.50
Nov	20.33	17.00	15.00	18.00	20.24	18.80	18.60	19.10
Dec	16.86	16.00	14.00	19.00	16.72	15.50	15.40	15.60
Jan	13.97	14.00	11.00	15.00	13.19	12.80	12.70	12.80
Feb	13.68	14.00	11.00	15.00	13.18	12.70	12.70	12.80
Mar	17.25	16.00	14.00	19.00	18.40	14.40	14.20	14.70
Apr	37.77	34.00	25.00	47.00	37.84	40.70	22.50	50.15
May	33.62	26.00	23.00	44.75	33.22	28.15	24.60	40.90
Jun	28.28	24.00	22.00	33.00	27.60	23.55	23.10	25.88

Table A-2. Statistical Summary of Hydrologic Calibration for USGS Station 15275100, at Arctic Boulevard, Anchorage, Alaska (MOA Fecal Monitoring Site CH2).

6.25-Year Analysis Period: 7/1/1987 to 9/30/1993 Flow volumes are (inches/year) for upstream drainage area			
Total Simulated In-stream Flow:	**0.936**	Total Observed In-stream Flow:	**0.937**
Total of simulated highest 10% flows:	**0.184**	Total of Observed highest 10% flows:	**0.227**
Total of Simulated lowest 50% flows:	**0.304**	Total of Observed Lowest 50% flows:	**0.285**
Simulated Summer Flow Volume (months 7-9):	**0.317**	Observed Summer Flow Volume (7-9):	**0.314**
Simulated Fall Flow Volume (months 10-12):	**0.200**	Observed Fall Flow Volume (10-12):	**0.202**
Simulated Winter Flow Volume (months 1-3):	**0.130**	Observed Winter Flow Volume (1-3):	**0.130**
Simulated Spring Flow Volume (months 4-6):	**0.288**	Observed Spring Flow Volume (4-6):	**0.291**
Total Simulated Storm Volume:	**0.154**	Total Observed Storm Volume:	**0.153**
Simulated Summer Storm Volume (7-9):	**0.065**	Observed Summer Storm Volume (7-9):	**0.079**
Errors (Simulated-Observed)	*Error Statistics*	*Recommended Criteria*	
Error in total volume:	**-0.13**	**10**	
Error in 50% lowest flows:	**6.44**	**10**	
Error in 10% highest flows:	**-23.51**	**15**	
Seasonal volume error - Summer:	**1.08**	**30**	
Seasonal volume error - Fall:	**-0.68**	**30**	
Seasonal volume error - Winter:	**-0.22**	**30**	
Seasonal volume error - Spring:	**-1.02**	**30**	
Error in storm volumes:	**0.31**	**30**	
Error in summer storm volumes:	**-20.94**	**50**	

Water Quality Calibration

After hydrology was sufficiently calibrated, water quality calibration was performed. Modeled versus observed in-stream concentrations were directly compared during model calibration. The water quality calibration consisted of executing the watershed model, comparing water quality time series output to available water quality observation data, and adjusting pollutant loading and in-stream water quality parameters within a reasonable range. The objective was to best simulate the observed data, as well as to obtain modeling output within the range of all observations (i.e., the observed minimum and maximum water quality concentrations should be within the range of the simulated minimum and maximums). The adequacy of the water quality calibration was assessed through comparison to observed water quality data.

Simulation of fecal coliform bacteria concentrations often presents a challenge for watershed modeling. Observed concentrations tend to be highly variable in both space and time - due to both natural variability and analytical uncertainty. Further, instream concentrations may be elevated by sources which cannot explicitly be included in the model (e.g., illicit connections to storm sewers or illegal dumping into storm drain systems), or which may be included in the model in a general way, but have large and unmonitored variability (e.g., wildlife sources). The watershed models represent average loads from the land surface as a washoff process. In addition, background loading is represented as a ground water concentration. In fact, the load attributed to ground water includes both true ground water load and other unmodeled sources of loading that are not flow-dependent.

Adjusted water quality parameters within the model included the daily surface fecal coliform accumulation factors (called QFACT1, QFACT2, and QFACT3), surface washoff factors (called WASHPO, and RCOEFF), and the instream decay rate coefficient.

A power-linear function was used to estimate the daily build up of fecal coliform, and is given in the expression below:

$$\text{PSHED} = \text{QFACT3} \times t^{\text{(QFACT2)}}$$

where,

PSHED = fecal accumulation rate, #FC/ac
QFACT3 = third build up factor, FC/acre
QFACT2 = second build up factor, dimensionless
t = time interval, day

Fecal coliform washoff is dependent upon the amount of fecal coliform available to be removed during a runoff event, and may be expressed as an exponential function as:

$$\text{POFF} = -\text{RCOEF} \times R^{\text{(WASHPO)}} \times \text{PSHED}$$

where,

POFF = fecal coliform load washed off at time t, quantity/second
PSHED = quantity of fecal coliform available for washoff at time t
RCOEF = washoff coefficient
R = runoff rate in inches/hour.

The calibrated SWMM water quality parameters are presented in Table A-3 according to impervious land cover type.

Table A-3. SWMM Water Quality Parameters Used in the Chester Creek Watershed.

MOA Impervious Classification	QFACT1	QFACT2	QFACT3	WASHPO	RCOEF	REFF[1]
Barren	1.37E8	0.6	1.70E6	1.9	0.7	0.5
ICI	1.70E8	0.7	1.50E6	1.9	0.7	0.5
DCI	6.26E8	0.7	2.00E5	1.9	0.7	0.5
Street	2.00E7	0.7	2.00E5	1.9	0.7	0.5
Wetland	8.35E10	0.8	3.10E6	1.9	0.7	0
Lake	1.75E7	0.8	2.00E5	1.9	0.7	0
Landscape	1.67E9	0.8	3.67E7	1.9	0.7	0.5
Forest	8.23E9	0.8	5.19E6	1.9	0.7	0

[1]REFF is the efficiency fraction of street sweeping practices. A value of 0.5 is equal to 50 % efficiency.

The values of WASHPO and RCOEF given in Table A-3 are representative of long duration, low intensity rainfall events that are characteristic of the storm events that typically occur within Anchorage, Alaska.

Water quality calibration adequacy was primarily assessed through review of time-series plots. Looking at a time series plot of modeled versus observed data provides more insight into the nature of the system and is more useful in water quality calibration than a statistical comparison. Flow (or rainfall) and water quality can be compared simultaneously, and thus can provide insight into conditions during the monitoring period (dry period versus storm event). The response of the model to storm events can be studied and compared to observations (data permitting). Ensuring that the storm events are represented within the range of the data over time is the most practical and meaningful means of assessing the quality of a calibration. Furthermore, due to the relative lack of water quality monitoring data, it was not possible to make statistical comparisons of the predicted and observed data.

Water quality calibration involved the examination of observed and predicted data at eight calibration sites, as shown in Figure 3-1 in the main report. These sites correspond to the following MOA fecal coliform water quality monitoring stations: CH7, CH9, ULI, ULO, CH6, CH2, CL3, and CL2.

Figures A-5 through A-12 present the results of the model calibration for each of the MOA fecal coliform monitoring stations. Simulation results show a reasonable general agreement between observed and simulated fecal coliform concentrations and the model is deemed suitable for use in TMDL development.

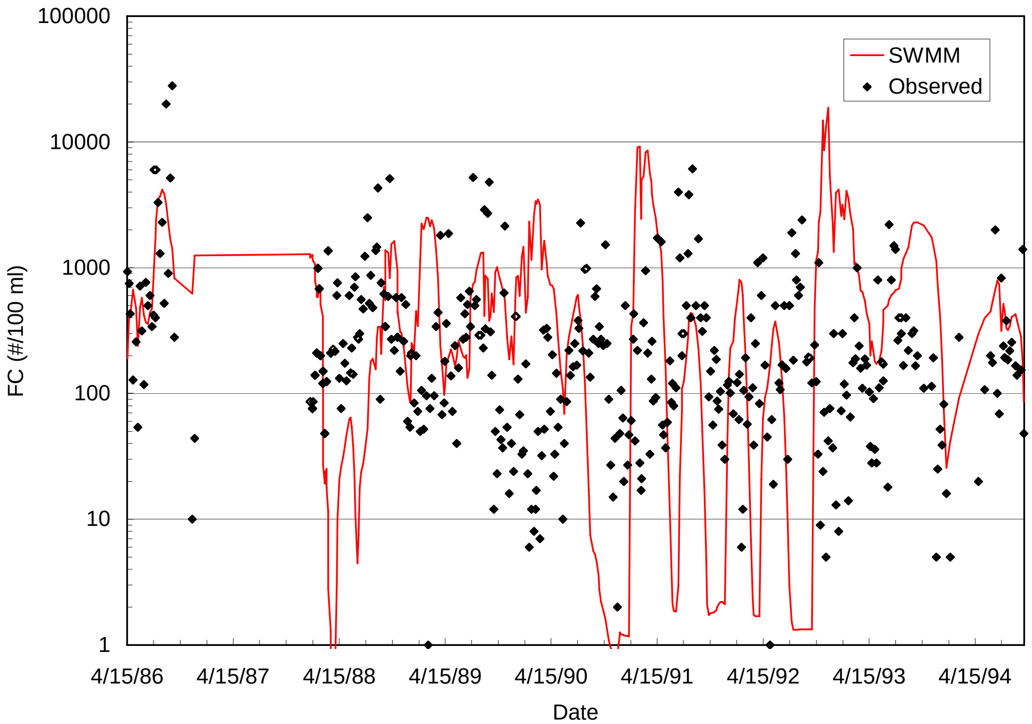


Figure A-5. Observed versus simulated fecal coliform at monitoring station CH7.

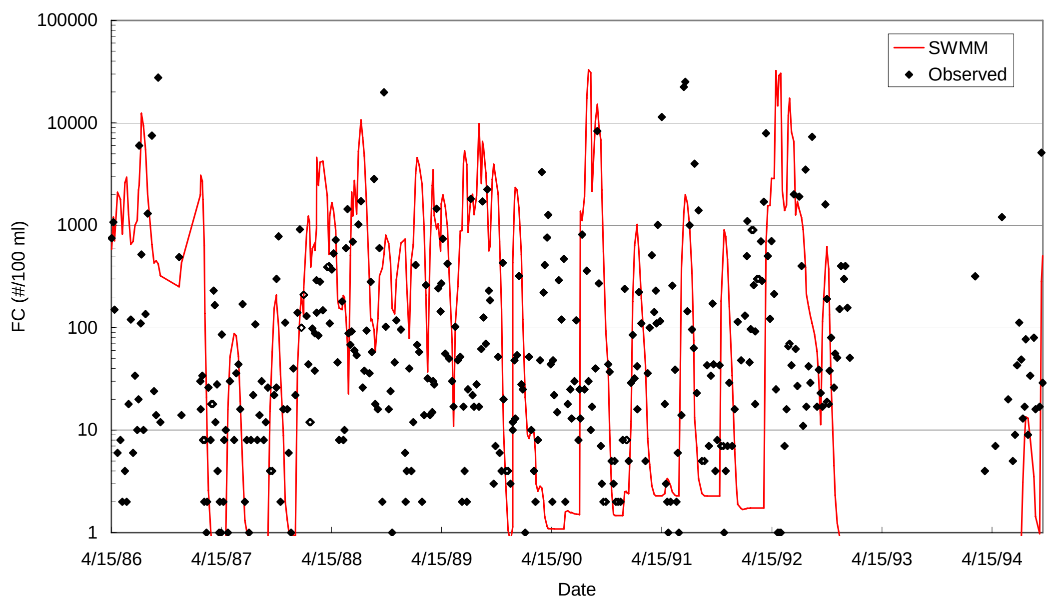


Figure A-6. Observed versus simulated fecal coliform at monitoring station CH9.

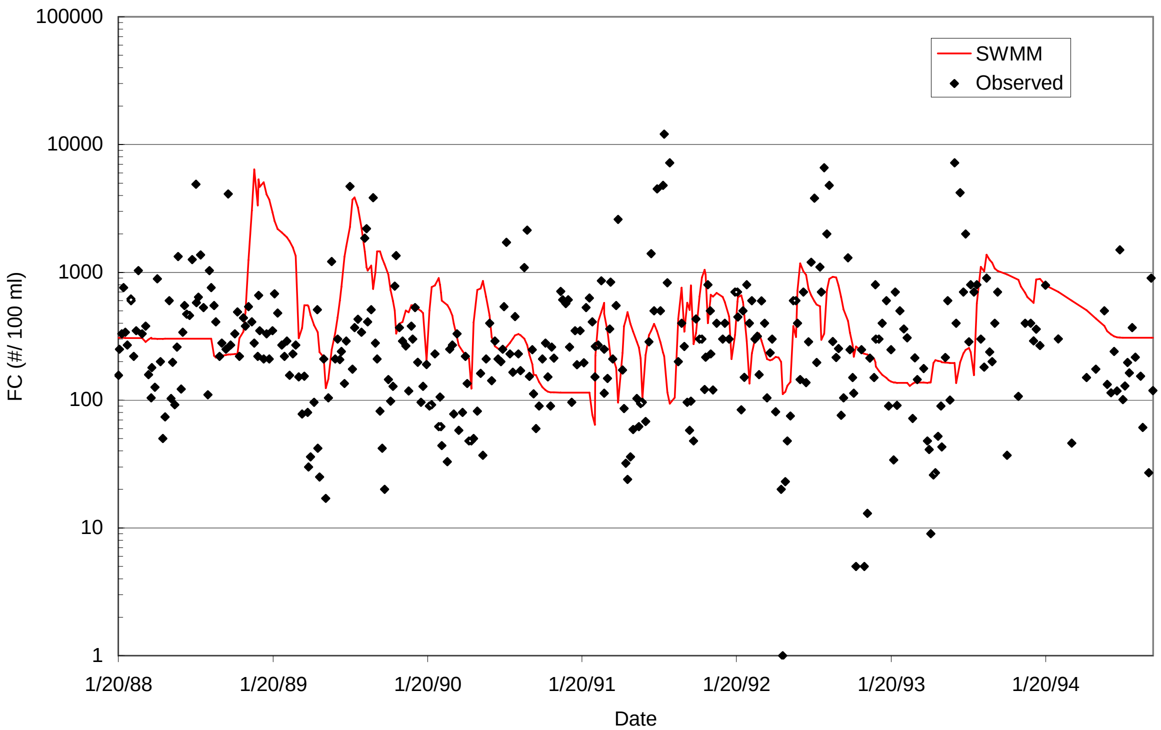


Figure A-7. Observed versus simulated fecal coliform at monitoring station ULI.

Figure A-8. Observed versus simulated fecal coliform at monitoring station ULO.

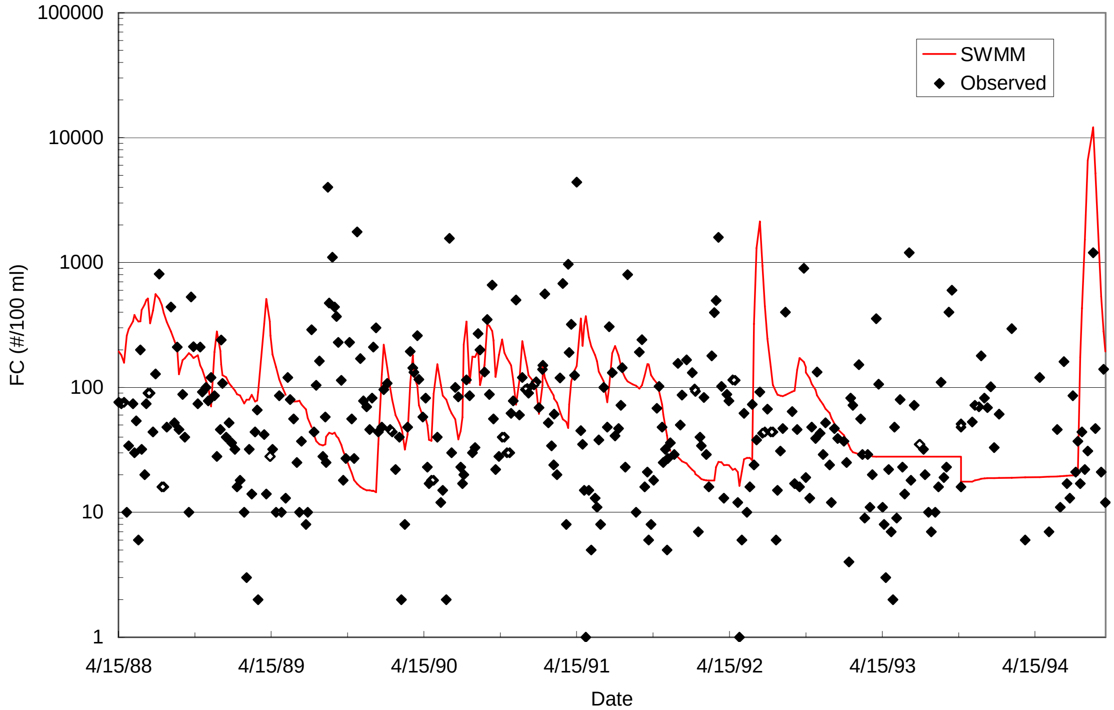


Figure A-9. Observed versus simulated fecal coliform at monitoring station CH6.

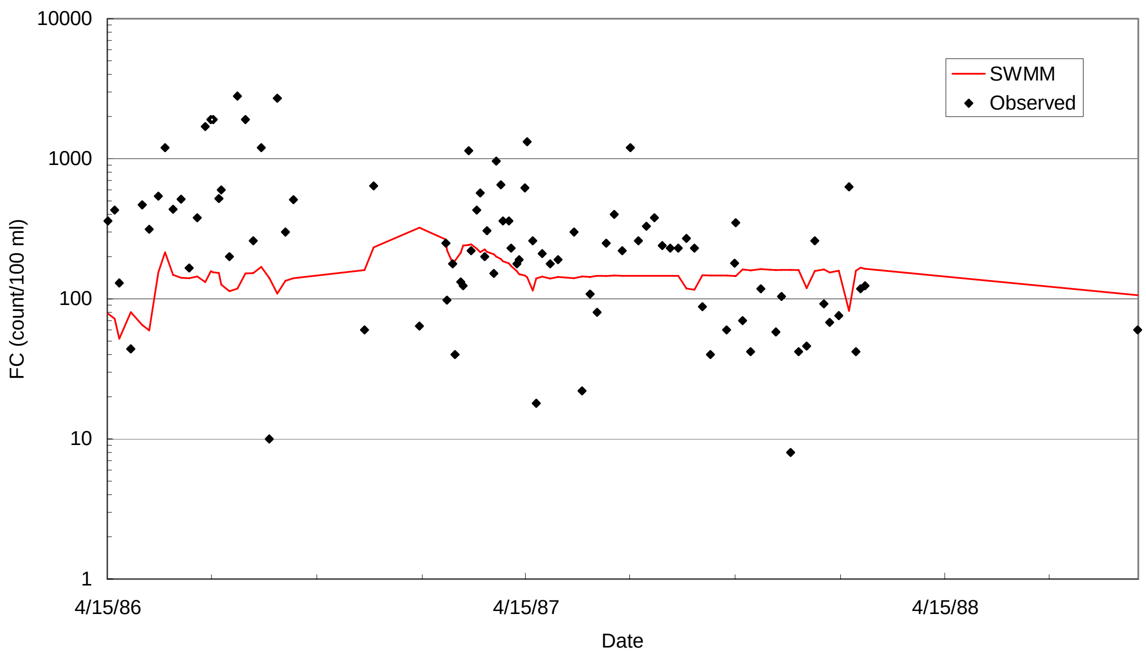


Figure A-10. Observed versus simulated fecal coliform at monitoring station CH2.

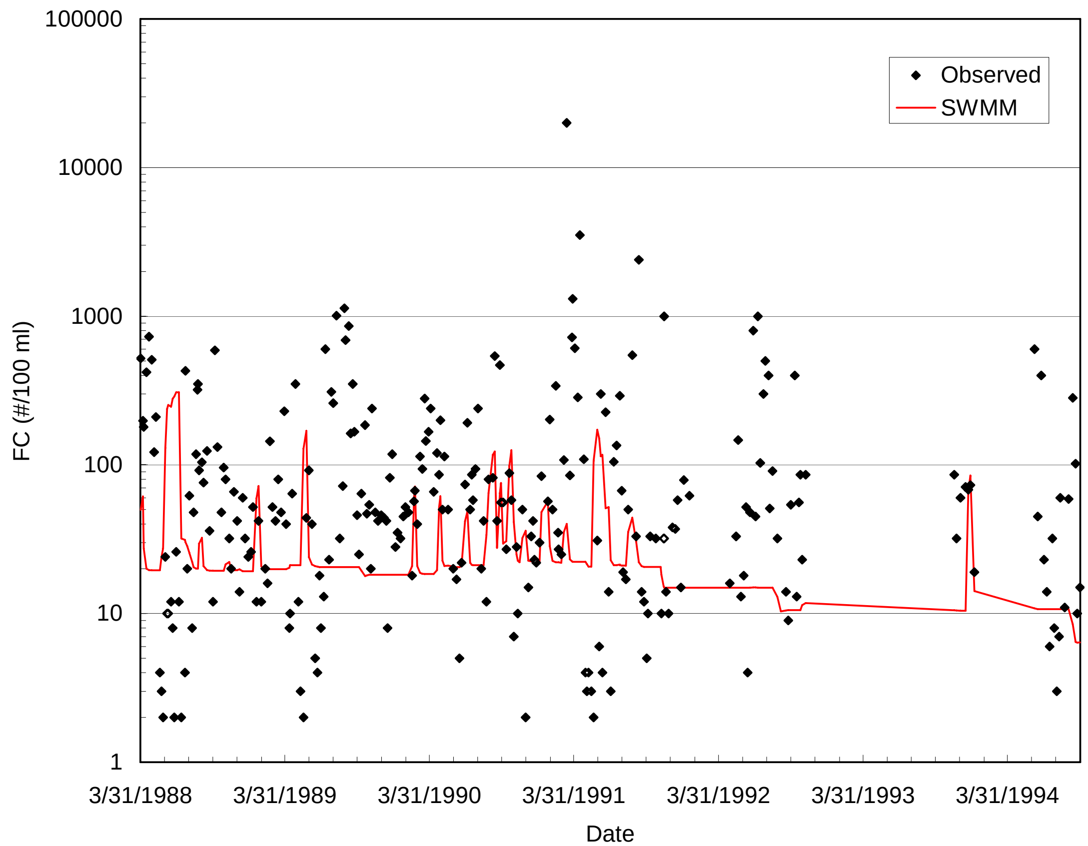


Figure A-11. Observed versus simulated fecal coliform at monitoring station CL3.

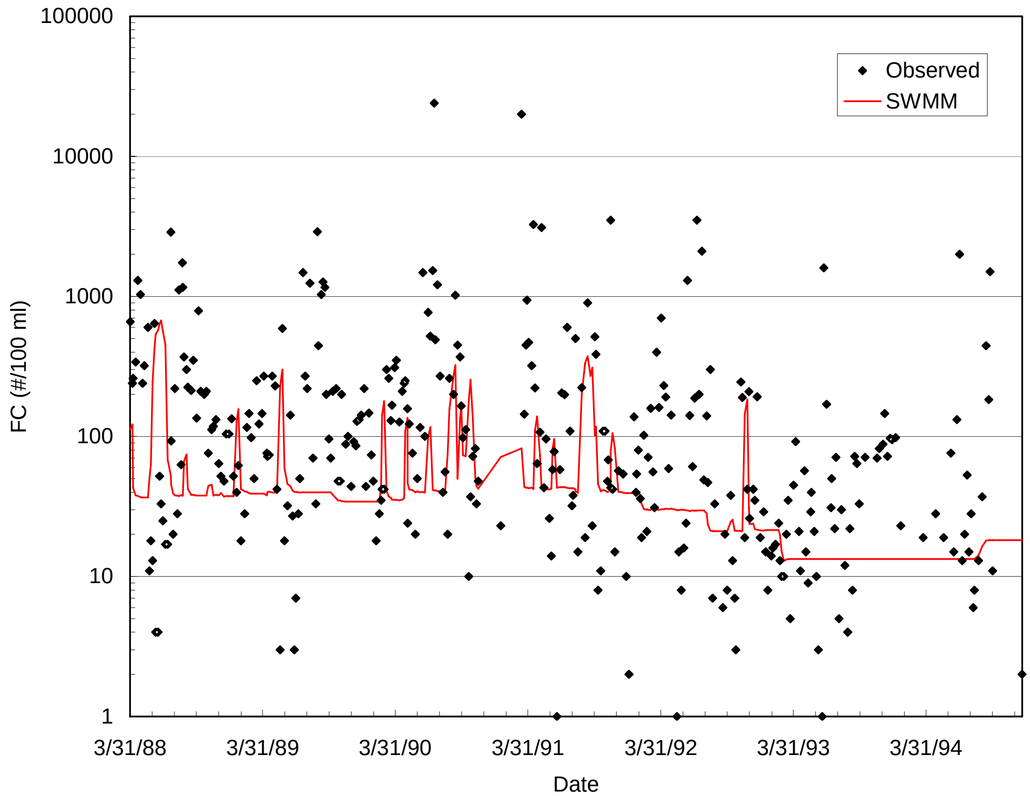


Figure A-12. Observed versus simulated fecal coliform at monitoring station CL2.

APPENDIX B: ANNUAL AVERAGE SUBBASIN FECAL COLIFORM LOADS

Table B-1. Annual Average Subbasin Fecal Coliform Loads.

SUBBASIN	ACRES	AVERAGE LOAD (#FC/YEAR)	AVG #FC/AC	RANK
77	42.0	1.425E+16	3.393E+14	1
133	23.0	6.950E+15	3.022E+14	2
81	56.8	1.461E+16	2.572E+14	3
144	9.2	2.000E+15	2.179E+14	4
118	8.8	1.892E+15	2.140E+14	5
126	188.2	3.842E+16	2.041E+14	6
119	19.6	3.902E+15	1.993E+14	7
154	31.8	6.289E+15	1.978E+14	8
180	37.0	7.070E+15	1.913E+14	9
51	0.0	1.077E+16	1.889E+14	10
45	18.5	3.414E+15	1.849E+14	11
152	71.4	1.293E+16	1.811E+14	12
135	26.2	4.707E+15	1.799E+14	13
149	18.7	3.323E+15	1.776E+14	14
91	0.0	7.300E+15	1.768E+14	15
2	1055.9	1.805E+17	1.710E+14	16
27	0.0	1.066E+16	1.686E+14	17
48	0.0	3.065E+15	1.655E+14	18
12	192.4	3.158E+16	1.641E+14	19
171	87.9	1.415E+16	1.611E+14	20
18	251.6	3.962E+16	1.575E+14	21
3	252.3	3.955E+16	1.568E+14	22
109	0.0	1.175E+16	1.546E+14	23
57	22.1	3.378E+15	1.528E+14	24
31	8.3	1.260E+15	1.518E+14	25
52	17.0	2.450E+15	1.442E+14	26
16	151.3	2.084E+16	1.377E+14	27
172	146.1	1.975E+16	1.352E+14	28
70	8.0	1.080E+15	1.343E+14	29
26	263.2	3.533E+16	1.343E+14	30
104	117.3	1.503E+16	1.281E+14	31
32	5.8	7.360E+14	1.278E+14	32
174	15.7	2.006E+15	1.275E+14	33
13	62.1	7.830E+15	1.260E+14	34
75	6.0	7.530E+14	1.259E+14	35
1	826.8	1.025E+17	1.240E+14	36
166	8.3	9.950E+14	1.199E+14	37
69	26.2	3.116E+15	1.188E+14	38
108	3.0	3.229E+14	1.095E+14	39
5	767.5	8.180E+16	1.066E+14	40
89	31.9	3.377E+15	1.058E+14	41
22	49.4	5.183E+15	1.049E+14	42
72	13.2	1.343E+15	1.021E+14	43
36	10.8	1.102E+15	1.018E+14	44

SUBBASIN	ACRES	AVERAGE LOAD (#FC/YEAR)	AVG #FC/AC	RANK
150	0.0	1.086E+15	9.936E+13	45
177	6.6	6.560E+14	9.880E+13	46
106	25.8	2.536E+15	9.822E+13	47
17	35.0	3.418E+15	9.760E+13	48
176	25.8	2.514E+15	9.752E+13	49
90	5.4	5.263E+14	9.746E+13	50
34	9.3	9.000E+14	9.709E+13	51
96	2.7	2.611E+14	9.670E+13	52
6	270.8	2.586E+16	9.549E+13	53
99	47.2	4.445E+15	9.417E+13	54
84	38.0	3.472E+15	9.130E+13	55
15	19.0	1.728E+15	9.090E+13	56
148	27.3	2.453E+15	8.982E+13	57
54	20.0	1.791E+15	8.942E+13	58
100	354.5	3.166E+16	8.932E+13	59
30	447.3	3.877E+16	8.667E+13	60
68	107.5	9.270E+15	8.620E+13	61
127	13.5	1.164E+15	8.597E+13	62
103	7.4	6.320E+14	8.541E+13	63
178	18.4	1.570E+15	8.523E+13	64
175	14.8	1.237E+15	8.352E+13	65
73	16.2	1.345E+15	8.302E+13	66
170	103.0	8.390E+15	8.142E+13	67
7	296.8	2.329E+16	7.848E+13	68
300	166.7	1.284E+16	7.705E+13	69
114	0.0	2.551E+16	7.637E+13	70
132	20.0	1.505E+15	7.540E+13	71
162	23.3	1.701E+15	7.297E+13	72
35	21.9	1.540E+15	7.038E+13	73
20	80.0	5.527E+15	6.907E+13	74
146	17.5	1.194E+15	6.819E+13	75
10	14.9	1.008E+15	6.770E+13	76
110	31.4	2.115E+15	6.731E+13	77
74	31.5	2.116E+15	6.722E+13	78
50	111.2	7.440E+15	6.694E+13	79
169	2.7	1.748E+14	6.596E+13	80
88	134.8	8.800E+15	6.528E+13	81
161	10.8	6.720E+14	6.228E+13	82
113	16.1	9.830E+14	6.090E+13	83
11	13.8	7.795E+14	5.649E+13	84
145	6.4	3.555E+14	5.546E+13	85
94	129.8	7.136E+15	5.498E+13	86
123	0.0	8.120E+14	5.486E+13	87
8	26.3	1.404E+15	5.332E+13	88
82	98.6	5.224E+15	5.297E+13	89
42	7.6	3.877E+14	5.115E+13	90
157	48.5	2.424E+15	4.997E+13	91

SUBBASIN	ACRES	AVERAGE LOAD (#FC/YEAR)	AVG #FC/AC	RANK
46	24.6	1.178E+15	4.781E+13	92
165	4.3	2.061E+14	4.771E+13	93
147	7.2	3.227E+14	4.470E+13	94
173	3.3	1.466E+14	4.470E+13	95
95	12.8	5.631E+14	4.399E+13	96
128	27.3	1.174E+15	4.308E+13	97
19	41.4	1.770E+15	4.277E+13	98
156	8.9	3.230E+14	3.621E+13	99
163	6.8	2.275E+14	3.336E+13	100
160	33.4	1.051E+15	3.150E+13	101
117	26.4	8.075E+14	3.065E+13	102
168	9.4	2.215E+14	2.364E+13	103
179	63.7	1.404E+15	2.205E+13	104
159	27.9	5.771E+14	2.068E+13	105
83	6.6	1.365E+14	2.068E+13	106
142	26.6	5.288E+14	1.992E+13	107
66	6.7	1.258E+14	1.878E+13	108
105	5.2	4.418E+13	8.496E+12	109
85	30.5	2.276E+14	7.453E+12	110
41	7.4	5.086E+13	6.854E+12	111
21	20.4	1.139E+14	5.578E+12	112
124	16.9	6.260E+13	3.704E+12	113
102	321.0	1.166E+15	3.632E+12	114
53	22.6	7.440E+13	3.296E+12	115
24	61.6	1.659E+14	2.693E+12	116
181	137.8	3.276E+14	2.378E+12	117
61	0.0	7.700E+13	8.499E+11	118
80	3.8	3.181E+12	8.371E+11	119
138	73.1	5.697E+13	7.797E+11	120
71	9.9	6.349E+12	6.420E+11	121
40	88.5	2.297E+13	2.595E+11	122
140	13.3	1.007E+12	7.571E+10	123
63	18.5	7.700E+11	4.162E+10	124
111	2.7	5.285E+10	1.957E+10	125
101	10.3	1.276E+11	1.235E+10	126
97	30.6	1.156E+11	3.778E+09	127
92	13.2	1.840E+10	1.394E+09	128
93	7.5	4.827E+09	6.462E+08	129
25	46.3	5.646E+09	1.219E+08	130
64	6.9	0.000E+00	0.000E+00	131
98	55.7	0.000E+00	0.000E+00	132
112	15.2	0.000E+00	0.000E+00	133
115	0.0	0.000E+00	0.000E+00	134

IPaC **U.S. Fish & Wildlife Service**

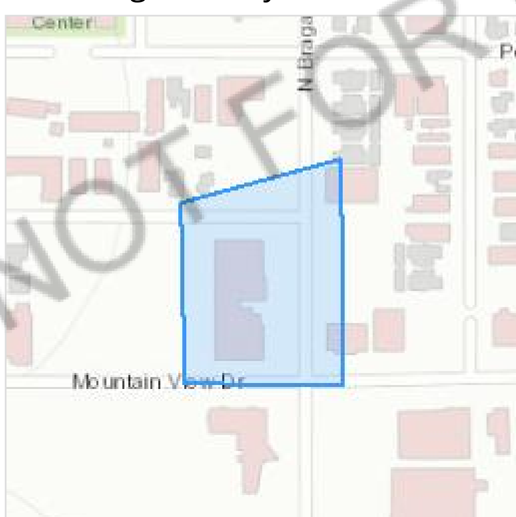
IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

Location

Anchorage County, Alaska



Local office

Anchorage Fish & Wildlife Field Office

(907) 271-2888
(907) 271-2786

4700 Blm Road

Anchorage, AK 99507

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species[1] and their critical habitats are managed by the Ecological Services Program of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries[2]).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact NOAA Fisheries for species under their jurisdiction.

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1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information. IPaC only shows species that are regulated by USFWS (see FAQ).

2. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

There are no listed species or critical habitats expected to occur at this location.

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

There are migratory birds in your project area. Please refer to Alaska's Bird Nesting Season for recommendations to minimize impacts to migratory birds, including eagles.

---

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.

Additional information can be found using the following links:

- Birds of Conservation Concern https://www.fws.gov/program/migratory-birds/species
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide conservation measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
American Golden-plover *Pluvialis dominica* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 20 to Aug 15
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds Feb 1 to Sep 30
Hudsonian Godwit *Limosa haemastica* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 15 to Jul 31
Lesser Yellowlegs *Tringa flavipes* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9679	Breeds May 1 to Aug 15
Olive-sided Flycatcher *Contopus cooperi* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/3914	Breeds May 20 to Aug 31
Short-billed Dowitcher *Limnodromus griseus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9480	Breeds Jun 1 to Aug 10

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

Breeding Season (■)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

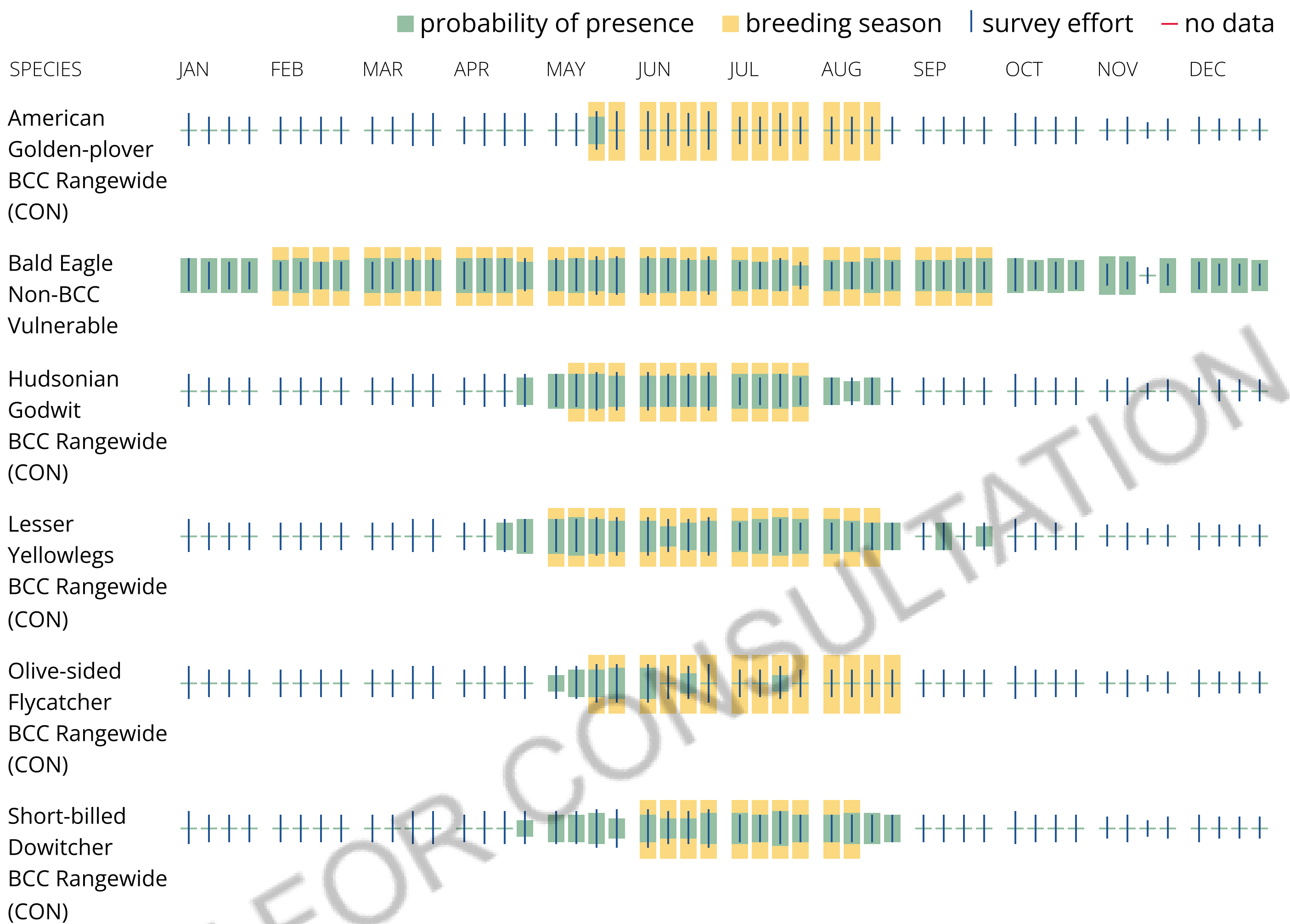
Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

To see a bar's survey effort range, simply hover your mouse cursor over the bar.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe

Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.



Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the list of migratory birds that potentially occur in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the Rapid Avian Information Locator (RAIL) Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets.

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering or migrating in my area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may query your location using the RAIL Tool and look at the range maps provided for birds in your area at the bottom of the profiles provided for each bird in your results. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Facilities

National Wildlife Refuge lands

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

There are no refuge lands at this location.

Fish hatcheries

There are no fish hatcheries at this location.

Wetlands in the National Wetlands Inventory (NWI)

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Wetland information is not available at this time

This can happen when the National Wetlands Inventory (NWI) map service is unavailable, or for very large projects that intersect many wetland areas. Try again, or visit the NWI map to view wetlands at this location.

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate Federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

Alaska DEC Drinking Water Protection Areas

Open in Map Viewer Classic

Sign In

Legend

Non-Community Water System (NC)

Alaska DEC Public Water System Source Minimum Required Separation Distances

PWS Separation Distance 100 ft

PWS Separation Distance 200 ft

Alaska DEC Drinking Water Protection Areas

Zone A (GW-Several Months Time of Travel or SW 1000 ft buffer)

Zone B (GW-2 Yr Time of Travel or SW-1 mile buffer)

Zone C Surface Water (Watershed Boundary)

Zone E Ground Water Surface Water Influence (1000 ft buffer)

Zone F Ground Water Surface Water Influence (1 mile buffer)

Zone G Ground Water Surface Water Influence (Watershed Boundary)

Provisional Protection Areas

Alaska DEC Contaminated Sites

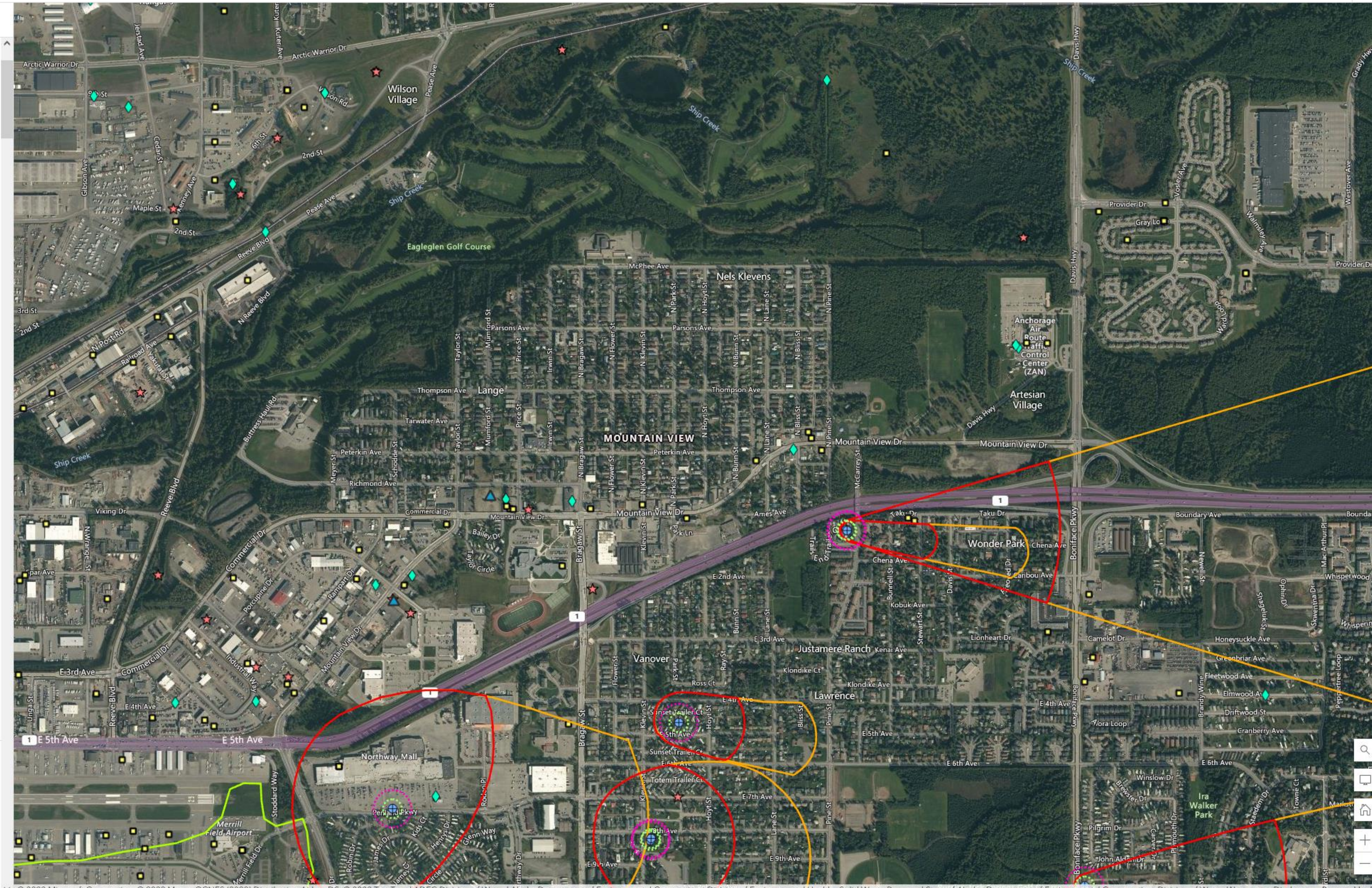
Contaminated Sites

Active

Cleanup Complete

Cleanup Complete - Institutional Controls

Informational



ANCHORAGE INTL AP, ALASKA (500280)

Period of Record Monthly Climate Summary

Period of Record : 04/01/1952 to 06/09/2016

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	21.5	26.1	32.7	43.7	55.1	62.3	65.2	63.3	55.1	40.7	27.9	22.8	43.0
Average Min. Temperature (F)	8.5	12.2	17.4	28.6	38.9	47.3	51.6	49.6	41.5	28.8	16.1	10.4	29.2
Average Total Precipitation (in.)	0.76	0.83	0.64	0.55	0.65	1.01	1.91	2.71	2.75	1.89	1.15	1.13	15.97
Average Total SnowFall (in.)	9.8	12.1	9.4	5.0	0.2	0.0	0.0	0.0	0.3	7.2	12.2	16.1	72.3
Average Snow Depth (in.)	11	12	11	4	0	0	0	0	0	1	4	9	4

Percent of possible observations for period of record.
Max. Temp.: 99.4% Min. Temp.: 99.6% Precipitation: 99.6% Snowfall: 98.1% Snow Depth: 97.9%
Check Station Metadata or Metadata graphics for more detail about data completeness.

Western Regional Climate Center, wrcc@dri.edu

NOAA Atlas 14, Volume 7, Version 2
Location name: Anchorage, Alaska, USA*
Latitude: 61.2248°, Longitude: -149.8091°
Elevation: m/ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Douglas Kane, Sarah Dietz, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Svetlana Stuefer, Amy Tidwell, Carl Trypaluk, Dale Unruh, Michael Yekta, Erica Betts, Geoffrey Bonnin, Sarah Heim, Lillian Hiner, Elizabeth Lilly, Jayashree Narayanan, Fenglin Yan, Tan Zhao

NOAA, National Weather Service, Silver Spring, Maryland
and
University of Alaska Fairbanks, Water and Environmental Research Center

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.091** (0.073-0.116)	**0.113** (0.089-0.146)	**0.144** (0.111-0.191)	**0.169** (0.128-0.228)	**0.203** (0.150-0.282)	**0.230** (0.167-0.326)	**0.257** (0.183-0.371)	**0.287** (0.201-0.422)	**0.328** (0.224-0.495)	**0.359** (0.241-0.551)
10-min	**0.123** (0.099-0.157)	**0.152** (0.120-0.197)	**0.193** (0.149-0.256)	**0.227** (0.172-0.307)	**0.273** (0.202-0.379)	**0.309** (0.224-0.437)	**0.345** (0.246-0.498)	**0.386** (0.270-0.568)	**0.441** (0.301-0.665)	**0.482** (0.323-0.740)
15-min	**0.144** (0.115-0.183)	**0.178** (0.141-0.230)	**0.226** (0.175-0.299)	**0.265** (0.201-0.358)	**0.320** (0.237-0.444)	**0.361** (0.262-0.511)	**0.403** (0.287-0.582)	**0.452** (0.316-0.665)	**0.516** (0.352-0.779)	**0.564** (0.378-0.866)
30-min	**0.191** (0.153-0.243)	**0.237** (0.187-0.306)	**0.300** (0.232-0.397)	**0.352** (0.267-0.476)	**0.424** (0.314-0.588)	**0.480** (0.348-0.679)	**0.535** (0.381-0.772)	**0.599** (0.419-0.881)	**0.685** (0.468-1.03)	**0.749** (0.503-1.15)
60-min	**0.261** (0.209-0.332)	**0.324** (0.256-0.419)	**0.411** (0.318-0.544)	**0.482** (0.366-0.651)	**0.581** (0.430-0.806)	**0.657** (0.477-0.930)	**0.733** (0.522-1.06)	**0.821** (0.574-1.21)	**0.938** (0.641-1.42)	**1.03** (0.688-1.58)
2-hr	**0.332** (0.266-0.423)	**0.412** (0.326-0.533)	**0.522** (0.403-0.691)	**0.613** (0.465-0.828)	**0.738** (0.546-1.02)	**0.835** (0.606-1.18)	**0.931** (0.663-1.34)	**1.04** (0.729-1.54)	**1.19** (0.814-1.80)	**1.30** (0.875-2.00)
3-hr	**0.402** (0.322-0.512)	**0.499** (0.394-0.645)	**0.632** (0.488-0.837)	**0.742** (0.563-1.00)	**0.894** (0.661-1.24)	**1.01** (0.734-1.43)	**1.13** (0.803-1.63)	**1.26** (0.883-1.86)	**1.44** (0.985-2.18)	**1.58** (1.06-2.42)
6-hr	**0.571** (0.458-0.727)	**0.709** (0.561-0.917)	**0.898** (0.694-1.19)	**1.05** (0.799-1.42)	**1.27** (0.939-1.76)	**1.44** (1.04-2.03)	**1.60** (1.14-2.31)	**1.80** (1.25-2.64)	**2.05** (1.40-3.09)	**2.24** (1.50-3.44)
12-hr	**0.777** (0.623-0.990)	**0.966** (0.764-1.25)	**1.23** (0.947-1.62)	**1.44** (1.09-1.94)	**1.73** (1.28-2.39)	**1.95** (1.42-2.76)	**2.18** (1.56-3.15)	**2.44** (1.71-3.59)	**2.78** (1.90-4.20)	**3.04** (2.04-4.67)
24-hr	**1.03** (0.897-1.19)	**1.28** (1.10-1.50)	**1.62** (1.37-1.94)	**1.89** (1.57-2.30)	**2.27** (1.85-2.83)	**2.57** (2.06-3.26)	**2.88** (2.27-3.71)	**3.23** (2.50-4.22)	**3.69** (2.79-4.93)	**4.04** (3.00-5.48)
2-day	**1.26** (1.10-1.46)	**1.54** (1.33-1.81)	**1.94** (1.64-2.32)	**2.27** (1.88-2.76)	**2.74** (2.22-3.40)	**3.12** (2.49-3.95)	**3.53** (2.78-4.54)	**4.02** (3.11-5.26)	**4.67** (3.53-6.24)	**5.16** (3.84-7.00)
3-day	**1.41** (1.23-1.63)	**1.70** (1.47-2.00)	**2.13** (1.80-2.55)	**2.49** (2.07-3.03)	**3.02** (2.45-3.75)	**3.46** (2.76-4.38)	**3.94** (3.10-5.07)	**4.54** (3.51-5.94)	**5.33** (4.03-7.12)	**5.92** (4.41-8.04)
4-day	**1.53** (1.34-1.78)	**1.84** (1.59-2.16)	**2.30** (1.94-2.75)	**2.68** (2.23-3.26)	**3.25** (2.64-4.05)	**3.73** (2.98-4.72)	**4.26** (3.35-5.48)	**4.91** (3.80-6.43)	**5.78** (4.37-7.73)	**6.44** (4.79-8.74)
7-day	**1.89** (1.65-2.19)	**2.26** (1.95-2.65)	**2.81** (2.37-3.36)	**3.26** (2.71-3.97)	**3.92** (3.19-4.88)	**4.47** (3.57-5.65)	**5.06** (3.97-6.51)	**5.76** (4.45-7.54)	**6.70** (5.07-8.95)	**7.40** (5.51-10.1)
10-day	**2.17** (1.90-2.52)	**2.61** (2.25-3.06)	**3.23** (2.73-3.86)	**3.73** (3.10-4.54)	**4.44** (3.61-5.53)	**5.03** (4.01-6.36)	**5.64** (4.43-7.26)	**6.36** (4.91-8.31)	**7.30** (5.52-9.76)	**8.02** (5.97-10.9)
20-day	**3.03** (2.65-3.51)	**3.64** (3.14-4.26)	**4.46** (3.77-5.34)	**5.10** (4.24-6.21)	**5.98** (4.86-7.44)	**6.66** (5.32-8.43)	**7.36** (5.78-9.47)	**8.11** (6.26-10.6)	**9.09** (6.88-12.2)	**9.84** (7.32-13.4)
30-day	**3.83** (3.34-4.43)	**4.60** (3.96-5.39)	**5.61** (4.74-6.72)	**6.38** (5.30-7.76)	**7.40** (6.01-9.20)	**8.17** (6.53-10.3)	**8.94** (7.02-11.5)	**9.71** (7.51-12.7)	**10.7** (8.12-14.3)	**11.5** (8.57-15.6)
45-day	**4.84** (4.22-5.60)	**5.81** (5.01-6.81)	**7.06** (5.96-8.45)	**7.97** (6.62-9.70)	**9.14** (7.43-11.4)	**10.0** (7.99-12.7)	**10.8** (8.51-13.9)	**11.6** (8.97-15.2)	**12.6** (9.56-16.9)	**13.4** (9.98-18.2)
60-day	**5.51** (4.81-6.38)	**6.63** (5.72-7.78)	**8.01** (6.77-9.59)	**8.98** (7.46-10.9)	**10.2** (8.27-12.7)	**11.0** (8.81-13.9)	**11.8** (9.29-15.2)	**12.5** (9.68-16.4)	**13.5** (10.2-18.0)	**14.2** (10.5-19.2)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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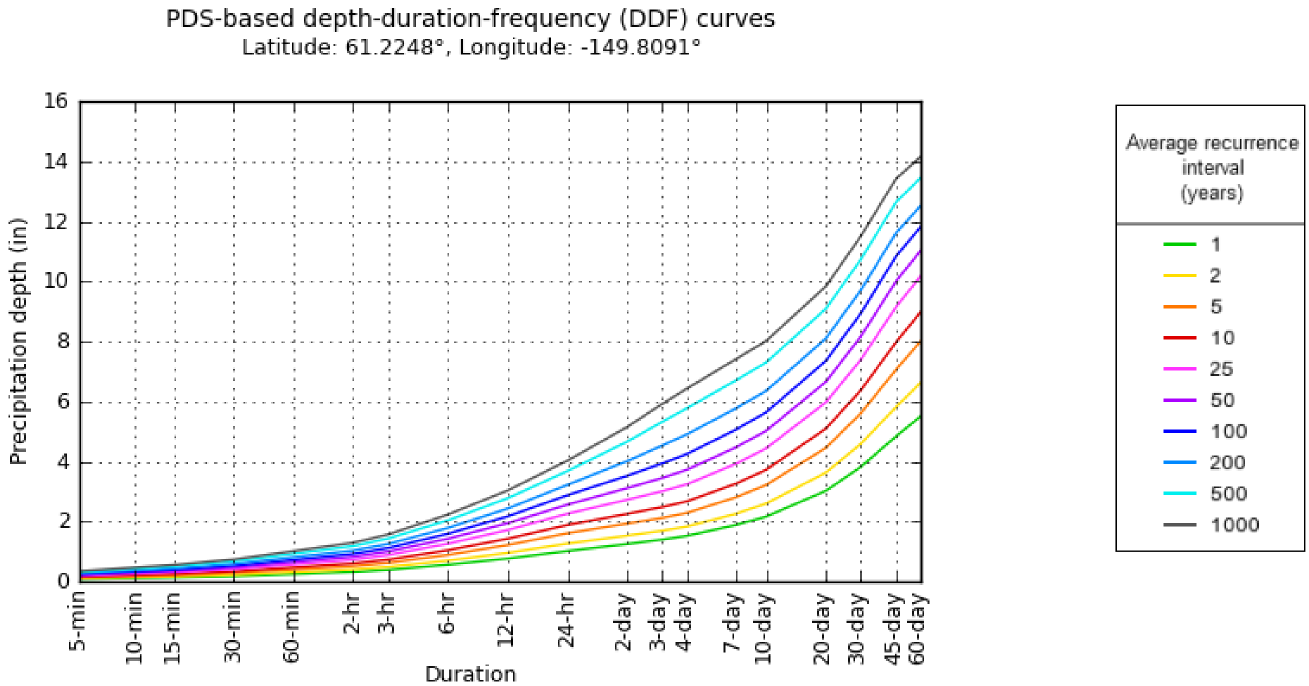
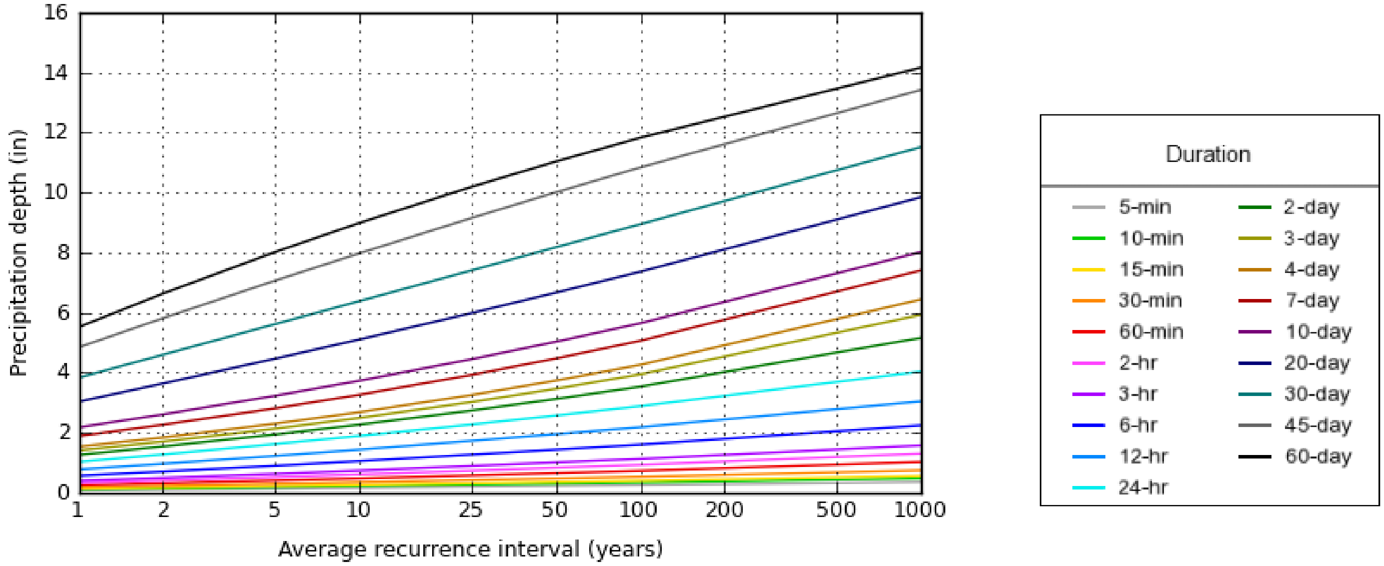
PF graphical





NOAA Atlas 14, Volume 7, Version 2

Created (GMT): Wed Mar 15 18:35:54 2023

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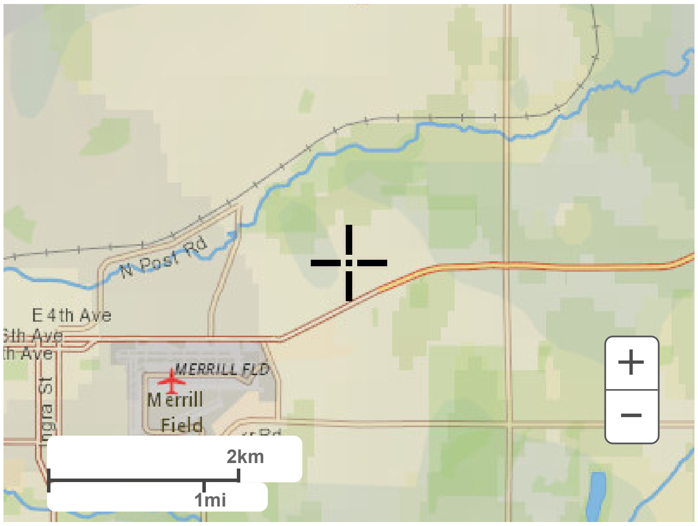
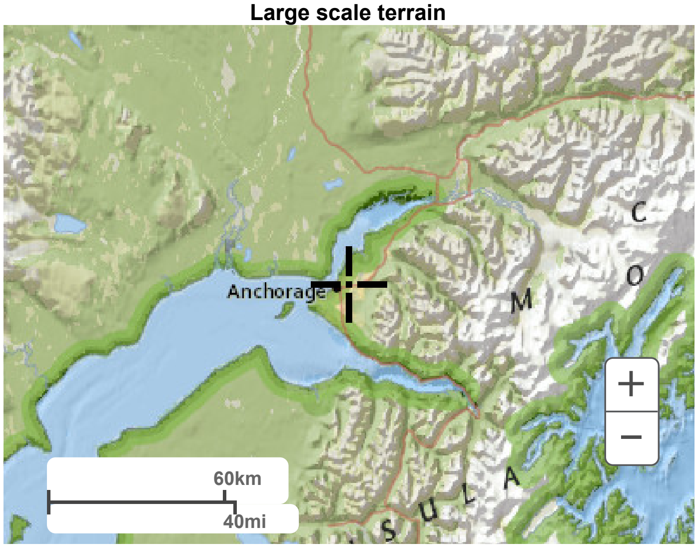
Maps & aerials

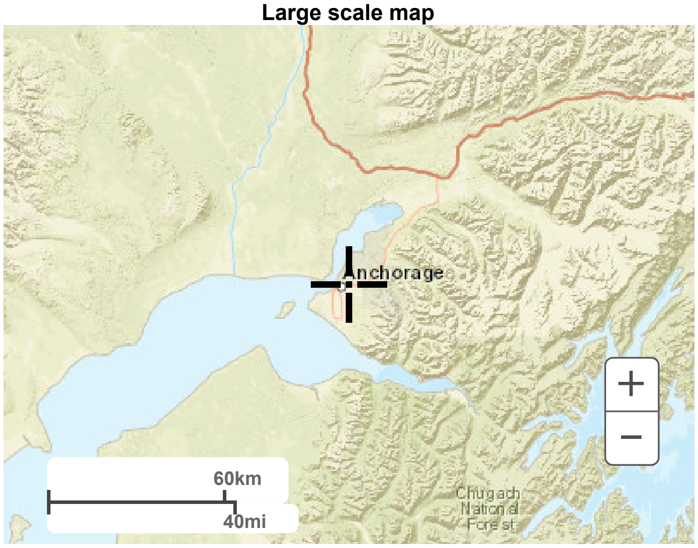
Small scale terrain



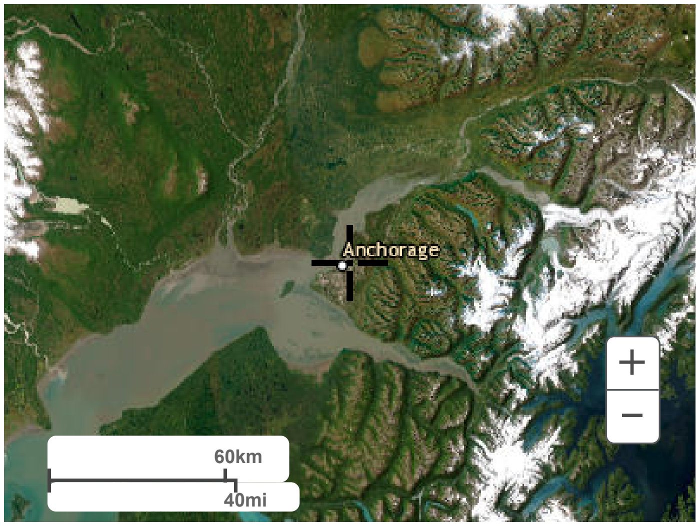
Large scale terrain



Large scale map



Large scale aerial



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US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Table 5. Median beginning and ending dates of the growing season for ecoregions in Alaska, derived from Markon (2001).

Ecoregion[1]	Beginning of Growing Season ('Minday')		End of Growing Season ('Lastday')	
	Julian Date	Calendar Date[2]	Julian Date	Calendar Date[2]
101 Arctic Coastal Plain	171	Jun 20	261	Sep 18
102 Arctic Foothills	158	Jun 7	264	Sep 21
103 Brooks Range	150	May 30	267	Sep 24
104 Interior Forested Lowlands and Uplands	123	May 3	276	Oct 3
105 Interior Highlands	124	May 4	275	Oct 2
106 Interior Bottomlands	122	May 2	277	Oct 4
107 Yukon Flats	110	Apr 20	276	Oct 3
108 Ogilvie Mountains	110	Apr 20	276	Oct 3
109 Subarctic Coastal Plains	143	May 23	276	Oct 3
110 Seward Peninsula	153	Jun 2	274	Oct 1
111 Ahklun and Kilbuck Mountains	136	May 16	275	Oct 2
112 Bristol Bay – Nushagak Lowlands	115	Apr 25	277	Oct 4
113 Alaska Peninsula Mountains	135	May 15	274	Oct 1
114 Aleutian Islands	--[3]	--[3]	--[3]	--[3]
115 Cook Inlet	128	May 8	278	Oct 5
116 Alaska Range	144	May 24	276	Oct 3
117 Copper Plateau	122	May 2	276	Oct 3
118 Wrangell Mountains	131	May 11	272	Sep 29
119 Pacific Coastal Mountains[4]	149	May 29	270	Sep 27
120 Coastal Western Hemlock – Sitka Spruce Forests[4]	119	Apr 29	271	Sep 28

[1] See Figure 21.

[2] Calendar dates shown are for non-leap years. For a leap year, subtract one day (e.g., for Ecoregion 101, the growing season would begin on June 19 in a leap year).

[3] There were no data available for Ecoregion 114 – Aleutian Islands. Growing season dates for Ecoregion 112 may be substituted when onsite data are lacking.

[4] Ecoregions 119 and 120 are intermingled in Southeast Alaska. Generally, 1,600 ft (500 m) in elevation separates the two ecoregions. Use growing season dates for Ecoregion 119 above 1,600 ft elevation and dates for Ecoregion 120 below 1,600 ft elevation. Annual variability may occur as the snow recedes from lower elevations at different rates.

U.S. Fish & Wildlife Service Region 7

Timing Recommendations for Land Disturbance & Vegetation Clearing

Planning Ahead to Protect Nesting Birds

In Alaska all native birds except grouse and ptarmigan, which are managed by the State of Alaska, are protected by the Migratory Bird Treaty Act (MBTA). Under the MBTA (16 U.S.C. 703) it is illegal for anyone to "take" migratory birds, their eggs, feathers or nests, unless permitted by regulations. "Take" is defined as "to pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to pursue, hunt, shoot, wound, kill, trap, capture or collect" a migratory bird (50 CFR §10.12). For more information, please see: http://www.fws.gov/birds/policies-and-regulations/laws-legislations/migratory-bird-treaty-act.php.

Destruction of active nests, eggs, or nestlings can result from spring and summer vegetation clearing, grubbing, brush hogging, burning, stockpiling fill, and other land disturbance and construction activities. An "active" nest is indicated by intact eggs, live chicks, or presence of at least one adult on the nest. Human disturbance and repeated loud noises near nest sites can cause nest failure and is considered "take". Avoiding nesting seasons during project implementation minimizes the risk of encountering an active nest or inadvertently causing a nest to fail.

Rusty Blackbird

Some bird species and their nests have additional protections under other federal laws, including Bald and Golden eagles under the Bald and Golden Eagle Protection Act (Eagle Act), and those listed under the Endangered Species Act (ESA). Please contact the U.S. Fish and Wildlife Service if these species may be present in your project area to ensure Eagle Act and ESA compliance.

Implementing the following timing recommendations considerably reduces the risk of "take" under the MBTA. Final compliance with the law is your responsibility.

Recommendations:

1. Conduct land disturbance and vegetation clearing activities as described above outside of the nesting season (please see nesting season timing for your area on the next page).

2. If you encounter an active nest *at any time*, including before or after the local recommended avoidance times, leave it undisturbed until the eggs hatch and the young depart the nest.

3. If you have any questions regarding the MBTA, the timing recommendations, or if you are unable to comply with the timing recommendations, please contact your local U.S. Fish and Wildlife Service Fish and Wildlife Conservation Office for assistance:

   Anchorage (includes Juneau and Kenai areas) - (907) 271-2888
   Fairbanks (includes the North Slope, Interior, and Western Alaska) - (907) 456-0203

U.S. Fish & Wildlife Service Region 7

Timing Recommendations for Land Disturbance & Vegetation Clearing

Planning Ahead to Protect Nesting Birds

Nesting Seasons by Habitat Type and Region:
Recommended Times to Avoid Land Disturbance & Vegetation Clearing

<table>
<tr><th>HABITAT TYPE→
REGION ↓</th><th>Forest or Woodland (i.e., trees present)</th><th>Shrub or Open (i.e., shrub cover or marsh, pond, tundra, gravel, or other treeless/shrubless ground habitat)</th><th>Seabird Colonies (including cliff and burrow colonies)</th><th>Eagles [e]</th></tr>
<tr><td>Southeast</td><td rowspan="2">April 15-July 15[a]</td><td rowspan="2">May 1-July 15[a, b]</td><td>May 1-September 15</td><td rowspan="10">March 1-August 31</td></tr>
<tr><td>Kodiak Archipelago</td><td rowspan="2">April 15-September 7</td></tr>
<tr><td>Southcentral (Lake Illiamna to Copper River Delta; north to Talkeetna)</td><td colspan="2">May 1-July 15[a, b]</td></tr>
<tr><td>Bristol Bay/AK Peninsula (north to Lake Illiamna)</td><td colspan="2">May 1-July 15[a, b, c]</td><td>May 10-September 15</td></tr>
<tr><td>Interior (north of Talkeetna to south slope Brooks Range; west to treeline)</td><td colspan="2">May 1-July 15[a, b]</td><td>May 1-July 20[d]</td></tr>
<tr><td>Aleutian Islands</td><td></td><td>April 25-July 15[a]</td><td>May 1-September 15</td></tr>
<tr><td>Yukon-Kuskokwim Delta</td><td>May 1-July 15</td><td>May 5-July 25 [a, b, c]</td><td rowspan="3">May 20-September 15</td></tr>
<tr><td>Seward Peninsula</td><td>May 1-July 15</td><td>May 10-July 20[a, c]</td></tr>
<tr><td>Northern (includes northern foothills of Brooks Range)</td><td rowspan="2"></td><td>June 1-July 31[a, c]</td></tr>
<tr><td>Pribilof and Bering Sea Islands</td><td>May 15-July 15[a]</td><td>May 15-September 15</td></tr>
</table>

[a] Raptors may nest two or more months earlier than other birds.
[b] Canada geese and swans begin nesting April 20.
[c] Black scoter are known to nest through August 10.
[d] Seabird colonies in Interior refer to terns and gulls.
[e] Eagles and their nests have additional protections under the Eagle Act and a permit may be required to conduct activities near an eagle nest. Visit the U.S. Fish and Wildlife Service's Alaska Region Eagle Permit Program web page (https://www.fws.gov/alaska/eaglepermit/guidelines/disturbnestingbaea1.htm) or call your local Fish and Wildlife Conservation Office for step-by-step guidance to determine if your activity is likely to take or disturb eagles and for conservation measures to that avoid disturbance.

ALASKA's IMPAIRED WATERS – 2010

As of September 2010

Impaired Waterbody Categories:

Category 4a – Impaired water with a final/approved TMDL

Category 4b – Impaired water with other pollution controls

Category 5 – Impaired water, Section 303(d) list, require TMDL

Within the tables waters are listed by region - -Interior, Southcentral, Southeast – and alphabetically.

Category 4a Waterbodies

Alaska's 2010

Category 4a Waterbodies – Impaired but not needing a TMDL, TMDL has been completed

Region	*Category*	*Alaska ID #*	*Waterbody*	*Location*	*Area of Concern*	*Water Quality Standard*	*Pollutant Parameters*	*Pollutant Sources*
IN	**Category 4a**	**40402-001**	**Birch Creek Drainage:- Upper Birch Creek; Eagle Creek; Golddust Creek**	**North of Fairbanks**	**N/A**	**Turbidity**	**Turbidity**	**Placer Mining**
IN	**Category 4a**	**40506-009**	**Garrison Slough**	**Eielson Air Force Base**	**N/A**	**Toxic & Other Deleterious Organic and Inorganic Substances**	**Polychlorinated biphenyls (PCBs)**	**Military Base/ Operations**
IN	**Category 4a**	**40506-003**	**Noyes Slough**	**Fairbanks**	**7 miles**	**Residues**	**Debris**	**Urban Runoff**
SC	**Category 4a**	**30102-604**	**Akutan Harbor**	**Akutan Island**	**N/A**	**Residues** **Dissolved Gas**	**Settleable Solids** **Low Dissolved Oxygen**	**Seafood Processing/ Waste**
SC	**Category 4a**	**20401-004**	**Campbell Creek**	**Anchorage**	**10 miles**	**Fecal Coliform Bacteria**	**Fecal Coliform Bacteria**	**Urban Runoff**
SC	**Category 4a**	**20401-402**	**Campbell Lake**	**Anchorage**	**125 acres**	**Fecal Coliform Bacteria**	**Fecal Coliform Bacteria**	**Urban Runoff**

SC	Category 4a	20401-003	Chester Creek	Anchorage	4.1 miles	Fecal Coliform Bacteria	Fecal Coliform Bacteria	Urban Runoff, Industrial
SC	Category 4a	20402-002	Eagle River	Eagle River	N/A	Toxic & Other Deleterious Organic and Inorganic Substances	Ammonia, Chlorine, Copper, Lead, Silver	Wastewater Treatment Facility
SC	Category 4a	20401-005	Fish Creek	Anchorage	6.4 miles	Fecal Coliform Bacteria	Fecal Coliform Bacteria	Urban Runoff
SC	Category 4a	20401-006	Furrow Creek	Anchorage	5.3 miles	Fecal Coliform Bacteria	Fecal Coliform Bacteria	Urban Runoff
SC	Category 4a	30101-501	King Cove	King Cove	N/A	Residues	Seafood Waste Residue	Seafood Processing/ Waste
SC	Category 4a	20505-409	Lake Lucille	Wasilla	N/A	Dissolved Gas	Low Dissolved Oxygen	Urban Runoff
SC	Category 4a	20401-017	Little Campbell Creek	Anchorage	8.3 miles	Fecal Coliform Bacteria	Fecal Coliform Bacteria	Urban Runoff
SC	Category 4a	20401-024	Little Rabbit Creek	Anchorage	6.2 miles	Fecal Coliform Bacteria	Fecal Coliform Bacteria	Urban Runoff
SC	Category 4a	20401-018	Little Survival Creek	Anchorage	3.0 miles	Fecal Coliform Bacteria	Fecal Coliform Bacteria	Urban Runoff
SC	Category 4a	20401-020	Ship Creek Glenn Hwy. Bridge. Down to Mouth	Anchorage	Glenn Hwy. Bridge. to Mouth	Fecal Coliform Bacteria	Fecal Coliform Bacteria	Urban Runoff
SC	Category 4a	30102-603	South Unalaska Bay	Unalaska Island	N/A	Residues, Low Dissolved Oxygen (BOD5)	Seafood Waste Residues, Dissolved Gas	Seafood Processing Waste
SC	Category 4a	30102-607	Udagak Bay	Unalaska Island	N/A	Residues	Settleable solids	Seafood Processing Waste
SC	Category 4a	20401-419	University Lake	Anchorage	10 acres	Fecal Coliform	Fecal Coliform Bacteria	Urban Runoff

						Bacteria		
SC	Category 4a	20401-421	Westchester Lagoon	Anchorage	30 acres	Fecal Coliform Bacteria	Fecal Coliform Bacteria	Urban Runoff
SE	Category 4a	10301-005	Duck Creek	Juneau	N/A	Dissolved Gas, Residues, Toxic & Other Deleterious Organic and Inorganic Sub-stances, Fecal Coliform Bacteria Turbidity	Low Dissolved Oxygen, Debris, Iron, Fecal Coliform Bacteria, and Turbidity	Urban Runoff, Landfill, Road Runoff, Land Develop-ment
SE	Category 4a	10203-005	Granite Creek	Sitka	N/A	Turbidity Sediment	Turbidity, Sediment	Gravel Mining
SE	Category 4a	10203-601-001	Herring Cove of Silver Bay	Sitka	102 acres	Residues	Bark & Woody Debris	Log Storage from former Pulp Mill Operations
SE	Category 4a	10301-004	Jordan Creek	Juneau	3 miles from tide-water up-stream	Dissolved Gas, Residues, Sediment	Debris, Sediment Low Dissolved Oxygen	Land Develop-ment, Road Runoff
SE	Category 4a	10203-602	Klag Bay	West Chichagof Island	1.25 acres	Toxic & Other Deleterious Organic and Inorganic Substances	Metals – Arsenic, Cobalt, Copper, Lead, Manganese, Mercury, Silver, Zinc	Mining

SE	**Category 4a**	**10301-001**	**Lemon Creek**	**Juneau**	**N/A**	**Turbidity Sediment**	**Turbidity, Sediment**	**Urban Runoff, Gravel Mining**
SE	**Category 4a**	**10301-014**	**Pederson Hill Creek**	**Juneau**	**Lower two miles**	**Fecal Coliform Bacteria**	**Fecal Coliform Bacteria**	**Septic Tanks**
SE	**Category 4a**	**10303-004**	**Pullen Creek (Lower Mile)**	**Skagway**	**Lower mile of Pullen Creek**	**Toxic & Other Deleterious Organic and Inorganic Substances**	**Metals – Cadmium, Copper, Lead, Zinc**	**Industrial**
SE	**Category 4a**	**10203-601**	**Silver Bay**	**Sitka**	**6.5 acres**	**Residues Toxic & Other Deleterious Organic and Inorganic Substances**	**Pulp Residues, Logs, Bark & Woody Debris, Sediment Toxicity due to Wood Decomposition By-products**	**Industrial, Historical Pulp Mill Activity**
SE	**Category 4a**	**10103-602**	**Thorne Bay**	**Prince of Wales Island**	**7.5 acres**	**Residues**	**Bark & Wood Debris**	**Historical Log Transfer Facility**
SE	**Category 4a**	**10301-017**	**Vanderbilt Creek**	**Juneau**	**N/A**	**Turbidity Residues Sediment**	**Turbidity, Debris, Sediment**	**Urban Runoff**
SE	**Category 4a**	**10102-601**	**Ward Cove**	**Ketchikan**	**250 acres**	**Residues Dissolved Gas**	**Pulp Residues, Logs, Bark & Woody Debris, Low Dissolved Oxygen**	**Industrial**

Category 4b Waterbodies

Alaska's 2010

Category 4b Waterbodies – Impaired, not needing a TMDL, and under "other pollution controls" and expected to meet standards in a reasonable time period

Region	*Category*	*Alaska ID #*	*Waterbody*	*Location*	*Area of Concern*	*Water Quality Standard*	*Pollutant Parameters*	*Pollutant Sources*
IN	**Category 4b**	**40501-001**	**Cabin Creek**	**Nabesna**	**1.5 miles**	**Toxic & Other Deleterious Organic and Inorganic Substances**	**Manganese, Arsenic, Iron, Copper & Cadmium**	**Mine Tailings**
SC	**Category 4b**	**N/A**	**Exxon Valdez Beaches**	**Prince William Sound - Alaska**	**23 beaches**	**Petroleum Hydrocar-bons, Oil & Grease**	**Petroleum Products**	**Oil Spill**

				Peninsula				
SE	**Category 4b**	**10203-808**	**East Port Frederick**	**NE Chichagof Island**	**0.4 acres**	**Residues**	**Bark & Woody Debris**	**Log Transfer Facility**
SE	**Category 4b**	**10103-031**	**Fubar Creek**	**Prince of Wales Island**	**N/A**	**Sediment**	**Sediment**	**Timber Harvesting**

Category 5/Section 303(d) Listed Waterbodies

Alaska's 2010

Category 5 Waterbodies – Impaired by pollutant(s) for one or more designated uses and requiring a TMDL; Clean Water Act Section 303(d) Listed Waters

Region	*Category*	*Alaska ID #*	*Waterbody*	*Location*	*Area of Concern*	*Water Quality Standard*	*Pollutant Parameters*	*Pollutant Sources*
IN	**Category 5 Section 303(d) listed**	**40506-007**	**Chena River**	**Fairbanks**	**15 miles**	**Sediment**	**Sediment**	**Urban Runoff**
IN	**Category 5 Section 303(d) listed**	**40506-002**	**Chena Slough**	**Fairbanks**	**13 miles**	**Sediment**	**Sediment**	**Urban Runoff**
IN	**Category 5 Section 303(d) listed**	**40402-010**	**Crooked Creek Bonanza Crooked Deadwood Ketchem Mammoth Mastodon Porcupine**	**North of Fairbanks**	**77 miles**	**Turbidity**	**Turbidity**	**Placer Mining**
IN	**Category 5 Section 303(d) listed**	**40509-001**	**Goldstream Creek**	**Fairbanks**	**70 miles**	**Turbidity**	**Turbidity**	**Placer Mining**
IN	**Category 5 Section 303(d) listed**	**30501-002**	**Kuskokwim River**	**Red Devil**	**1,000 feet, 900 feet down river and 100 feet upriver from mouth of Red**	**Toxic & Other Deleterious Organic and Inorganic Substances**	**Metals - Antimony, Arsenic, Mercury**	**Mining**

					Devil Creek			
IN	Category 5 Section 303(d) listed	40506-003	Noyes Slough	Fairbanks	7 miles	Sediment, Petroleum Hydrocar-bons, Oil & Grease	Sediment, Petroleum Products,	Urban Runoff
IN	Category 5 Section 303(d) listed	30501-002	Red Devil Creek	Red Devil	0.5 mile of creek	Toxic & Other Deleterious Organic and Inorganic Substances	Metals - Antimony, Arsenic, Mercury	Inactive Mine
IN	Category 5 Section 303(d) listed	40510-101	Slate Creek	Denali National Park	2.5 miles	Turbidity	Turbidity	Mining
SC	Category 5 Section 303(d) listed	20505-401	Big Lake	Wasilla	1,250 acres	Petroleum Hydrocar-bons	Total Aromatic Hydrocarbons (TAH)	Motorized watercraft

SC	Category 5 Section 303(d) listed	30101-503	Cold Bay	King Cove, Alaska Peninsula	0.01 acre	Petroleum Hydrocar-bons, Oil & Grease	Petroleum Products	Military, Fuel Storage
SC	Category 5 Section 303(d) listed	20505-001	Cottonwood Creek	Wasilla	7 miles	Fecal Coliform Bacteria	Fecal Coliform Bacteria	Urban Runoff, Urban Development
SC	Category 5 Section 303(d) listed	30102-606	Dutch Harbor	Unalaska Island	0.5 acre	Petroleum Hydrocar-bons, Oil & Grease	Petroleum Products	Industrial, Urban Runoff
SC	Category 5 Section 303(d) listed	30203-001	Egegik River	Egegik	0.25 mile	Petroleum Hydrocar-bons, Oil & Grease	Petroleum Products	Spills, Fuel Tanks, Under-ground Fuel Tanks
SC	Category 5 Section 303(d) listed	20201-401	Eyak Lake	Cordova	50 feet of shore-line	Petroleum Hydrocarbons, Oil & Grease	Petroleum Products, Petroleum Contamination, Sheen	Above Ground Storage Tanks, Spills
SC	Category 5 Section 303(d) listed	20401-412	Hood/ Spenard Lake	Anchorage	307 acres	Dissolved Gas	Low Dissolved Oxygen	Urban Runoff, Industrial
SC	Category 5 Section 303(d) listed	30102-602	Iliuliuk Harbor	Dutch Harbor	1.4 acres	Petroleum Hydrocarbons, Oil & Grease	Petroleum Products	Urban Runoff
SC	Category 5 Section 303(d) listed	20402-001	Matanuska River	Palmer	½ mile	Residues	Debris	Landfill
SC	Category 5 Section 303(d) listed	30101-502	Popof Strait	East Aleutians Borough	5 miles	Residues	Seafood Waste Residue	Seafood Processor
SC	Category 5 Section 303(d) listed	30102-409	Red Lake Anton Road Ponds	Kodiak	2.0 acres	Toxic & Other Deleterious Organic and Inorganic Substances	Metals – Iron, Manganese	Urban Runoff

SC	**Category 5 Section 303(d) listed**	**20401-020**	**Ship Creek Glenn Hwy. Bridge. Down to Mouth**	**Anchorage**	**11 miles, Glenn Hwy. Bridge. Down to Mouth**	**Petroleum Hydrocar-bons, Oil & Grease**	**Petroleum Products**	**Urban Runoff**
SE	**Category 5 Section 303(d) listed**	**10203-002**	**Katlian River**	**N. of Sitka, Baranof Island**	**4.5 miles**	**Sediment, Turbidity**	**Sediment, Turbidity**	**Timber Harvest**
SE	**Category 5 Section 303(d) listed**	**10103-504**	**Salt Chuck Bay**	**Kasaan Area, Prince of Wales Island**	**0.03 square miles**	**Toxic & Other Deleterious Organic and Inorganic Substances**	**Metals -- Copper**	
SE	**Category 5 Section 303(d) listed**	**10303-601**	**Skagway Harbor**	**Skagway**	**1.0 acre**	**Toxic & Other Deleterious Organic and Inorganic Substances**	**Metals – Cadmium, Copper, Lead, Mercury, Zinc**	**Industrial**

SE	**Category** 5 Section 303(d) listed	**10103-010**	**Unnamed Creek, Sweetwater Lake, USFS 3030 Road, ADF&G Stream 3027 (Stream 3)**	**Prince of Wales Island**	**0.4 mile**	**Toxic & Other Deleterious Organic and Inorganic Substances**	**Metals - Aluminum, Cadmium, Copper, Iron**	**Road Construction**
SE	**Category 5 Section 303(d) listed**	**10103-012**	**Unnamed Creek, Sweetwater Lake, USFS 3030 Road, ADF&G Stream 3021 (Stream 6)**	**Prince of Wales Island**	**1.14 mile**	**Toxic & Other Deleterious Organic and Inorganic Substances, Dissolved Inorganic Substances**	**Metals – Aluminum, Cadmium, Copper, Iron, Manganese, Sulfate**	**Road Construction**
SE	**Category 5 Section 303(d) listed**	**10103-013**	**Unnamed Creek, Sweetwater Lake, USFS 3030 Road, ADF&G Stream 3019 tributary (Stream 7)**	**Prince of Wales Island**	**0.3 mile**	**Toxic & Other Deleterious Organic and Inorganic Substances**	**Metals - Aluminum, Cadmium, Copper, Iron, Manganese**	**Road Construction**
SE	**Category 5 Section 303(d) listed**	**10103-014**	**Unnamed Creek, Sweetwater Lake, USFS 3030 Road, ADF&G Stream 3019 (Stream 8)**	**Prince of Wales Island**	**0.3 mile**	**Toxic & Other Deleterious Organic and Inorganic Substances**	**Metals - Cadmium, Copper, Iron, Manganese, Nickel, Zinc**	**Road Construction**
SE	**Category 5 Section 303(d) listed**	**10103-015**	**Unnamed Creek, Sweetwater Lake, USFS 3030 Road, ADF&G Stream 3017 (Stream 9)**	**Prince of Wales Island**	**0.8 mile**	**Toxic & Other Deleterious Organic and Inorganic Substances, Dissolved Inorganic Substances**	**Metals – Aluminum, Cadmium, Copper, Iron, Manganese, Nickel, Zinc, Sulfate**	**Road Construction**

Total Maximum Daily Load for Fecal Coliform in Chester Creek, University Lake, and Westchester Lagoon, Anchorage, Alaska

FINAL

Alaska Department of Environmental Conservation
555 Cordova Street
Anchorage , Alaska 99501

May 2005

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Total Maximum Daily Load for Fecal Coliform in the Waters of Chester Creek in Anchorage, Alaska

TMDL AT A GLANCE:

TMDL is for: Chester Creek, University Lake and Westchester Lagoon
Water Quality-limited? Yes
Hydrologic Unit Code: 19020401
Criteria of Concern: Fecal coliform
Designated Uses Affected: Water supply and water recreation
Major Source(s): Urban runoff
Loading Capacity: 6.46×10^{11} to 4.15×10^{12}FC/year
Wasteload Allocation: 5.18×10^{11} to 3.73×10^{12}FC/year (Sections 6 to 8 include monthly allocations)
Load Allocation: 0 FC/year
Margin of Safety: 10 percent
Necessary Annual Reduction: 54 to 98 percent (Sections 6 to 8 include monthly load reductions)

EXECUTIVE SUMMARY

The Chester Creek watershed is located in the Municipality of Anchorage (MOA), the urban center of the Anchorage Bowl in south-central Alaska. Chester Creek flows through University Lake and Westchester Lagoon. The state of Alaska included the entire length of Chester Creek, University Lake and Westchester Lagoon on its 1990 303(d) list as water quality-limited due to fecal coliform, identifying urban runoff as the expected pollutant source. These waters have been included on all subsequent state 303(d) listings. A Total Maximum Daily Load (TMDL) is established in this document for these waters to meet requirements of Section 303(d)(1)(C) of the Clean Water Act and the U.S. Environmental Protection Agency's (EPA) implementing regulations (40 CFR Part 130), which require the establishment of a TMDL for the achievement of water quality standards when a waterbody is water quality-limited. A TMDL is composed of the sum of individual waste load allocations (WLAs) for point sources and load allocations (LAs) for nonpoint sources and natural background loads. In addition, the TMDL must include a margin of safety (MOS), either implicitly or explicitly, that accounts for the uncertainty in the relationship between pollutant loads and the quality of the receiving waterbody. A TMDL represents the amount of a pollutant the waterbody can assimilate while maintaining compliance with applicable water quality standards. Although separate TMDLs could have been prepared for each of the three waters, DEC integrated them into one TMDL as University Lake and Westchester Lagoon are part of the mainstem flow of Chester Creek and have no other natural inlets or outlets.

Applicable water quality standards for fecal coliform bacteria in Chester Creek, University Lake, and Westchester Lagoons establish protection for designated uses of water supply, water recreation, and growth and propagation of fish, shellfish, and other aquatic life, and wildlife. The TMDLs are developed for the most stringent of these—the fecal coliform criteria for drinking, culinary, and food processing water supply that states that in a 30-day period, the geometric mean may not exceed 20 FC/100 mL, and not more than 10 percent of the samples may exceed 40 FC/100 mL (18 AAC 70.020(2)(b)(2)(A)(i)). If the water quality is restored to meet drinking water criteria it will also meet other designated use criteria.

Fecal coliform data indicate that Chester Creek, University Lake and Westchester Lagoons do not meet the applicable water quality standards related to drinking water or water recreation uses. The largest and most frequent exceedances of the water quality criteria occur during summer months, likely due to increased storm water runoff. Fecal coliform concentrations are lower during colder winter months that experience less storm water runoff. Concentrations steadily increase during spring months, with increased surface runoff during spring thaw and breakup. Because of the substantial seasonal variation in fecal coliform levels, the Chester Creek, University Lake, and Westchester Lagoons TMDLs are developed on a monthly basis to isolate times of similar weather, runoff and in-stream conditions.

Due to the water quality criteria being based on a 30-day geometric mean, the urban character of the watershed, previous modeling efforts made by MOA, and availability of USGS flow data, the Storm Water Management Model (SWMM) (USEPA, 2000) was selected to estimate existing and potential future fecal coliform counts in the Chester Creek watershed. SWMM simulates the quantity and quality of runoff produced by storms, as well as during baseflow conditions, and is one of the most advanced tools available for evaluating water quality in urban watersheds. SWMM simulates real storm events based on rainfall and other meteorological inputs, such as evaporation and temperature, and watershed transport, storage and management practices to predict runoff quantity and quality. At the subwatershed scale, SWMM provides predictions of daily fecal coliform counts, which allows for a direct comparison with Alaska's water quality standards.

The SWMM model was first calibrated to observed hydrology and fecal coliform counts for the period 1987 to 1993 and was then used to assess the effectiveness of various implementation options. Seven "analysis points" were identified to evaluate conditions at various points along Chester Creek and in

University Lake and Westchester Lagoon. The following nine tables summarize the results of the TMDL analysis. They indicate that significant reductions in existing loads throughout the watershed are necessary to meet water quality standards. Areas of the watershed with the highest fecal coliform loading rates tend to be residential land uses with a high degree of imperviousness and located in close proximity to the stream. MOA (2003) reports that the likely sources associated with these land uses are warm-blooded animal sources including domestic pets (particularly cats and dogs) and wild animals.

Although all of Chester Creek originally was listed in 1990, the stretch actually impaired is smaller. This document identifies the section of stream that monitoring data indicates is water-quality limited and recommends that the listing be amended to reflect the new boundaries. Specifically, the available monitoring data indicate that the portion of Chester Creek above the Municipality of Anchorage/ Fort Richardson property line is not water-quality limited by bacteria impairment.

Through an evaluation of information collected in developing this TMDL and in a fecal coliform assessment of Chester Creek done through a DEC grant to the University of Alaska (to be published in July 2005), DEC believes three potential sources of fecal coliform contribute little or insignificant loads of fecal coliform bacteria to the Chester Creek system: onsite septic systems, illegal campsites, and leaking sewage lines. DEC believes that waterfowl and wildlife contribute little fecal coliform through most of the watershed, but at some locations may contribute higher amounts at certain times of the year. As any contributions they provide are not resulting from human actions, they are not included in the TMDL loading allocations. This TMDL focuses on stormwater discharges as the main component. These discharges in the MOA are regulated by a National Pollutant Discharge Elimination System (NPDES) storm water permit for municipal separate storm sewer systems (MS4), watershed loads delivered to Chester Creek are addressed through the wasteload allocation component of this TMDL.

Implementation of the stormwater control actions in this TMDL will be achieved through actions associated with the MOA's MS4 permit. EPA recommends that for NPDES-regulated municipal and small construction storm water discharges effluent limits should be expressed as best management practices (BMPs) or other similar requirements, rather than as numeric effluent limits. This recognizes the need for an iterative approach to control pollutants in storm water discharges and anticipates that a suite of BMPs will be used in the initial rounds of permits and that these BMPs will be tailored in subsequent rounds. Follow-up monitoring will be coordinated between DEC and MOA to track the progress of TMDL implementation and subsequent water quality response, track BMP effectiveness, and track the water quality of Chester Creek, University Lake, and Westchester Lagoons to evaluate future attainment of water quality standards.

Although the SWMM scenarios in this TMDL did not show that fecal coliform bacteria will be reduced to levels meeting state water quality standards, DEC believes the standards will be met because of the following mitigating issues: 1) although SWMM is considered the best model for the type and amount of data available, it was not designed for Alaska’s extreme northern climate and could have predicted conservative reductions under the implementation scenarios; 2) the data used are 10-15 years old and do not reflect improvements in stormwater management known to have occurred since the data was collected; and 3) recent monitoring data[1] consistently shows fecal coliform levels are considerably lower than levels seen in data used to develop the TMDL, translating into fewer reductions needed to meet state water quality standards than projected by the model. DEC will continue to monitor these waters for levels of fecal coliform bacteria and if sampling results show the actions are not achieving the target levels, DEC will, in coordination with the MOA, consider and take other actions to adjust and meet the targets.

[1] In 2004, DEC contracted with the University of Alaska, Anchorage to collect temporal and spatial fecal coliform data on Chester Creek. Unfortunately the data collected could not used in developing the TMDL because there wasn’t any corresponding flow data need for SWMM.

Table ES-1. Summary of the Middle Fork Chester Creek TMDL (Analysis Point 112).

Month	Existing (FC/month)	Loading Capacity (FC/month)	Margin of Safety (FC/month)	Waste Load Allocation (FC/month)	Required Reduction
Jan	**3.11E+09**	**2.90E+09**	**2.90E+08**	**2.61E+09**	**7%**
Feb	**1.45E+12**	**4.78E+11**	**4.78E+10**	**4.30E+11**	**67%**
Mar	8.51E+11	3.21E+10	3.21E+09	2.89E+10	96%
Apr	9.58E+12	8.85E+10	8.85E+09	7.96E+10	99%
May	2.99E+12	6.75E+10	6.75E+09	6.08E+10	98%
Jun	1.10E+12	6.44E+10	6.44E+09	5.80E+10	94%
Jul	2.05E+12	6.55E+10	6.55E+09	5.90E+10	97%
Aug	5.13E+12	8.10E+10	8.10E+09	7.29E+10	98%
Sep	5.12E+12	8.07E+10	8.07E+09	7.26E+10	98%
Oct	1.15E+12	6.69E+10	6.69E+09	6.02E+10	94%
Nov	2.01E+11	4.23E+10	4.23E+09	3.81E+10	79%
Dec	**2.50E+10**	**1.80E+10**	**1.80E+09**	**1.62E+10**	**28%**
Annual	2.82E+13	6.46E+11	6.46E+10	5.81E+11	98%

Bold denotes monthly values assessed for not-to-exceed standard.
Annual loads are given in FC/year.

Table ES-2. Summary of the South Fork Chester Creek TMDL (Analysis Point 171).

Month	Existing (FC/month)	Loading Capacity (FC/month)	Margin of Safety (FC/month)	Waste Load Allocation (FC/month)	Required Reduction
Jan	5.18E+11	3.63E+10	3.63E+09	3.27E+10	93%
Feb	7.55E+11	3.75E+10	3.75E+09	3.38E+10	95%
Mar	2.01E+12	7.25E+10	7.25E+09	6.53E+10	96%
Apr	9.06E+12	1.97E+11	1.97E+10	1.77E+11	98%
May	6.87E+12	1.66E+11	1.66E+10	1.49E+11	98%
Jun	2.91E+12	1.46E+11	1.46E+10	1.32E+11	95%
Jul	3.23E+12	1.43E+11	1.43E+10	1.28E+11	96%
Aug	4.75E+12	1.74E+11	1.74E+10	1.56E+11	96%
Sep	4.92E+12	1.78E+11	1.78E+10	1.60E+11	96%
Oct	2.86E+12	1.52E+11	1.52E+10	1.37E+11	95%
Nov	1.57E+12	9.81E+10	9.81E+09	8.83E+10	94%
Dec	6.37E+11	5.80E+10	5.80E+09	5.22E+10	91%
Annual	4.01E+13	1.46E+12	1.46E+11	1.31E+12	96%

Annual loads are given in FC/year.

Table ES-3. Summary of the South Fork Chester Creek TMDL (Analysis Point 350).

Month	Existing (FC/month)	Loading Capacity (FC/month)	Margin of Safety (FC/month)	Waste Load Allocation (FC/month)	Required Reduction
Jan	6.42E+10	5.71E+10	5.71E+09	5.14E+10	11%
Feb	1.32E+11	5.96E+10	5.96E+09	5.36E+10	55%
Mar	9.09E+11	1.15E+11	1.15E+10	1.04E+11	87%
Apr	4.66E+12	2.99E+11	2.99E+10	2.69E+11	94%
May	2.88E+12	2.53E+11	2.53E+10	2.27E+11	91%
Jun	1.08E+12	2.29E+11	2.29E+10	2.06E+11	79%
Jul	1.26E+12	2.28E+11	2.28E+10	2.05E+11	82%
Aug	2.28E+12	2.77E+11	2.77E+10	2.49E+11	88%
Sep	2.22E+12	2.77E+11	2.77E+10	2.49E+11	88%
Oct	1.15E+12	2.37E+11	2.37E+10	2.13E+11	79%
Nov	5.77E+11	1.55E+11	1.55E+10	1.39E+11	73%
Dec	1.28E+11	9.01E+10	9.01E+09	8.11E+10	30%
Annual	1.73E+13	2.27E+12	2.27E+11	2.05E+12	87%

Annual loads are given in FC/year.

Table ES-4. Summary of the Chester Creek TMDL (Analysis Point 101).

Month	Existing (FC/month)	Loading Capacity (FC/month)	Margin of Safety (FC/month)	Waste Load Allocation (FC/month)	Required Reduction
Jan	**9.59E+09**	**8.69E+09**	**8.69E+08**	**7.82E+09**	**9%**
Feb	**1.26E+11**	**1.04E+11**	**1.04E+10**	**9.35E+10**	**18%**
Mar	**7.76E+11**	**4.02E+11**	**4.02E+10**	**3.62E+11**	**48%**
Apr	**4.28E+12**	**1.26E+12**	**1.26E+11**	**1.13E+12**	**71%**
May	**2.69E+11**	**1.50E+11**	**1.50E+10**	**1.35E+11**	**44%**
Jun	**2.69E+11**	**1.74E+11**	**1.74E+10**	**1.56E+11**	**36%**
Jul	**4.87E+11**	**2.76E+11**	**2.76E+10**	**2.49E+11**	**43%**
Aug	**9.51E+11**	**4.09E+11**	**4.09E+10**	**3.68E+11**	**57%**
Sep	**8.30E+11**	**3.89E+11**	**3.89E+10**	**3.51E+11**	**53%**
Oct	**2.85E+11**	**1.82E+11**	**1.82E+10**	**1.64E+11**	**36%**
Nov	**1.44E+11**	**1.01E+11**	**1.01E+10**	**9.11E+10**	**30%**
Dec	1.63E+10	1.63E+10	1.63E+09	1.47E+10	0%
Annual	**8.44E+12**	**3.47E+12**	**3.47E+11**	**3.12E+12**	**59%**

Bold denotes monthly values assessed for not-to-exceed standard.
Annual loads are given in FC/year.

Table ES-5. Summary of the Chester Creek TMDL (Analysis Point CH2).

Month	Existing (FC/month)	Loading Capacity (FC/month)	Margin of Safety (FC/month)	Waste Load Allocation (FC/month)	Required Reduction
Jan	1.21E+12	1.80E+11	1.80E+10	1.62E+11	85%
Feb	1.23E+12	1.85E+11	1.85E+10	1.66E+11	85%
Mar	1.98E+12	2.75E+11	2.75E+10	2.48E+11	86%
Apr	3.40E+12	5.03E+11	5.03E+10	4.53E+11	85%
May	2.84E+12	4.39E+11	4.39E+10	3.95E+11	85%
Jun	3.14E+12	3.73E+11	3.73E+10	3.35E+11	88%
Jul	3.45E+12	3.87E+11	3.87E+10	3.49E+11	89%
Aug	3.28E+12	4.58E+11	4.58E+10	4.12E+11	86%
Sep	2.69E+12	4.55E+11	4.55E+10	4.09E+11	83%
Oct	2.80E+12	3.91E+11	3.91E+10	3.52E+11	86%
Nov	2.91E+12	2.91E+11	2.91E+10	2.62E+11	90%
Dec	1.74E+12	2.13E+11	2.13E+10	1.92E+11	88%
Annual	3.07E+13	4.15E+12	4.15E+11	3.73E+12	86%

Annual loads are given in FC/year.

Table ES-6. Summary of the University Lake TMDL, Analysis Point 171.

Month	Existing (FC/month)	Loading Capacity (FC/month)	Margin of Safety (FC/month)	Waste Load Allocation (FC/month)	Required Reduction
Jan	5.18E+11	3.63E+10	3.63E+09	3.27E+10	93%
Feb	7.55E+11	3.75E+10	3.75E+09	3.38E+10	95%
Mar	2.01E+12	7.25E+10	7.25E+09	6.53E+10	96%
Apr	9.06E+12	1.97E+11	1.97E+10	1.77E+11	98%
May	6.87E+12	1.66E+11	1.66E+10	1.49E+11	98%
Jun	2.91E+12	1.46E+11	1.46E+10	1.32E+11	95%
Jul	3.23E+12	1.43E+11	1.43E+10	1.28E+11	96%
Aug	4.75E+12	1.74E+11	1.74E+10	1.56E+11	96%
Sep	4.92E+12	1.78E+11	1.78E+10	1.60E+11	96%
Oct	2.86E+12	1.52E+11	1.52E+10	1.37E+11	95%
Nov	1.57E+12	9.81E+10	9.81E+09	8.83E+10	94%
Dec	6.37E+11	5.80E+10	5.80E+09	5.22E+10	91%
Annual	4.01E+13	1.46E+12	1.46E+11	1.31E+12	96%

Annual loads are given in FC/year.

Table ES-7. Summary of the University Lake TMDL, Analysis Point ULO.

Month	Existing (FC/month)	Loading Capacity (FC/month)	Margin of Safety (FC/month)	Waste Load Allocation (FC/month)	Required Reduction
Jan	1.35E+11	5.71E+10	5.71E+09	5.14E+10	58%
Feb	2.02E+11	5.95E+10	5.95E+09	5.36E+10	71%
Mar	5.97E+11	1.10E+11	1.10E+10	9.92E+10	82%
Apr	3.67E+12	2.80E+11	2.80E+10	2.52E+11	92%
May	3.05E+12	2.48E+11	2.48E+10	2.23E+11	92%
Jun	1.15E+12	2.25E+11	2.25E+10	2.02E+11	80%
Jul	1.24E+12	2.21E+11	2.21E+10	1.99E+11	82%
Aug	1.97E+12	2.65E+11	2.65E+10	2.39E+11	87%
Sep	2.05E+12	2.68E+11	2.68E+10	2.41E+11	87%
Oct	1.14E+12	2.32E+11	2.32E+10	2.09E+11	80%
Nov	5.60E+11	1.53E+11	1.53E+10	1.38E+11	73%
Dec	2.06E+11	9.00E+10	9.00E+09	8.10E+10	56%
Annual	1.60E+13	2.21E+12	2.21E+11	1.99E+12	86%

Annual loads are given in FC/year.

Table ES-8. Summary of the Westchester Lagoon TMDL, Analysis Point CH2.

Month	Existing (FC/month)	Loading Capacity (FC/month)	Margin of Safety (FC/month)	Waste Load Allocation (FC/month)	Required Reduction
Jan	1.21E+12	1.80E+11	1.80E+10	1.62E+11	85%
Feb	1.23E+12	1.85E+11	1.85E+10	1.66E+11	85%
Mar	1.98E+12	2.75E+11	2.75E+10	2.48E+11	86%
Apr	3.40E+12	5.03E+11	5.03E+10	4.53E+11	85%
May	2.84E+12	4.39E+11	4.39E+10	3.95E+11	85%
Jun	3.14E+12	3.73E+11	3.73E+10	3.35E+11	88%
Jul	3.45E+12	3.87E+11	3.87E+10	3.49E+11	89%
Aug	3.28E+12	4.58E+11	4.58E+10	4.12E+11	86%
Sep	2.69E+12	4.55E+11	4.55E+10	4.09E+11	83%
Oct	2.80E+12	3.91E+11	3.91E+10	3.52E+11	86%
Nov	2.91E+12	2.91E+11	2.91E+10	2.62E+11	90%
Dec	1.74E+12	2.13E+11	2.13E+10	1.92E+11	88%
Annual	3.07E+13	4.15E+12	4.15E+11	3.73E+12	86%

Annual loads are given in FC/year.

Table ES-9. Summary of the Westchester Lagoon TMDL, Analysis Point CL2.

Month	Existing (FC/month)	Loading Capacity (FC/month)	Margin of Safety (FC/month)	Waste Load Allocation (FC/month)	Required Reduction
Jan	**1.48E+11**	**1.34E+11**	**1.34E+10**	**1.21E+11**	**9%**
Feb	2.14E+11	2.14E+11	2.14E+10	1.93E+11	0%
Mar	**5.41E+11**	**3.34E+11**	**3.34E+10**	**3.01E+11**	**38%**
Apr	1.13E+12	2.80E+11	2.80E+10	2.52E+11	75%
May	6.53E+11	2.58E+11	2.58E+10	2.33E+11	60%
Jun	6.00E+11	2.49E+11	2.49E+10	2.24E+11	59%
Jul	6.64E+11	2.59E+11	2.59E+10	2.33E+11	61%
Aug	8.94E+11	2.71E+11	2.71E+10	2.44E+11	70%
Sep	8.25E+11	2.62E+11	2.62E+10	2.36E+11	68%
Oct	6.14E+11	2.58E+11	2.58E+10	2.32E+11	58%
Nov	3.79E+11	2.33E+11	2.33E+10	2.10E+11	39%
Dec	2.24E+11	2.08E+11	2.08E+10	1.87E+11	7%
Annual	6.63E+12	2.92E+12	2.92E+11	2.63E+12	56%

Bold denotes monthly values assessed for not-to-exceed standard.
Annual loads are given in FC/year.

1.0 DESCRIPTION OF THE WATERSHED AND WATERBODIES

Section 303(d)(1)(C) of the Clean Water Act and the U.S. Environmental Protection Agency's (EPA) implementing regulations (40 CFR Part 130) require the establishment of a Total Maximum Daily Load (TMDL) for the achievement of state water quality standards when a waterbody is water quality-limited. A TMDL identifies the amount of pollution control needed to maintain compliance with standards and includes an appropriate margin of safety. The focus of the TMDL is reduction of pollutant inputs to a level (or "load") that fully supports the designated uses of a given waterbody. The mechanisms used to address water quality problems after the TMDL is developed can include a combination of best management practices and/or effluent limits required through National Pollutant Discharge Elimination System (NPDES) permits.

The state of Alaska first included Chester Creek, University Lake and Westchester Lagoon on its 1990 303(d) list as water quality-limited due to fecal coliform and identified urban runoff as the expected pollutant source. These waters have been included on all subsequent 303(d) lists. This document establishes a TMDL to address the fecal coliform impairment throughout the Chester Creek watershed, including University Lake and Westchester Lagoon.

1.1 Location

The Chester Creek watershed is located in south-central Alaska, and is bounded on the east by the Chugach Mountains, on the north by the Ship Creek watershed, and on the south by the Campbell Creek watershed (see Figure 1-1). The basin lies entirely within Anchorage Borough and drains an area of approximately 30.2 square miles. Additionally, the Chester Creek watershed lies within the approximate 1,000 square mile, 8-digit U.S. Geological Survey hydrologic unit code (HUC) 19020401. University Lake and Westchester Lagoon are located within the Chester Creek watershed and are hydrologically connected to Chester Creek as shown in Figure 1-1.

The headwaters of Chester Creek are in the Chugach Mountains that form the eastern boundary of the Municipality of Anchorage (MOA). From the headwater region, the main stream flows toward the northwest and upon reaching the municipality flows to the west, through University Lake and Westchester Lagoons, and ultimately discharges into Cook Inlet.

For the purposes of storm water and drainage management, the MOA has identified three major subwatersheds within the Chester Creek watershed: the Lower Chester Creek subwatershed, the Upper Chester Creek subwatershed, and the Headwaters subwatershed (Figure 1-2; MOA, 2002). The Lower Chester Creek subwatershed is further subdivided into the Westchester drainage and the North Fork of Chester Creek drainage. Likewise, the Upper Chester subwatershed is comprised of the Middle Fork of Chester Creek drainage, the South Fork of Chester Creek drainage, and the Reflection Lake drainage. The Headwaters subwatershed is defined by the drainage divide of the Chugach Mountains, which forms the eastern-most boundary of the entire Chester Creek watershed, and the eastern boundary of the Municipality of Anchorage. Table 1-1 summarizes the major subwatersheds and drainages within the Chester Creek watershed.

Table 1-1. Major Subwatersheds and Drainages within the Chester Creek Watershed.

Subwatershed Name	Area Acres	Area Square Miles
Lower Chester Creek	**3,838.6**	**6.0**
• Westchester drainage	2,703.9	4.2
• North Fork of Chester Creek drainage	1,134.7	1.8
Upper Chester Creek	**9,297.0**	**14.5**
• Middle Fork of Chester Creek drainage	2,354.3	3.6
• South Fork of Chester Creek drainage	6,563.2	10.3
• Reflection Lake drainage	379.5	0.6
Headwaters	**6,226.2**	**9.7**
Total Watershed Area	**19,361.8**	**30.2**

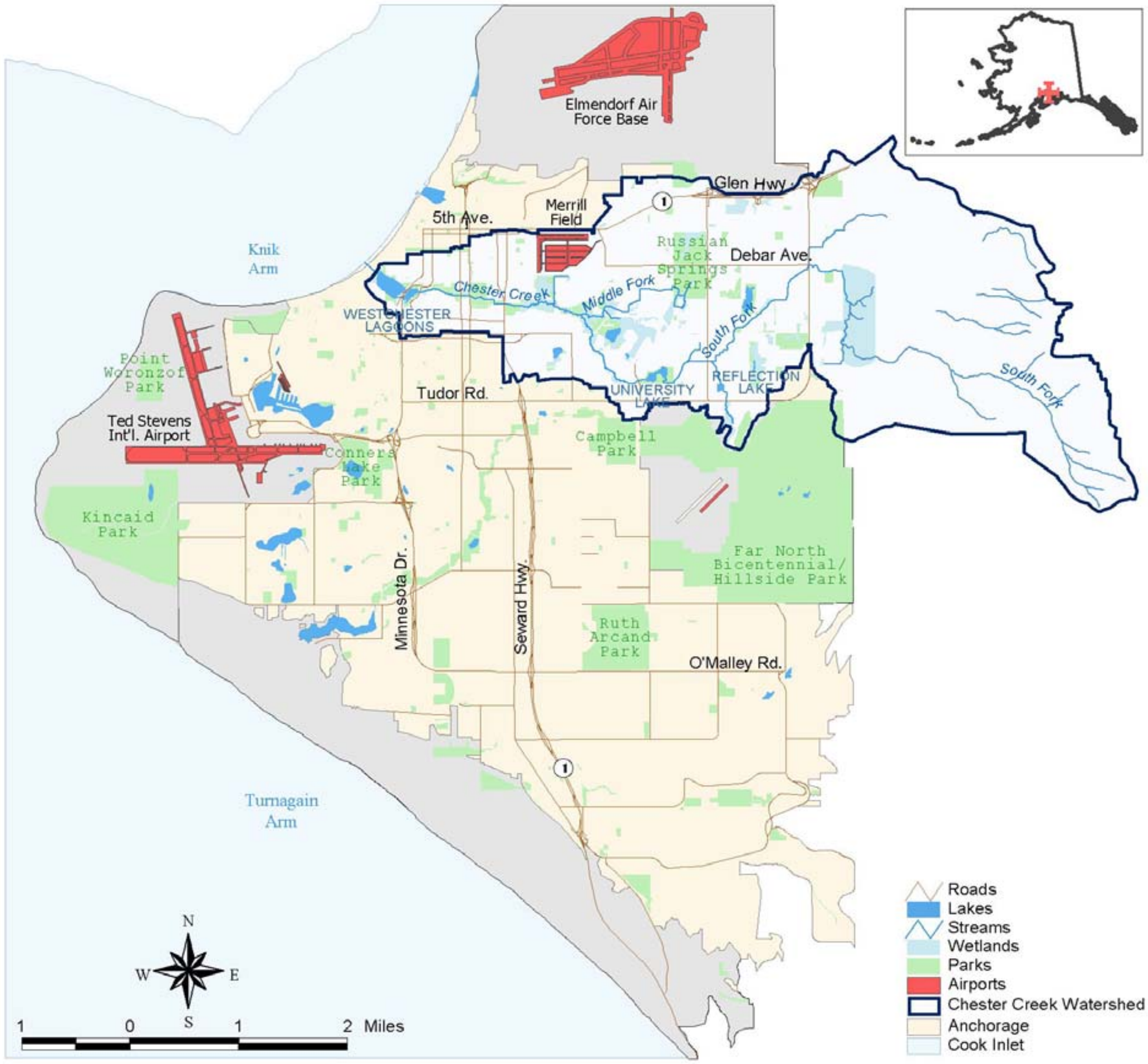


Figure 1-1. Location of the Chester Creek watershed.

1.2 Population

Population within the Chester Creek watershed was estimated using geographic information systems (GIS) analysis that incorporated 2000 census block data for the basin. Block level spatial and census data for the Municipality of Anchorage were downloaded from the online Geography Network (2002) and clipped to the watershed boundary. Population was then summed for each block within the watershed. The analysis resulted in an estimated population of 78,262 persons and a total of 30,319 households within the basin.

1.3 Topography

Elevations in the Chester Creek watershed range from 1,357 feet above sea level along the drainage divide in the Chugach Mountains to zero feet above sea level at the outlet into Cook Inlet. The rate of fall varies from an average of 931 feet per mile in the eastern mountainous region of the basin to an average of 73 feet per mile in the western portion of the basin. Slope gradients in the extreme western portion of the watershed are very low.

1.4 Land Cover

Information on land use and land cover is important because they significantly affect a stream's hydrology and water quality. MOA offers the best available land cover data for the Chester Creek watershed (MOA, 2002). The land cover data were derived from satellite imagery in the summer of 2000 and classified to provide information best suited for storm water management applications.

The land cover data include five major classes: Impervious, Barren Pervious, Vegetated Pervious, Snow and Ice, and Water. These land cover classes were further subdivided to reflect changes in perviousness due to different land development applications. For example, impervious surfaces are classified as either street surface, directly connected impervious, or indirectly connected impervious. Values for hydraulic connectedness (direct or indirect connection) are attributed to each mapped land parcel independently of the degree of surrounding pervious land cover. Vegetation classes were reclassified as either landscaped or forested. Wetlands were derived from features mapped by the MOA and superimposed on the land cover data. The MOA land cover classification scheme is given in Table 1-2.

Land cover in the Chester Creek watershed is shown in Figure 1-2 and summarized in Table 1-3. Figure 1-2 shows that at the higher elevations in the upper portion of the Chester Creek watershed, land cover is primarily forest with tenure by the federal government (military lands) and state parklands (Brabets et al., 1999). The lower portion of the watershed is dominated by urban residential and commercial land uses. Forest cover accounts for 51.3 percent of the total land cover in the basin (Table 1-3), while urban land covers (landscape, impervious surfaces, and streets) account for 42 percent of the total land cover in the basin.

Table 1-2. The Municipality of Anchorage land cover classification system

Land Cover	Land Cover Description
Impervious	Large paved areas, parking lots, and rooftops.
Directly Connected Impervious	Impervious features (not including roads) that are immediately adjacent to paved roads and spatially intersect a 60-foot buffer from the edge of pavement. For example, a large parking lot that extends beyond 60 feet from the edge of a paved road will be categorized as directly connected impervious as long as a portion of that feature enters a 60-foot buffer from an adjacent roadway.
Indirectly Connected Impervious	Areas that do not intersect the 60-foot buffer from the edge of pavement are classified as Indirectly Connected Impervious (ICI). These include impervious areas that are adjacent and/or within the vicinity of dirt or unpaved roads.
Streets	Paved roadways.
Landscaped	Parks, open fields, residential yards, large areas of non-forested and non-wetland vegetation.
Forested	Areas of tree canopy—natural forest.
Barren	Includes areas of zero or little vegetation, exposed soil, non-active land-cover.
Wetland	Moist areas containing vegetation, marshes, bogs.
Lakes/Water	Areas of exposed water bodies, reservoirs.

Table 1-3. Land cover within the Chester Creek watershed.

Land Cover/Land Use	Area		Percent of Watershed Area
	Acres	Square Miles	
Forested	10,015.6	15.5	51.3
Landscaped	3,233.3	5.1	16.9
Directly Connected Impervious	2,746.9	4.3	14.2
Street	1,381.2	2.2	7.3
Wetland	1,124.4	1.8	6.0
Indirectly Connected Impervious	692.3	1.1	3.6
Lakes	156.7	0.2	0.7
Barren	11.5	< 0.1	< 0.1
Total	**19,361.9**	**30.2**	**100.0**

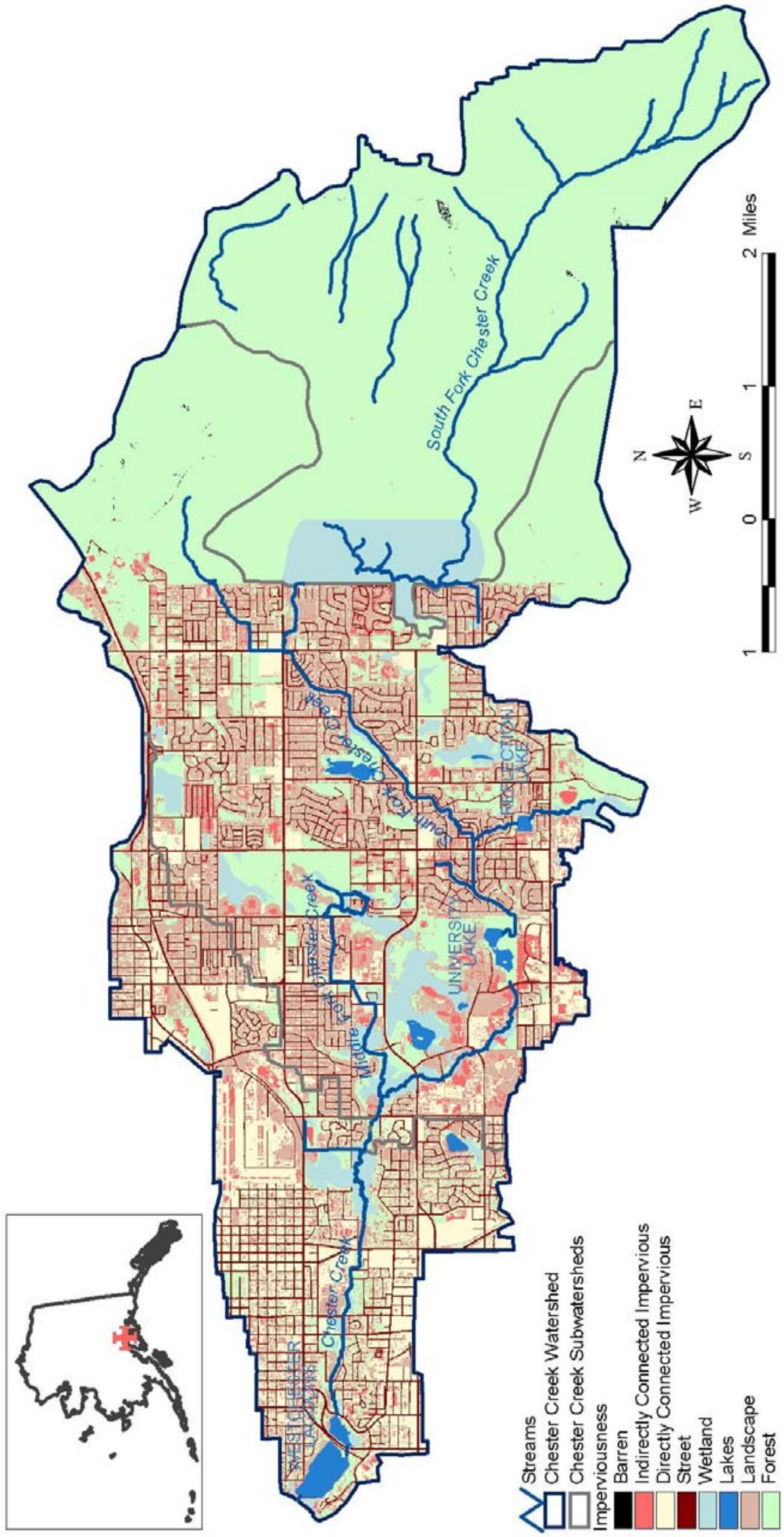


Figure 1-2. Chester Creek watershed MOA land cover classification.

Land cover may also be examined within major subwatershed divisions. Table 1-4 presents land cover within each of the three major subwatersheds in the Chester Creek basin. As seen in the table, the Lower Chester Creek subwatershed is the most urbanized subwatershed, with landscape, impervious surfaces, and streets accounting for 80.8 percent of the subwatershed area. Significant urbanization also occurs in the Upper Chester Creek subwatershed where landscape, impervious surfaces, and streets account for 53 percent of the total subwatershed area. A large portion of the Upper Chester Creek subwatershed, approximately 40 percent of the total subbasin area, is comprised of forest cover. In contrast to the lower portions of the Chester Creek watershed, the Headwaters subwatershed is comprised primarily of forested lands and wetlands, which together represent 99.8 percent of the total subwatershed area.

Table 1-4. Land cover within the major subwatersheds of the Chester Creek watershed.

Subwatershed Name	Area		Percent of Watershed Area
	Acres	Square Miles	
Lower Chester Creek			
Directly Connected Impervious	1,515.7	2.4	39.4
Landscaped	763.1	1.2	19.9
Street	581.8	0.9	15.2
Forested	525.0	0.8	13.7
Indirectly Connected Impervious	241.5	0.4	6.3
Wetland	129.7	0.2	3.4
Lakes	81.8	0.1	2.1
Subwatershed Total	**3,838.6**	**6.0**	**100.0**
Upper Chester Creek			
Forested	3,753.3	5.9	40.4
Landscaped	2,469.5	3.9	26.7
Directly Connected Impervious	1,231.1	1.9	13.2
Street	799.3	1.2	8.6
Wetland	515.5	0.8	5.5
Indirectly Connected Impervious	450.2	0.7	4.8
Lakes	74.9	0.1	0.8
Barren	3.2	< 0.1	< 0.1
Subwatershed Total	**9,297.0**	**14.5**	**100.0**
Headwaters			
Forested	5737.3	9.0	92.1
Wetland	479.2	0.7	7.7
Landscaped	0.8	< 0.1	< 0.1
Barren	8.2	< 0.1	0.1
Directly Connected Impervious	0.0	< 0.1	< 0.1
Indirectly Connected Impervious	0.6	< 0.1	< 0.1
Street	0.1	< 0.1	< 0.1
Subwatershed Total	**6,226.2**	**9.7**	**100.0**

1.5 Climate

Searby (1968) identified three distinct climate zones in the Cook Inlet region: continental, transition, and maritime. These climate zones are broadly defined by variations in precipitation and temperature. Chester Creek lies within the transition climate zone, where average annual precipitation is roughly 16 inches and annual average temperature is around 27 °F.

Figure 1-3 presents monthly average precipitation, snowfall, and temperature for Anchorage Ted Stevens International Airport (cooperative station number 500280) located at an elevation of 131.9 feet above sea level (WRCC, 2002). Figure 1-3 shows that the data for Anchorage fits within the transition climate zone discussed above, although average annual precipitation for the station is 15.7 inches, a bit lower than the zonal average. However, elevations in the eastern portion of the basin exceed 1,000 feet and precipitation is expected to increase accordingly. An average minimum monthly temperature of 15.8 °F occurs in January and an average maximum monthly temperature of 58.4 °F occurs in July. Most of the precipitation occurs from June through December, peaking in late summer during August and September with monthly mean precipitation of 2.7 inches and 2.6 inches, respectively. Snowfall occurs from September through May, with the greatest snowfall occurring during the months of December, February, and November.

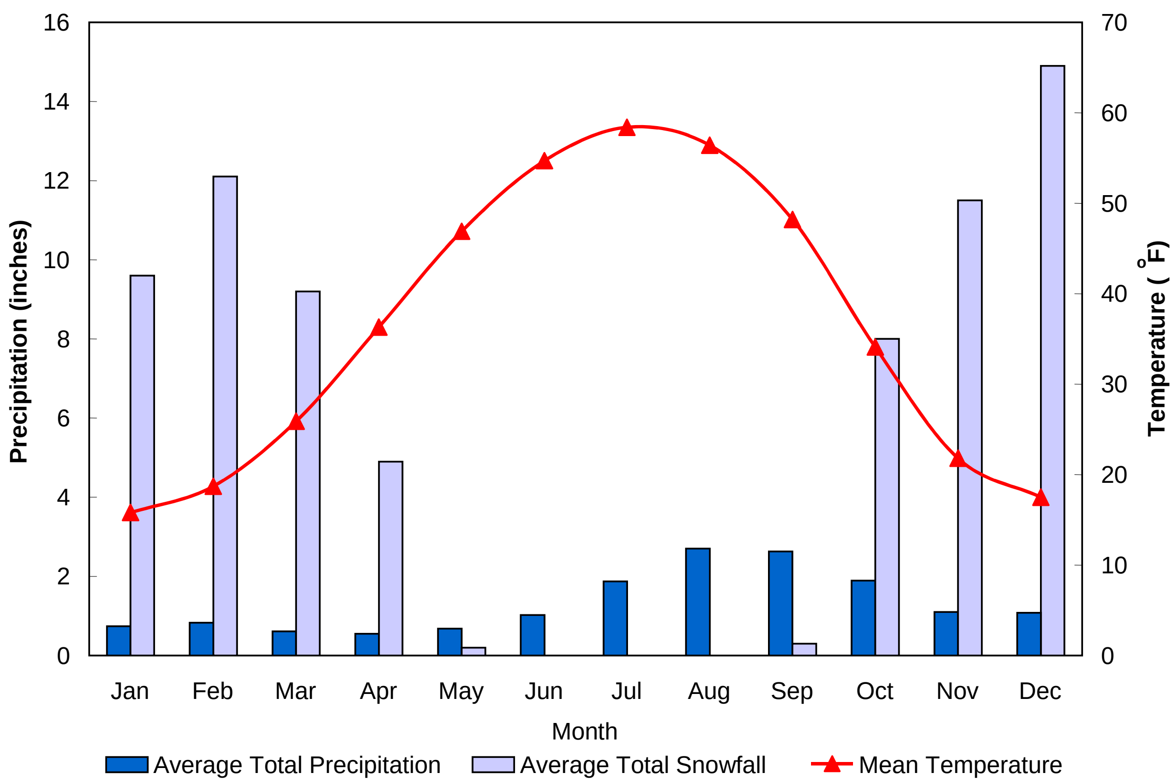


Figure 1-3. Climate summary for Anchorage Ted Stevens International Airport. Data cover the period April 1, 1952 to March 31, 2003.

1.6 Hydrology

Chester Creek originates from the combined flow of smaller tributary streams located in the Chugach Mountains. The creek flows through Anchorage on the way to its mouth along the Cook Inlet. Ice cover affects streams for a significant part of the year. Ice typically forms over the streams in late November to early December and open water reappears around the beginning of April (Ourso, 2001). The time of ice cover varies according to the elevation of a particular segment of the stream.

As shown in Figure 1-2, MOA has identified three major subwatersheds in the Chester Creek basin: the lower Chester Creek subwatershed, the upper Chester Creek subwatershed, and the headwaters of the Chester Creek watershed. The lower Chester Creek subwatershed is defined at its upper-most reach by a point just downstream of the confluence of the South Fork and Middle Fork of Chester Creek, and at its lower-most reach by the outlet of Westchester Lagoon to Cook Inlet. The upper Chester Creek subwatershed unit is bounded by the limits of the municipality at it upper-most reach, and the confluence of the South Fork and Middle Fork of Chester Creek at its lower-most reach. The headwaters subwatershed is defined by the drainage divide at the upper-most reach and the limits of the municipality at its lower-most reach.

Much of Chester Creek has been modified through wetland drainage for development and Westchester Lagoon and University Lake are two man-made waterbodies directly connected to Chester Creek. Westchester Lagoon is located in the lowermost portion of the watershed. A dam with a concrete weir was constructed across the Chester Creek estuary in 1971 forming the Westchester Lagoon (Davis and Muhlberg, 2001). Minnesota Drive and Spenard Road divide the lagoon into three sections. The upper lagoon basin is located from the mouth of Chester Creek to Spenard Road and covers approximately two acres. The upper basin is a major site for sediment deposition within the Chester Creek system. The middle basin lies between Spenard Road and Minnesota Road and cover 17 acres. The middle basin provides most of the waterfowl nesting and rearing area in the lagoon. The lower basin extends from Minnesota Road to the concrete weir, and covers approximately 65 acres. The lower basin provides recreational opportunities for canoeists and kayakers, and habitat for waterfowl. Overall the lagoon basin system is very shallow with maximum depths of 1.5 feet in the upper, most eastern basin, 5-feet in the middle basin, and 22 feet near the weir in the old stream channel in the lower, larger basin.

University Lake is located on the South Fork of Chester Creek and has a surface area of approximately 35 acres. The lake was originally a gravel pit subject to groundwater intrusion. Chester Creek was channeled through the gravel pit in 1983 forming University Lake. The lake does not have any control structures and is typically regarded as a wide stream reach in the South Fork of Chester Creek. The lake is used for recreational purposes, such as boating and fishing, and provides a nesting and rearing area for waterfowl.

The United States Geological Survey (USGS) has measured continuous streamflow in Chester Creek at two stations (15275000 and 15275100) over the past 34 years. Only one of these stations (USGS stream gage 15275100) is in operation today and is located on Arctic Boulevard, near the stream outlet into Westchester Lagoons. This gage site has a long-term mean annual flow of 21 cubic feet per second (cfs). Long-term daily average flow for the site is presented in Figure 1-4. The figure shows that daily mean flows peak in late April due primarily to snowmelt and again in early fall, primarily in response to precipitation. The amount of water available in Chester Creek at any given time and location is impacted by a variety of consumptive uses and by the influence of shallow and deep-water aquifers (groundwater systems) through natural processes and disturbances within the streambed. In turn, some water is gained from returns by non-consumptive users and from springs from groundwater systems. In addition, seasonal flow fluctuations make available stream flow highly variable, while most consumptive user demand tends to be more constant. The exceptions are seasonal uses such as golf course irrigation, watering of lawns and trees, etc.

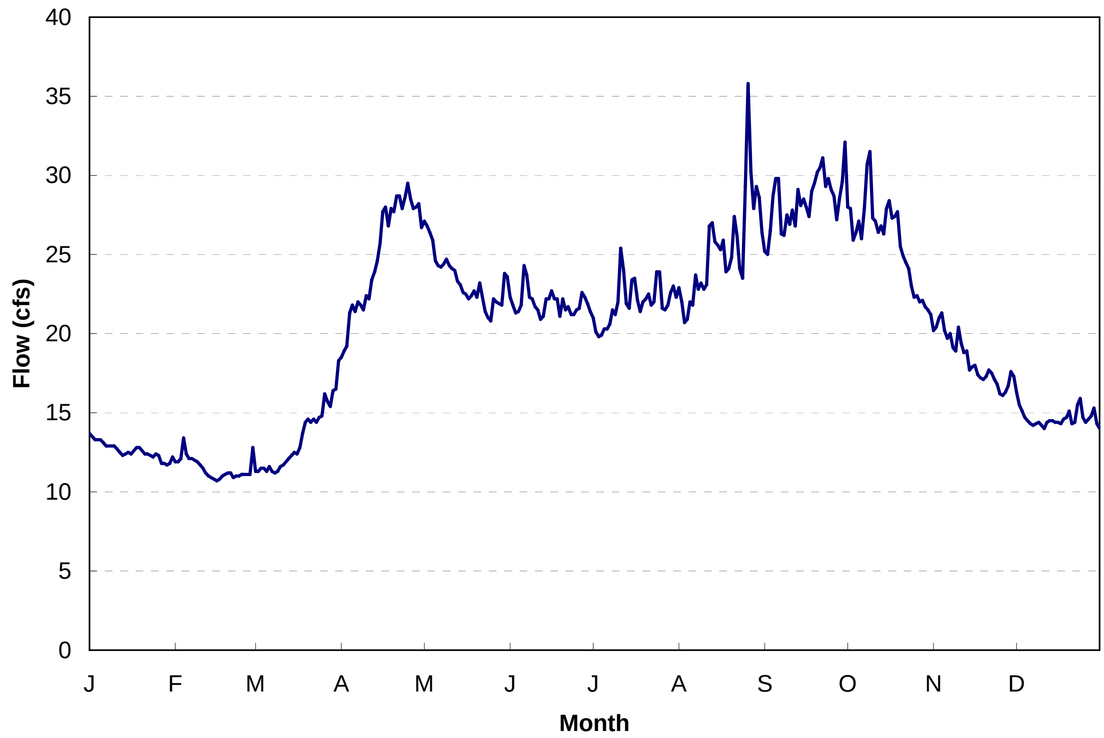


Figure 1-4. Average daily streamflow in Chester Creek at USGS stream Gage # 15275100. Data cover the period June 17, 1966 to September 30, 2001.

2.0 WATER QUALITY STANDARDS, TMDL TARGET AND AREA OF COVERAGE

The purpose of developing a TMDL is to identify the allowable loads of a pollutant such that water quality standards will be met. This section of the report presents the water quality standards for fecal coliform that apply to Chester Creek, University Lake, and Westchester Lagoon.

2.1 Applicable Water Quality Standards

Within the State of Alaska, water quality standards are published pursuant to Title 46 of the Alaska Statutes (AS). Regulations dealing with water quality (46.03.02 & 46.03.080) are found in Title 18, Chapter 70 of the Alaska Administrative Code (AAC). Through the adoption of water quality standards, Alaska has defined the beneficial uses to be protected in each of its drainage basins and the criteria necessary to protect these uses (see Table 2-1).

Water quality criteria are developed for each designated use and give guidance on how much pollution a waterbody can accommodate while still supporting the designated uses. The most stringent of Alaska's water quality standards with respect to fecal coliform bacteria (FC) is for drinking, culinary, and food processing water supply. The applicable standard states that

> *In a 30-day period, the geometric mean may not exceed 20 FC/100 mL, and not more than 10% of the samples may exceed 40 FC/100 mL. (*18 AAC 70.020(2)(b)(2)(A)(i)*)*

The TMDL must therefore identify the allowable load (or loading capacity) such that both the 30-day geometric mean and the not-to-exceed portions of the standards will be met.

Table 2-1. Alaska water quality standards for fecal coliform.

Water Use	Description of Standard
(A) Water Supply (i) drinking, culinary and food processing	In a 30-day period, the geometric mean may not exceed 20/FC/100 ml, and not more than 10% of the samples may exceed 40 FC/100 ml. For groundwater, the FC concentration must be less than 1 FC/100 ml, using the fecal coliform Membrane Filter Technique, or less than 3 FC/100 ml, using the fecal coliform most probable number (MPN) technique.
(A) Water Supply (ii) agriculture, including irrigation and stock watering	The geometric mean of samples taken in a 30-day period may not exceed 200 FC/100 ml, and not more than 10% of the samples may exceed 400 FC/100 ml. For products not normally cooked and for dairy sanitation of unpasteurized products, the criteria for dinking water supply, (1)(A)(i), apply.
(A) Water Supply (iii) aquaculture	For products normally cooked, the geometric mean of samples taken in a 30-day period may not exceed 200 FC/100 ml, and not more than 10% of the samples may exceed 400 FC/100 ml. For products not normally cooked, the criteria for drinking water supply, (1)(A)(i), apply.
(A) Water Supply (iii) Industrial	Where worker contact is present, the geometric mean of samples taken in a 30-day period may not exceed 200 FC/100 ml, and not more than 10% of the samples may exceed 400 FC/100 ml.
(B) Water Recreation (i) contact recreation	In a 30-day period, the geometric mean of samples may not exceed 100 FC/100 ml, and not more than one sample or more than 10% of the samples if there are more than 10 samples, may exceed 200 FC/100 ml.
(B) Water Recreation (ii) secondary contact	In a 30-day period, the geometric mean of samples may not exceed 200 FC/100 ml, and not more than 10% of the total samples may exceed 400 FC/100 ml.
(C) Growth and Propagation of Fish, Shellfish, other Aquatic Life and Wildlife	Not applicable.

2.2 Designated Use Impacts

Designated uses for Alaska's waters are established by regulation and are specified in the State of Alaska Water Quality Standards (18 AAC 70). For fresh waters of the state, designated uses include (1) water supply, (2) water recreation, and (3) growth and propagation of fish, shellfish, other aquatic life, and wildlife. Chester Creek does not support its designated uses of water supply and water recreation due to elevated fecal coliform levels. The presence of fecal coliform indicates an increased risk of pathogen contamination. Consumption of or contact with pathogen-contaminated water can result in a variety of gastrointestinal, respiratory, eye, ear, nose, throat, and skin diseases.

2.3 Area of Coverage

Because of the lack of delineating information at the time of listing, all of Chester Creek was listed as impaired. However, monitoring data included in the studies listed in Section 3.1 below show the portion of Chester Creek above the Municipality of Anchorage/ Fort Richardson property line is not water-quality limited by bacteria impairment. Based on the evaluation of this data, this document proposes a new boundary for the 303(d)-listed stretch. The TMDL concludes that the actual water-quality limited areas are the upper and lower subwatershed areas from the Municipal/Fort Richardson property line to the Cook Inlet. The section of stream is best depicted in Figure 3-1.

3.0 DATA ANALYSIS

Several important previous water quality studies have been performed for the Chester Creek watershed. These earlier studies provide some insight to the fecal coliform loadings in the Chester Creek watershed and were consulted during the development of the TMDL. This section of the report summarizes these previous studies and also presents the available fecal coliform sampling data.

3.1 Previous Studies

Brabets (1986) performed a water quantity and quality study of the Chester Creek watershed and found that water quality in the watershed varies according to season and flow conditions. The study found that average fecal coliform counts in Chester Creek ranged from 211 to 4,000 FC/ 100 mL, and that fecal coliform counts near the mouth of Chester Creek exceeded water quality standards during all flow ranges. The study also concluded that the primary source of fecal coliform bacteria originated from residential areas.

MOA conducted a water quality monitoring program, of which fecal coliform was one of the observed parameters, that included nine stations in the Chester Creek watershed during the period 1986 to 1994. The data observed during the monitoring period suggest that fecal coliform counts were lowest in the winter months and increased in the spring during snowmelt. MOA concluded that the primary source of fecal coliform bacteria was storm drain runoff from urban areas (MOA, 1990).

A draft water quality assessment for Chester Creek was completed in April 1993 (ADEC, 1993). The assessment concluded that the Chester Creek drainage was water-quality limited due to violations of the fecal coliform standard. Potential point sources identified included Merrill Field Landfill and public sanitary sewers upstream of University Lake. To alleviate the impact of the landfill, the report recommended that North Fork of Chester Creek be rerouted around the landfill facility. This project was begun in 1993 and is now completed. Potential nonpoint sources identified by the report include urban runoff, waterfowl, and domestic animals.

The USGS collected fecal coliform in five creeks characterized as “undeveloped”, “semi-developed”, and “developed areas” in Anchorage from August 19 to September 4, 1998 (USGS, 1999). Included in this study were three samples collected from an undeveloped site on upper Chester Creek, located on Fort Richardson approximately three miles upstream from Muldoon Road. Additionally, one sample was collected on a developed site in the lower reach of Chester Creek, near Arctic Boulevard. The data collected at the undeveloped site in upper Chester Creek ranged from 2 FC/100 ml to 10 FC/100 ml, while the single sample collected in the developed portion of lower Chester Creek yielded 80 FC/100 ml.

Frenzel and Couvillion (2002) evaluated fourteen sites in Anchorage to determine the effects of urbanization on water quality. Three of the sites were on Chester Creek and a total of sixteen samples were collected from these three stations during the period March 2000 to November 2000. As part of the overall study the authors concluded that higher counts of fecal coliform, *Escherichia coli*, and enterococci were measured at the most urbanized sites. They also found that fecal indicator bacteria counts were higher in the summer than in the winter, but that seasonal differences were not significant.

MOA released a report in 2003 discussing fecal coliform sources and transport processes in Anchorage streams (MOA, 2003). This report indicated that the least likely sources of fecal coliform included municipal community piped sanitary sewer systems, on-site wastewater disposal systems, and street surfaces. MOA investigators attributed the primary source of fecal coliform concentrations to animal (non-human) origin. Warm-blooded animal sources include domestic pets (particularly cats and dogs) and wild animals (particularly terrestrial and aquatic birds, shrews, rabbits, rodents, foxes, coyotes, wolves, bears, and moose). MOA also suggests that elevated fecal coliform concentrations result from a complex relationship between sources and transport processes within local storm drainage systems and the streams themselves.

3.2 Data Inventory

The fecal coliform data collected by MOA during the period 1986 to 1994 are the data used in this study because they are the most recent data set with both good spatial and temporal coverage and have corresponding USGS flow data [1]. The data are available at eleven different stations within the Chester Creek watershed. The locations of these stations are shown in Figure 3-1 relative to the major subwatersheds comprising the Chester Creek drainage. Most data are from the period 1988 to 1994, although some older and a few more recent data are also available.

3.3 Data Analysis

The available fecal coliform data in Chester Creek were compared to the geometric mean and not-to-exceed standards to evaluate impairment and water quality standards violations. Table 3-1 presents the results of the not-to-exceed comparison for each standard. All stations exceeded the standard more than 10 percent of the time.

Table 3-1. Summary of available fecal coliform data for Chester Creek.

Station	No. of Samples	Start Date	End Date	Min	Average	Max	Over 40 FC/100 mL	
							No.	Percentage
CH11	62	3/16/1993	12/20/1994	0	442	7,000	53	85%
CH10	58	3/16/1993	9/30/1994	0	147	2,500	18	31%
CH9	431	4/15/1986	9/30/1994	0	564	28,000	365	85%
CH7A	375	12/16/1987	9/30/1994	0	133	3,940	159	42%
CH7	409	4/15/1986	9/17/1992	0	555	27,600	167	41%
CH6	354	4/15/1988	9/30/1994	0	136	4,400	192	54%
ULI	371	1/20/1988	9/30/1994	0	524	12,089	340	92%
ULO	369	1/20/1988	9/30/1994	0	135	6,100	224	61%
CH2	94	4/15/1986	2/5/1988	8	417	2,800	88	94%
CL3	281	3/31/1988	9/30/1994	0	210	20,000	156	56%
CL2	341	3/31/1988	12/20/1994	0	371	24,000	217	64%

For comparison to the geometric mean criterion, geometric means were calculated for every possible 30-day period included in the dataset, based on all individual observations within that 30-day period. The results are summarized Tables 3-2 to 3-10 and Figures 3-2 to 3-10. The tables include the monthly average, median, minimum, maximum, and 25th and 75th percentiles of all calculated geometric means. The tables also present a ratio and percentage of the number of 30-day geometric means included in each month that exceed the 20 FC/100 mL criterion ("Exceedances: Count" and "Percentage of Exceedances"). The highest levels of bacteria in Chester Creek generally occur during the summer months (July to September), possibly due to the increased rain events and resulting storm water runoff. Freezing

[1] The data used for this study are based on a report provided by ADEC to Tetra Tech during a site visit in 2000. The data were not available electronically and therefore had to be manually input to a database to allow for analysis and modeling. The data were evaluated for quality assurance purposes to screen for data entry errors but no other testament can be made as to the quality of the data.

temperatures during October and November decrease surface runoff, resulting in lower in-stream bacteria counts. Slight increases in bacteria during December and January are likely due to occasional periods of above-freezing temperatures and runoff-producing thaw. Runoff from the spring break-up and thaw result in increasing bacteria counts from March to April. A brief discussion of seasonal patterns at each site follows. The sites are discussed moving from upstream to downstream locations.

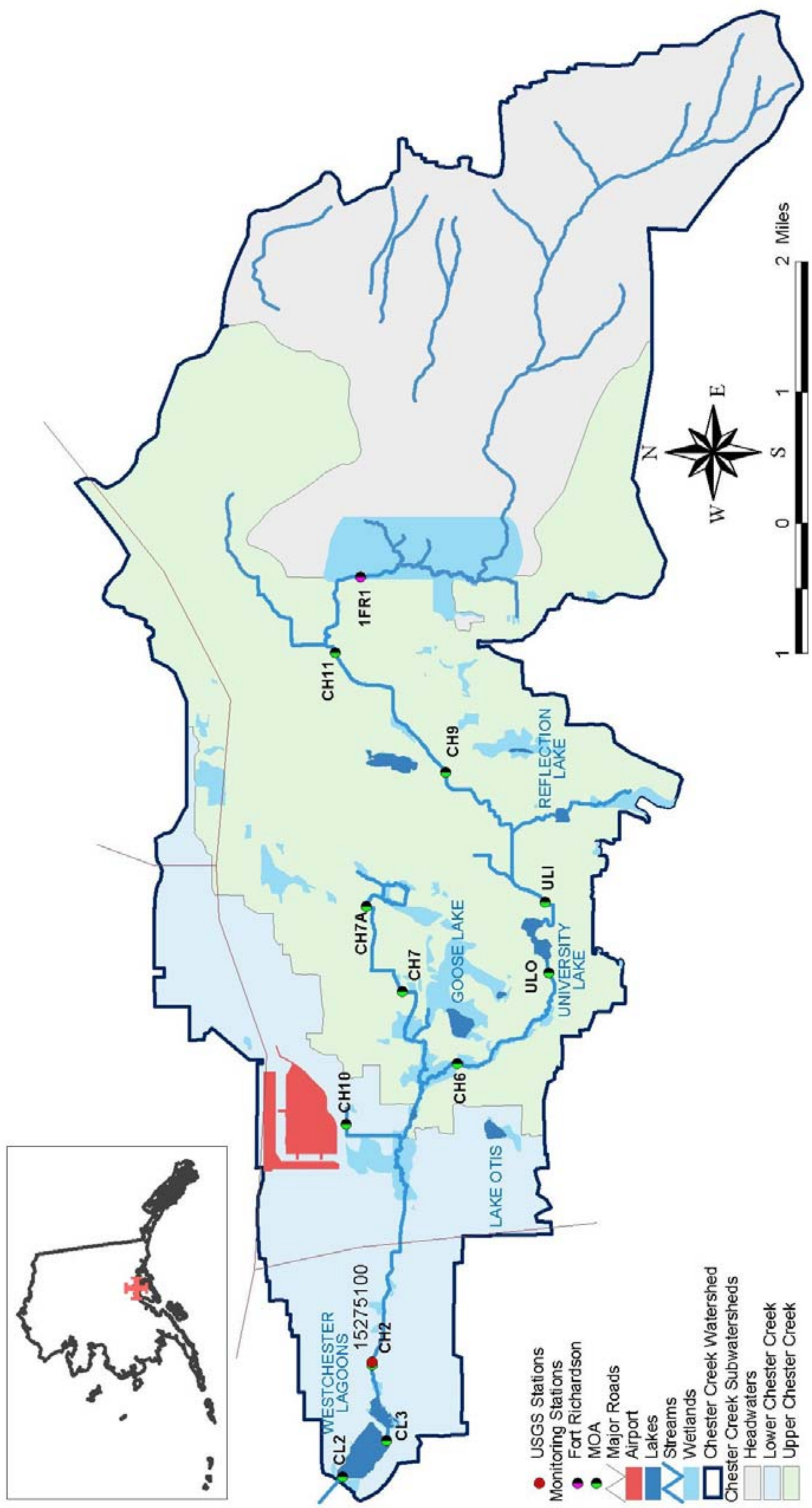


Figure 3-1. Location of MOA monitoring stations and modeling units.

3.3.1 Station CH11, South Fork Chester Creek, Upper Chester Creek Subwatershed

Station CH11 is located on the South Fork of the Chester Creek drainage and is the most upstream sampling station. Although it drains a predominantly forested watershed, the area immediately upstream includes land cover classified by MOA as mobile home parks and multi-family homes. There are also approximately 10 storm water outfalls upstream of the station. Sampling data are available for the period March 16, 1993 to December 20, 1994 and the results are summarized in Table 3-2 and Figure 3-2.

Counts of fecal coliform at station CH11 appear to have a bimodal distribution, with peaks during late winter and late summer. Counts increase steadily from May to September and then begin to decrease during the winter. Most calculated 30-day geometric means exceed the water quality standard.

Table 3-2. Summary statistics of geometric means calculated using observed fecal coliform data at station CH11. Data cover the period March 16, 1993 to December 20, 1994.

Month	Average[1]	Median[1]	Min[1]	Max[1]	25th[1]	75th[1]	Exceedances: Count[2]	Percentage of Exceedances[3]
Jan	27	28	15	35	23	35	4:5	80%
Feb	217	217	87	347	152	282	2:2	100%
Mar	144	97	34	300	66	199	3:3	100%
Apr	115	122	92	131	107	127	3:3	100%
May	59	51	43	98	45	63	6:6	100%
Jun	149	133	79	247	93	201	8:8	100%
Jul	470	153	101	1076	140	839	7:7	100%
Aug	513	511	242	937	385	574	9:9	100%
Sep	495	482	86	944	333	644	15:15	100%
Oct	402	402	346	458	374	430	2:2	100%
Nov	63	63	63	63	63	63	1:1	100%
Dec	33	42	0	47	30	45	3:4	75%

[1]Average, median, minimum, maximum and 25th and 75th percentile values of all 30-day geometric means calculated for the month (i.e., using samples within the month).
[2] Ratio of number of calculated 30-day geometric means that exceed the water quality criterion to the number of calculated 30-day geometric means in the month.
[3] Percentage of all calculated 30-day geometric means for the month that exceed the water quality criterion.

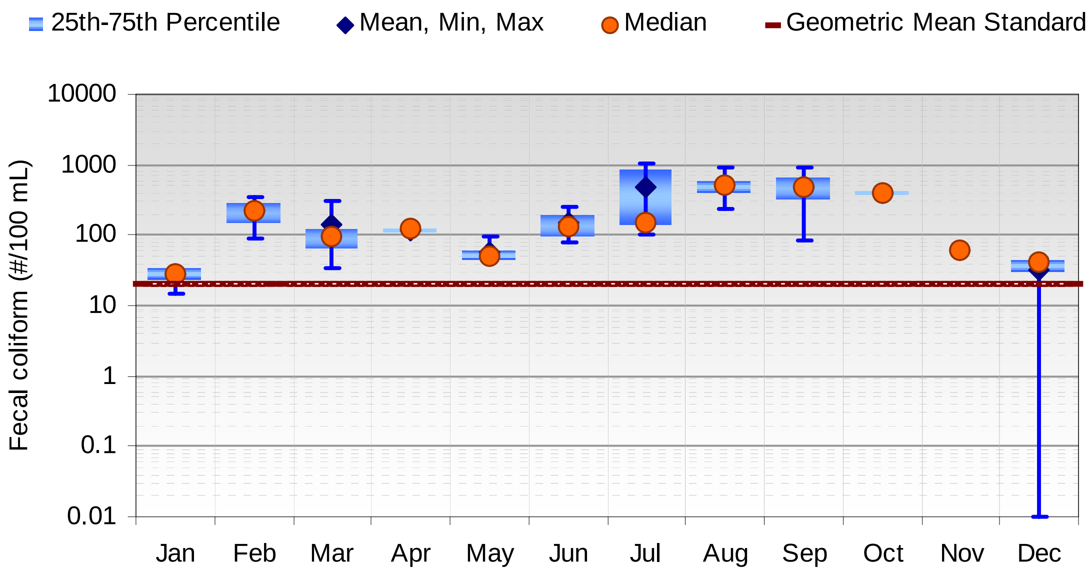


Figure 3-2. Summary of calculated monthly geometric means of fecal coliform at station CH11.

3.3.2 Station CH9, South Fork Chester Creek, Upper Chester Creek Subwatershed

Station CH9 is located downstream of station CH11 in the upper Chester Creek watershed and drains an area consisting primarily of single family homes. Data are available for the period April 15, 1986 to September 30, 1994 and the results are summarized in Table 3-3 and Figure 3-3.

Many fecal coliform data are available for station CH9 and almost all calculated 30-day geometric means are above the water quality standard. Counts rise during the spring and summer and then begin to decrease in September.

Table 3-3. Summary statistics of geometric means calculated using observed fecal coliform data at station CH9. Data cover the period April 15, 1986 to September 30, 1994.

Month	Average[1]	Median[1]	Min[1]	Max[1]	25th[1]	75th[1]	Exceedances: Count[2]	Percentage of Exceedances[3]
Jan	60	59	9	138	21	85	26:34	76%
Feb	121	76	12	302	43	219	32:36	89%
Mar	168	175	14	340	111	208	44:46	96%
Apr	221	227	82	440	160	260	36:36	100%
May	129	97	28	397	64	187	34:34	100%
Jun	183	189	44	399	105	242	35:35	100%
Jul	473	404	132	1222	267	664	40:40	100%
Aug	851	680	238	2525	407	1155	40:40	100%
Sep	789	314	24	4229	204	845	45:45	100%
Oct	261	171	18	725	57	368	28:29	97%
Nov	147	111	20	452	66	184	28:28	100%
Dec	66	51	7	233	31	72	23:27	85%

[1]Average, median, minimum, maximum and 25th and 75th percentile values of all 30-day geometric means calculated for the month (i.e., using samples within the month).
[2] Ratio of number of calculated 30-day geometric means that exceed the water quality criterion to the number of calculated 30-day geometric means in the month.
[3] Percentage of all calculated 30-day geometric means for the month that exceed the water quality criterion.

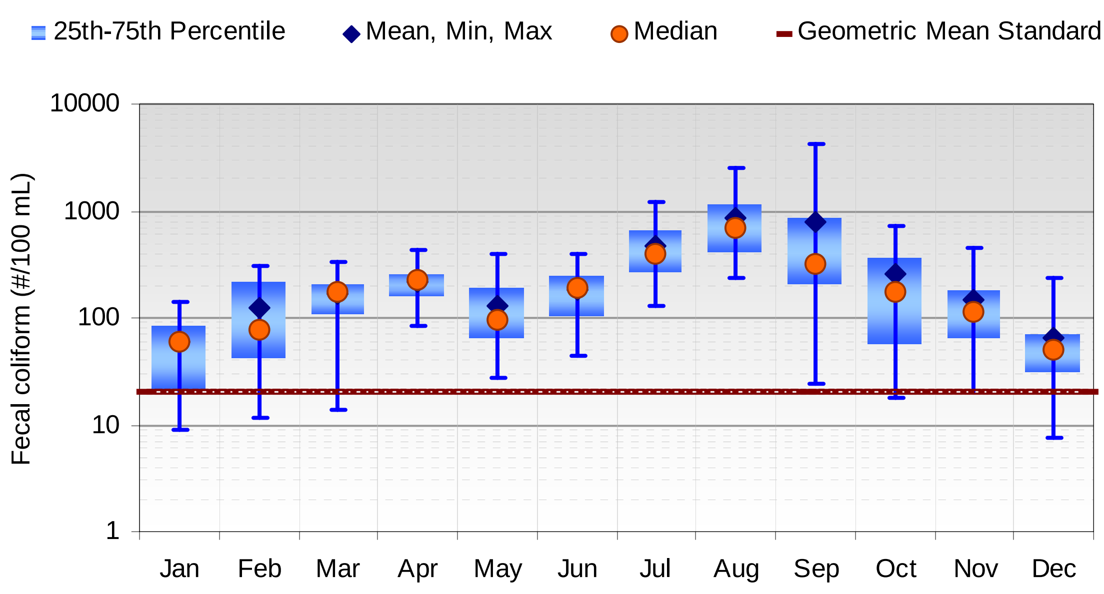


Figure 3-3. Summary of calculated monthly geometric means of fecal coliform at station CH9.

3.3.3 Station ULI (inlet to University Lake), South Fork Chester Creek, Upper Chester Creek Subwatershed

Station ULI is located at the inlet to University Lake and drains an area of multi-family homes, mobile home parks, and parks. Data are available for the period January 20, 1988 to September 30, 1994 and are summarized in Table 3-4 and Figure 3-4.

Fecal coliform counts at ULI appear to be bimodal. There is a distinct peak in the calculated 30-day geometric means in August at approximately 600 FC/ 100 mL and a slight peak in February at approximately 350 FC/ 100 mL. Counts are at their lowest point in May and increase steadily from May to August.

Table 3-4. Summary statistics of geometric means calculated using observed fecal coliform data at station ULI-351. Data cover the period January 20, 1988 to September 30, 1994.

Month	Average[1]	Median[1]	Min[1]	Max[1]	25th[1]	75th[1]	Exceedances: Count[2]	Percentage of Exceedances[3]
Jan	262	284	41	461	203	331	32:32	100%
Feb	268	320	40	489	153	366	27:27	100%
Mar	230	234	3	462	73	372	28:33	85%
Apr	196	188	10	534	88	282	28:31	90%
May	78	66	5	209	42	87	28:32	88%
Jun	173	151	32	518	102	227	29:29	100%
Jul	521	376	157	1761	248	660	37:37	100%
Aug	758	537	164	3034	355	762	35:35	100%
Sep	446	383	29	1663	166	471	37:37	100%
Oct	208	158	63	537	121	227	27:27	100%
Nov	222	207	4	524	73	335	21:26	81%
Dec	263	286	4	479	240	340	23:25	92%

[1]Average, median, minimum, maximum and 25th and 75th percentile values of all 30-day geometric means calculated for the month (i.e., using samples within the month).
[2] Ratio of number of calculated 30-day geometric means that exceed the water quality criterion to the number of calculated 30-day geometric means in the month.
[3] Percentage of all calculated 30-day geometric means for the month that exceed the water quality criterion.

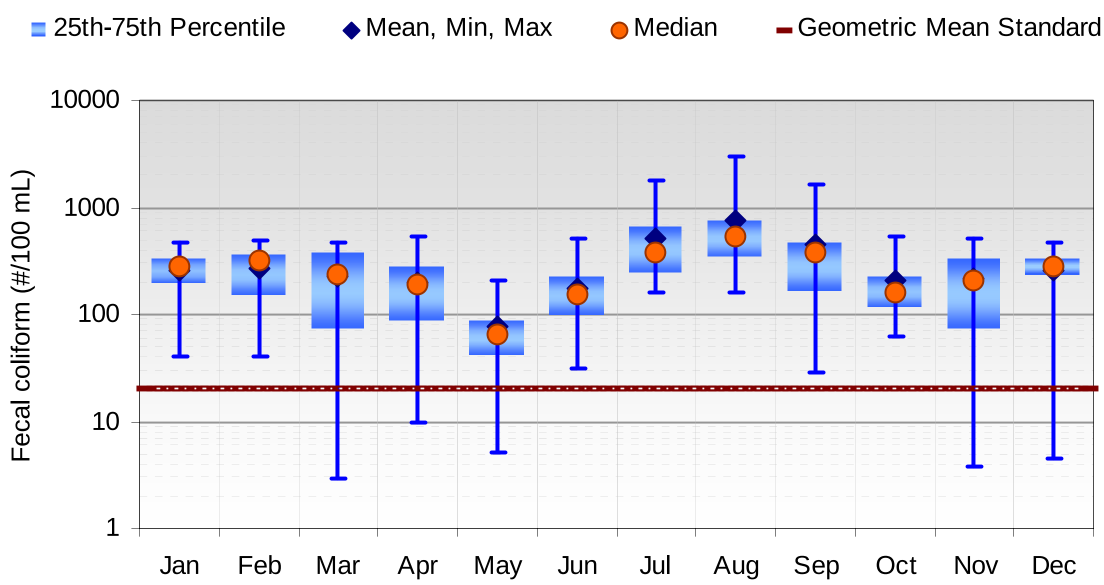


Figure 3-4. Summary of calculated monthly geometric means of fecal coliform at station ULI.

3.3.4 Station ULO (outlet of University Lake), South Fork Chester Creek, Upper Chester Creek Subwatershed

Station ULO is located at the outlet of University Lake. Data are available for the period January 20, 1988 to September 30, 1994 and are summarized in Table 3-5 and Figure 3-5.

Fecal coliform counts at the output from the lake do not appear to have a clearly defined distribution. There are slight peaks in fecal coliform counts in January, April, and August.

It is noteworthy that fecal coliform counts appear to drop significantly from station ULI-351 to ULO. The calculated 30-day geometric means are approximately 70 percent less below the lake than they are above, indicating that the lake is a net sink of bacteria.

Table 3-5. Summary statistics of geometric means calculated using observed fecal coliform data at station ULO. Data cover the period January 20, 1988 to September 30, 1994.

Month	Average[1]	Median[1]	Min[1]	Max[1]	25th[1]	75th[1]	Exceedances: Count[2]	Percentage of Exceedances[3]
Jan	72	69	0	181	13	116	20:33	61%
Feb	56	41	2	313	19	63	19:26	73%
Mar	77	49	1	800	4	100	23:32	72%
Apr	92	75	1	336	13	159	19:29	66%
May	23	20	1	72	5	37	16:32	50%
Jun	31	27	1	74	11	46	19:29	66%
Jul	55	50	11	126	41	67	35:37	95%
Aug	74	62	10	229	45	93	30:35	86%
Sep	118	40	6	634	13	138	22:37	59%
Oct	100	51	17	418	33	127	26:27	96%
Nov	92	70	0	224	47	142	26:27	96%
Dec	89	83	1	247	57	117	22:25	88%

[1]Average, median, minimum, maximum and 25th and 75th percentile values of all 30-day geometric means calculated for the month (i.e., using samples within the month).
[2] Ratio of number of calculated 30-day geometric means that exceed the water quality criterion to the number of calculated 30-day geometric means in the month.
[3] Percentage of all calculated 30-day geometric means for the month that exceed the water quality criterion.

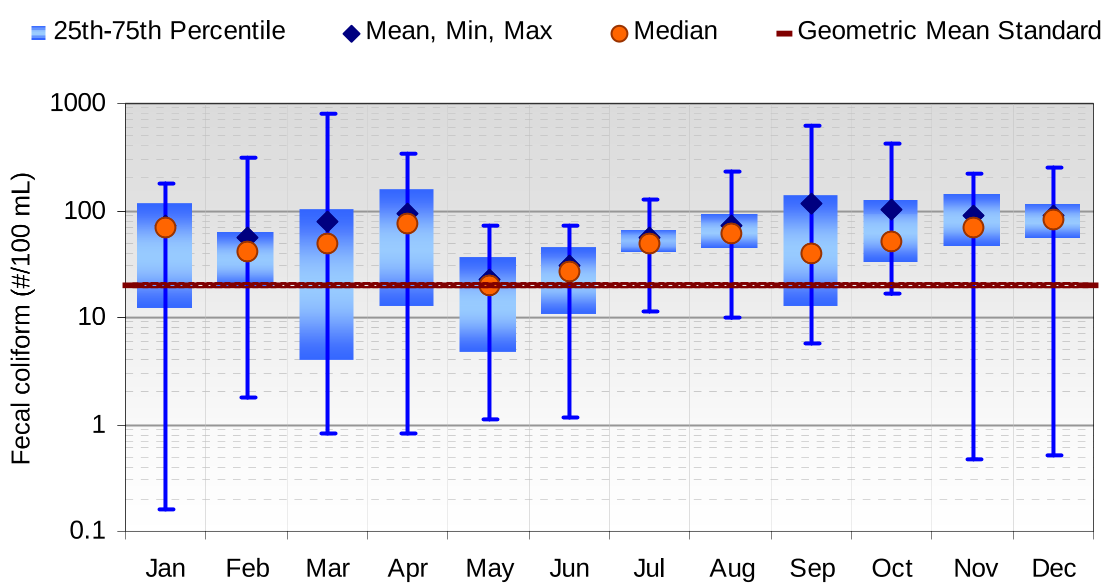


Figure 3-5. Summary of calculated monthly geometric means of fecal coliform at station ULO.

3.3.5 Station CH6, Downstream of Station ULO, South Fork Chester Creek, Upper Chester Creek Subwatershed

Station CH6 is located on the South Fork of Chester Creek in the upper Chester Creek subwatershed and drains an area consisting of parks and single-family detached homes. Data are available for the period April 15, 1988 to September 30, 1994 and the results are summarized in Table 3-6 and Figure 3-6.

Most calculated 30-day geometric means at station CH6 are above the standard. Average geometric means vary from 24 to 117 FC/100ml with the highest counts in April and September. Counts drop from April to May and then slowly increase during the summer.

Table 3-6. Summary statistics of geometric means calculated using observed fecal coliform data at station CH6. Data cover the period April 15, 1988 to September 30, 1994.

Month	Average[1]	Median[1]	Min[1]	Max[1]	25th[1]	75th[1]	Exceedances: Count[2]	Percentage of Exceedances[3]
Jan	63	63	15	145	33	92	24:29	83%
Feb	58	43	4	295	19	70	18:24	75%
Mar	50	30	4	212	16	60	16:25	64%
Apr	117	111	20	337	37	183	25:26	96%
May	24	24	7	48	13	32	17:29	59%
Jun	31	30	6	68	17	42	22:31	71%
Jul	53	48	15	130	35	66	33:35	94%
Aug	53	41	11	185	27	76	28:34	82%
Sep	103	68	6	654	13	103	25:37	68%
Oct	69	59	16	209	32	90	26:27	96%
Nov	57	43	29	174	37	62	28:28	100%
Dec	65	70	13	122	30	91	28:29	97%

[1]Average, median, minimum, maximum and 25th and 75th percentile values of all 30-day geometric means calculated for the month (i.e., using samples within the month).
[2] Ratio of number of calculated 30-day geometric means that exceed the water quality criterion to the number of calculated 30-day geometric means in the month.
[3] Percentage of all calculated 30-day geometric means for the month that exceed the water quality criterion.

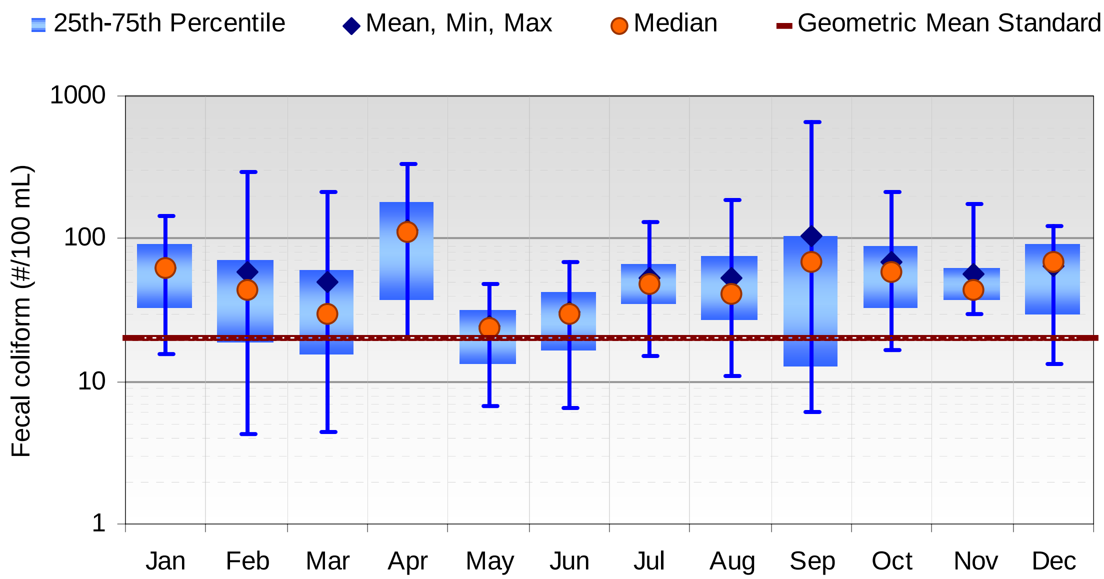


Figure 3-6. Summary of calculated monthly geometric means of fecal coliform at station CH6.

3.3.6 Station CH7A, Middle Fork Chester Creek, Upper Chester Creek Subwatershed

Station CH7A is located on the Middle Fork of Chester Creek in the upper Chester Creek subwatershed and drains an area consisting of parks, wetlands, and multi-family homes. Data are available for the period December 16, 1987 to September 30, 1994 and the results are summarized in Table 3-7 and Figure 3-7.

Many fecal coliform data are available for station CH7A. Most samples during the winter and early spring are above the 20 FC/100 mL standard whereas values during the rest of the year are both above and below the standard. A significant decrease in fecal coliform counts occurs between April and May, possibly due to greater flows associated with snowmelt.

Table 3-7. Summary statistics of geometric means calculated using observed fecal coliform data at station CH7A. Data cover the period December 16, 1987 to September 30, 1994.

Month	Average[1]	Median[1]	Min[1]	Max[1]	25th[1]	75th[1]	Exceedances: Count[2]	Percentage of Exceedances[3]
Jan	80	22	1	359	10	40	19:36	53%
Feb	80	42	1	445	16	69	20:29	69%
Mar	97	86	6	287	44	134	28:34	82%
Apr	245	216	28	672	81	385	30:30	100%
May	38	15	2	143	9	45	14:31	45%
Jun	33	21	1	101	5	59	16:30	53%
Jul	35	17	3	140	10	58	14:34	41%
Aug	24	13	1	117	3	26	12:34	35%
Sep	12	8	0	104	5	12	4:36	11%
Oct	17	10	0	71	5	24	9:29	31%
Nov	32	12	0	188	4	50	10:26	38%
Dec	70	5	0	510	3	18	6:26	23%

[1]Average, median, minimum, maximum and 25th and 75th percentile values of all 30-day geometric means calculated for the month (i.e., using samples within the month).
[2] Ratio of number of calculated 30-day geometric means that exceed the water quality criterion to the number of calculated 30-day geometric means in the month.
[3] Percentage of all calculated 30-day geometric means for the month that exceed the water quality criterion.

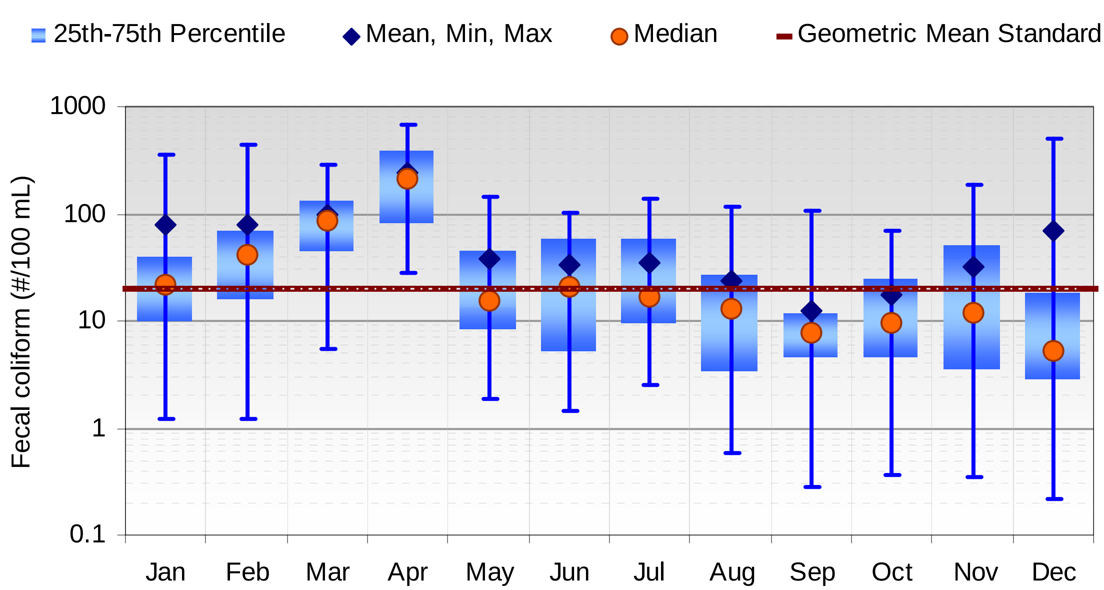


Figure 3-7. Summary of calculated monthly geometric means of fecal coliform at station CH7A.

3.3.7 Station CH7, Downstream of Station CH7A, Middle Fork Chester Creek, Upper Chester Creek Subwatershed

Station CH7 is located on the Middle Fork of Chester Creek downstream of station CH7A in the upper Chester Creek subwatershed. The station represents a drainage area consisting of primarily multi-family homes. Data are available for the period April 15, 1986 to September 30, 1994 and the results are summarized in Table 3-8 and Figure 3-8.

Calculated 30-day geometric means at station CH7 usually exceeded the 20 FC/ 100 mL standard but dropped below the standard in November and December. Fecal coliform distribution appears to be annually bimodal having peaks in April and August. There is a sharp drop in fecal coliform counts from April to May, similar to what is observed at station 7A. Counts drop from May to June and then increase from July through September.

Table 3-8. Summary statistics of geometric means calculated using observed fecal coliform data at station CH7. Data cover the period December 16, 1987 to September 30, 1994.

Month	Average[1]	Median[1]	Min[1]	Max[1]	25th[1]	75th[1]	Exceedances: Count[2]	Percentage of Exceedances[3]
Jan	39	22	2	185	7	39	15:28	54%
Feb	89	51	1	317	33	82	21:25	84%
Mar	110	46	3	789	13	135	25:35	71%
Apr	262	242	4	895	23	328	29:37	78%
May	57	28	1	257	7	71	22:36	61%
Jun	36	23	1	213	8	40	17:31	55%
Jul	144	50	3	1510	22	147	32:42	76%
Aug	104	76	11	323	38	155	37:40	93%
Sep	104	63	5	575	18	139	31:43	72%
Oct	39	24	2	222	10	53	18:29	62%
Nov	28	19	3	85	9	45	15:31	48%
Dec	50	13	3	258	7	51	13:33	39%

[1]Average, median, minimum, maximum and 25th and 75th percentile values of all 30-day geometric means calculated for the month (i.e., using samples within the month).
[2] Ratio of number of calculated 30-day geometric means that exceed the water quality criterion to the number of calculated 30-day geometric means in the month.
[3] Percentage of all calculated 30-day geometric means for the month that exceed the water quality criterion.

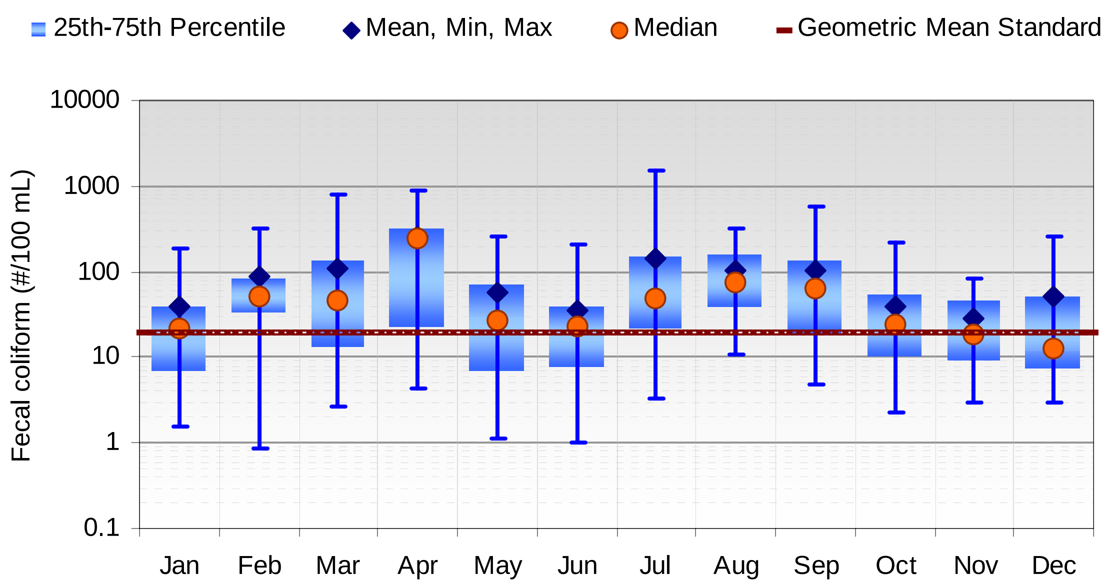


Figure 3-8. Summary of calculated monthly geometric means of fecal coliform at station CH7.

3.3.8 Station CH10, North Fork Chester Creek, Lower Chester Creek Subwatershed

Station CH10 is located on the North Fork of the Chester Creek drainage in the lower Chester Creek subwatershed and drains an area consisting of single family homes, multi-family homes, and commercial/transportation land uses. There are two storm water outfalls located near the sampling station. Data are available for the period March 16, 1993 to September 30, 1994 and the results are summarized in Table 3-9 and Figure 3-9.

Fecal coliform data at station CH10 appear to be highly variable, perhaps due to the limited number of samples. Calculated 30-day geometric means during the spring and summer are usually below water quality standards, while the limited data for the winter show more exceedances of the standard.

Table 3-9. Summary statistics of geometric means calculated using observed fecal coliform data at station CH10. Data cover the period March 16, 1993 to September 30, 1994.

Month	Average[1]	Median[1]	Min[1]	Max[1]	25th[1]	75th[1]	Exceedances: Count[2]	Percentage of Exceedances[3]
Jan	29	24	17	49	20	33	3:4	75%
Feb	244	244	130	359	187	302	2:2	100%
Mar	14	14	14	14	14	14	0:1	0%
Apr	0	0	0	0	0	0	0:2	0%
May	6	0	0	28	0	1	1:5	20%
Jun	6	4	0	19	2	7	0:6	0%
Jul	4	3	1	9	2	5	0:7	0%
Aug	23	9	2	63	3	51	3:9	33%
Sep	94	36	6	454	25	75	13:15	87%
Oct	256	256	144	368	200	312	2:2	100%
Nov	6	6	6	6	6	6	0:1	0%
Dec	13	12	9	17	9	15	0:4	0%

[1]Average, median, minimum, maximum and 25th and 75th percentile values of all 30-day geometric means calculated for the month (i.e., using samples within the month).
[2] Ratio of number of calculated 30-day geometric means that exceed the water quality criterion to the number of calculated 30-day geometric means in the month.
[3] Percentage of all calculated 30-day geometric means for the month that exceed the water quality criterion.

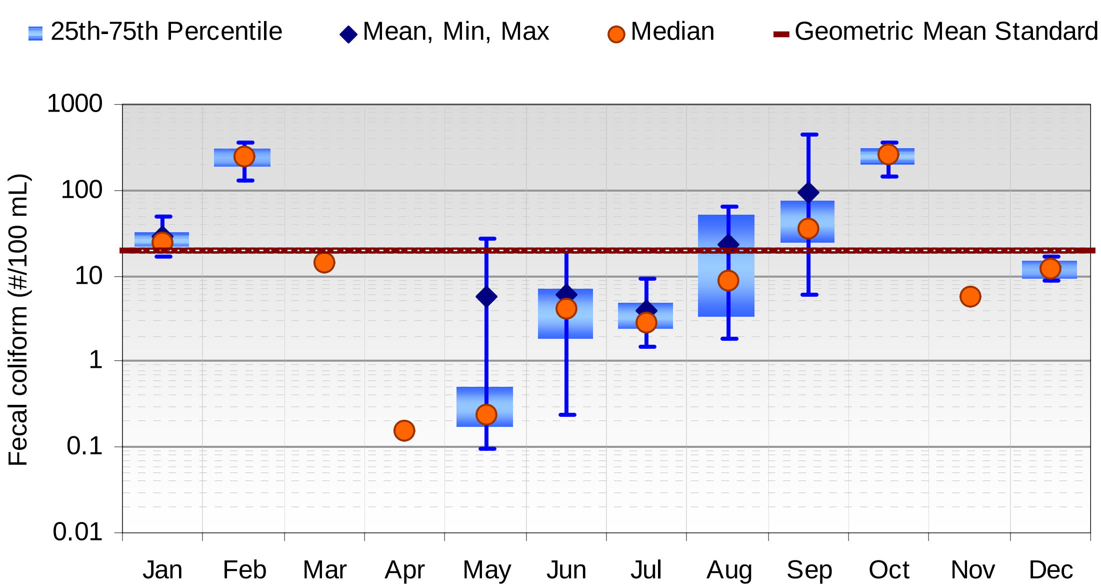


Figure 3-9. Summary of calculated monthly geometric means of fecal coliform at station CH10.

3.3.9 Station CH2, Chester Creek, Lower Chester Creek Subwatershed

Station CH2 is located on Chester Creek in the lower Chester Creek subwatershed and drains a majority of the watershed. Data are available for the period April 15, 1986 to February 5, 1988 and are summarized in Table 3-10 and Figure 3-10.

Every calculated 30-day geometric mean at station CH2 was above the water quality standard of 20 FC/100 mL. The distribution of fecal coliform at the station is annually bimodal having peaks in April and August. A significant decrease in fecal coliform counts occurs between April and May, as is observed at many of the other stations in the watershed.

Table 3-10. Summary statistics of geometric means calculated using observed fecal coliform data at station CH2. Data cover the period April 15, 1986 to February 5, 1988.

Month	Average[1]	Median[1]	Min[1]	Max[1]	25th[1]	75th[1]	Exceedances: Count[2]	Percentage of Exceedances[3]
Jan	106	97	79	151	87	116	4:4	100%
Feb	117	122	85	140	113	124	6:6	100%
Mar	285	257	207	408	226	349	8:8	100%
Apr	324	336	224	431	263	371	10:10	100%
May	188	208	106	223	175	216	10:10	100%
Jun	316	335	107	539	115	502	7:7	100%
Jul	452	416	114	764	311	673	10:10	100%
Aug	647	682	276	1026	388	895	10:10	100%
Sep	336	302	106	745	240	437	13:13	100%
Oct	90	93	78	96	89	94	4:4	100%
Nov	89	95	66	106	72	105	5:5	100%
Dec	153	52	39	640	47	124	7:7	100%

[1]Average, median, minimum, maximum and 25th and 75th percentile values of all 30-day geometric means calculated for the month (i.e., using samples within the month).
[2] Ratio of number of calculated 30-day geometric means that exceed the water quality criterion to the number of calculated 30-day geometric means in the month.
[3] Percentage of all calculated 30-day geometric means for the month that exceed the water quality criterion.

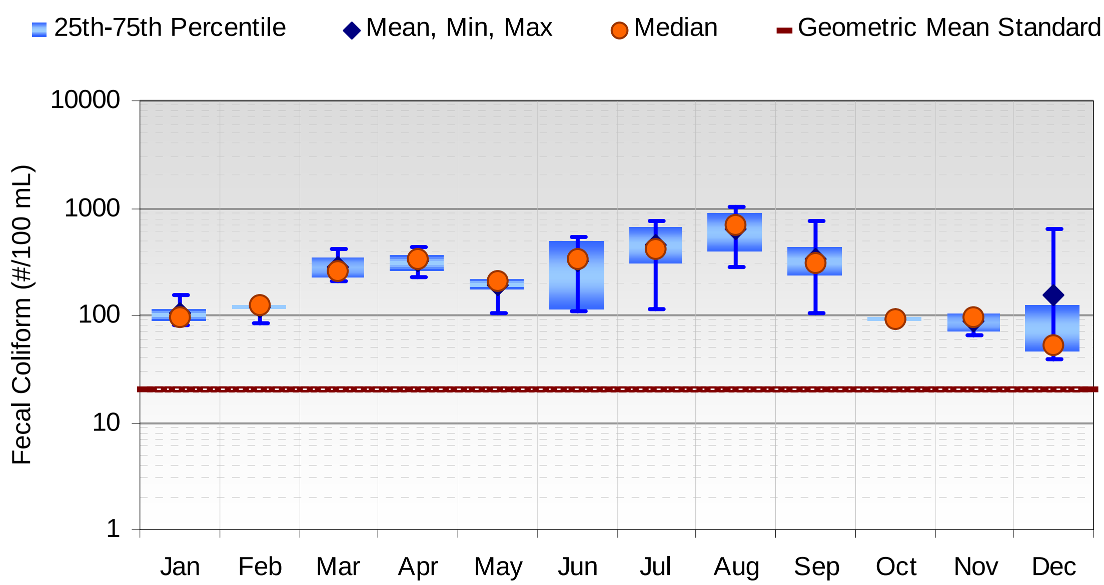


Figure 3-10. Summary of calculated monthly geometric means of fecal coliform at station CH2.

3.3.10 Station CL3, Near Inlet from Chester Creek to Westchester Lagoon

Station CL3 is located in the southeastern edge of the Westchester Lagoon, to the west of Minnesota Avenue. The site drains nearly the entire Chester Creek watershed. Forest cover characterizes the immediate area surrounding the monitoring site. Data are available for the period March 31, 1988 to September 30, 1994 and the results are summarized in Table 3-11 and Figure 3-11.

All calculated 30-day geometric means at station CL3 are above the standard. Average monthly geometric means range from 14 to 287 FC/ 100 mL with the highest geometric means occurring in March and April. Average geometric means decline from May through July, and then increase during August and September, and decline again from October through February. The greatest variability in monthly geometric means occurs in January.

Table 3-11. Summary Statistics of geometric mean calculated using observed fecal coliform data at Station CL3. Data cover the period March, 31 1988 to September 30, 1994.

Month	Average[1]	Median[1]	Min[1]	Max[1]	25th[1]	75th[1]	Exceedances: Count[2]	Percent of Exceedences[3]
Jan	33	36	0	73	26	40	24:29	83%
Feb	47	43	18	83	32	60	9:10	90%
Mar	112	83	40	404	57	126	14:14	100%
Apr	287	161	36	808	68	605	17:17	100%
May	78	25	5	332	15	95	13:22	59%
Jun	14	16	3	30	7	19	5:21	24%
Jul	55	30	6	257	14	70	21:32	66%
Aug	89	61	6	283	19	129	22:32	69%
Sep	96	66	3	431	24	122	24:31	77%
Oct	59	64	1	145	32	84	20:24	83%
Nov	43	50	0	123	7	56	18:25	72%
Dec	35	35	3	68	24	45	18:24	75%

[1]Average, median, minimum, maximum and 25th and 75th percentile values of all 30-day geometric means calculated for the month (i.e., using samples within the month).
[2] Ratio of number of calculated 30-day geometric means that exceed the water quality criterion to the number of calculated 30-day geometric means in the month.
[3] Percentage of all calculated 30-day geometric means for the month that exceed the water quality criterion.

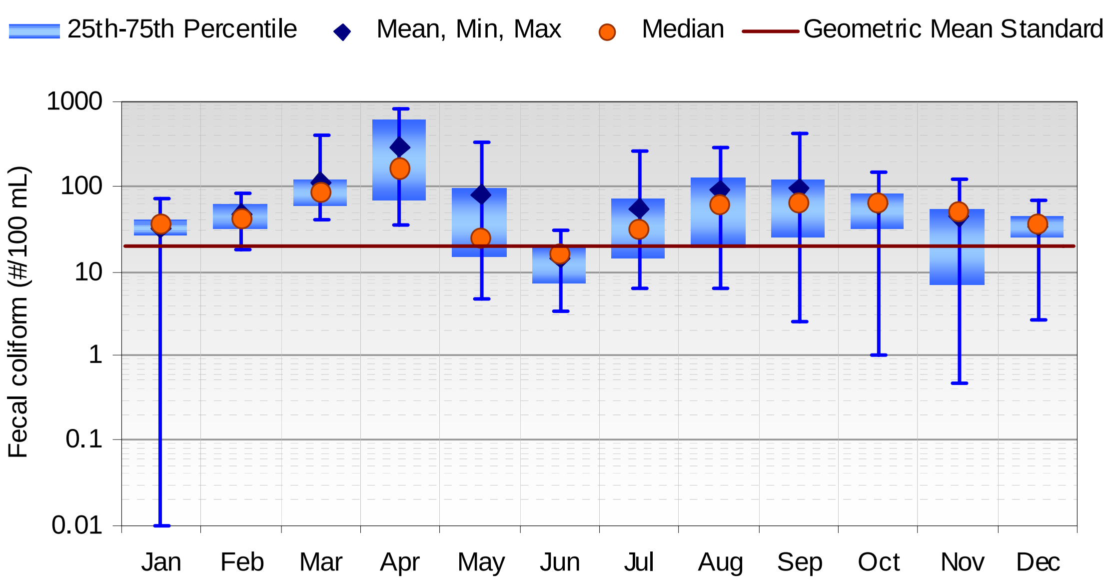


Figure 3-11. Summary of calculated monthly geometric means of fecal coliform at station CL3.

3.3.11 Station CL2, Near Outlet into Cook Inlet

Station CL2 is located at the outlet of Westchester Lagoon, adjacent to the weir and the conveyance pipe used to discharge into the inlet. The site drains the entire Chester Creek watershed. Data are available for the period March 31, 1988 to December 20, 1994, and the results are summarized in Table 3-12 and Figure 3-12.

Most of the calculated 30-day geometric means at station CL3 are above the standard. Average monthly geometric means vary between 28 and 231 FC/100 mL. Monthly average geometric means peak in April and remain high during May, then decrease rapidly in June. Mean monthly geometric means increase rapidly in July and remain high through August, September, and October. Minimum average geometric means occur in February, June, and January, respectively.

Table 3-12. Summary Statistics of geometric mean calculated using observed fecal coliform data at Station CL2. Data cover the period March, 31 1988 to December 20, 1994.

Month	Average[1]	Median[1]	Min[1]	Max[1]	25th[1]	75th[1]	Exceedances: Count[2]	Percent of Exceedences[3]
Jan	58	55	1	127	23	88	22:28	79%
Feb	28	15	4	61	13	48	8:17	47%
Mar	58	33	13	167	15	103	12:22	55%
Apr	231	197	9	754	130	276	25:26	96%
May	144	93	3	573	22	161	25:32	78%
Jun	46	28	2	231	20	62	23:30	77%
Jul	195	68	15	1435	40	205	33:35	94%
Aug	178	91	12	1205	24	252	27:35	77%
Sep	168	79	2	855	12	300	24:39	62%
Oct	129	74	10	356	49	251	24:28	86%
Nov	79	79	19	221	43	99	26:27	96%
Dec	59	70	2	97	32	84	18:23	78%

[1]Average, median, minimum, maximum and 25th and 75th percentile values of all 30-day geometric means calculated for the month (i.e., using samples within the month).
[2] Ratio of number of calculated 30-day geometric means that exceed the water quality criterion to the number of calculated 30-day geometric means in the month.
[3] Percentage of all calculated 30-day geometric means for the month that exceed the water quality criterion.

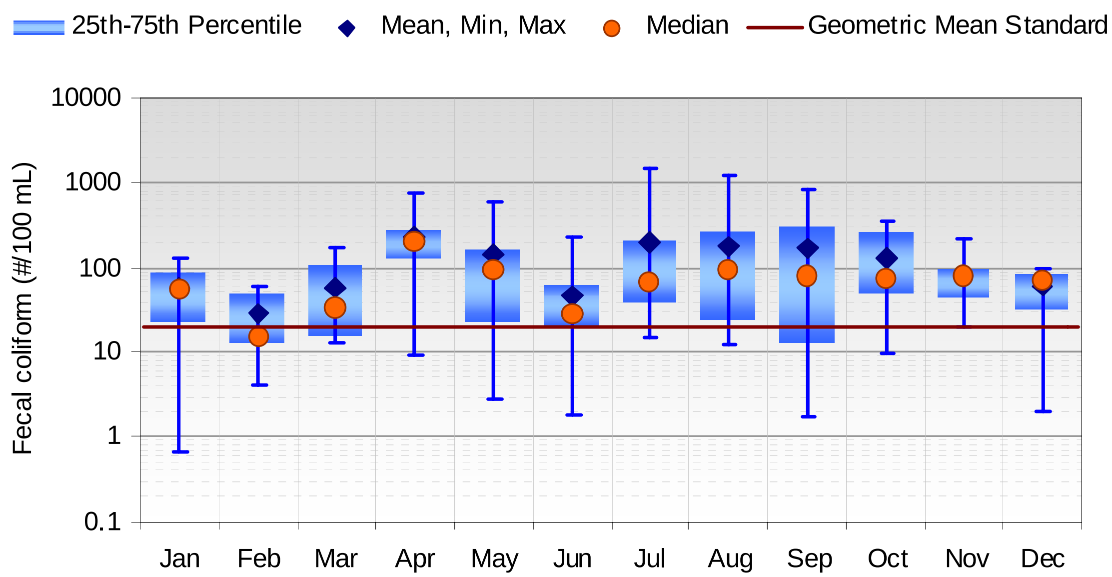


Figure 3-12. Summary of calculated monthly geometric means of fecal coliform at station CL2.

A statistical summary of all fecal coliform monitoring stations in the Chester Creek watershed is presented in Figure 3-13. The figure shows significant variability in observed fecal coliform counts for all monitoring stations, and that mean fecal coliform counts exceed the geometric mean standard of 20 per 100 mL at all stations. Similarly, median fecal coliform counts exceed the geometric mean standard at all stations except CH10.

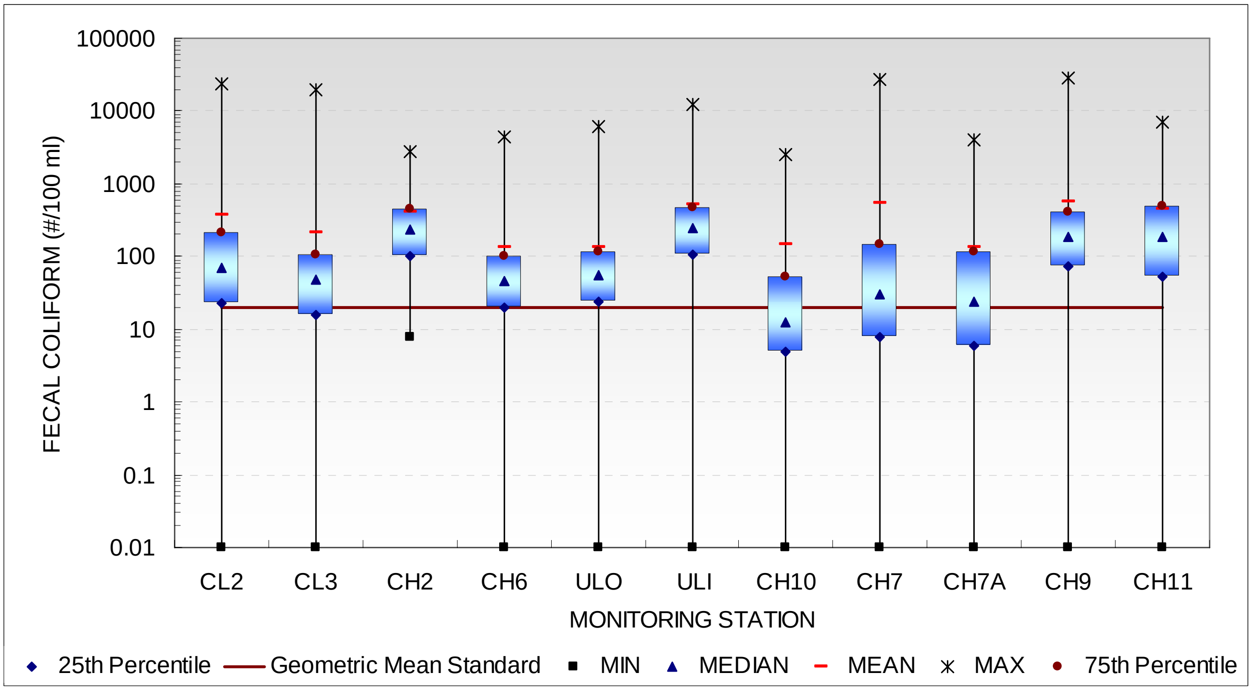


Figure 3-13. Summary of calculated monthly geometric means of fecal coliform for all monitoring stations.

4.0 POLLUTANT SOURCES

The identification of sources is important to the successful implementation of a TMDL and the control of pollutant loading to a stream. Characterizing watershed sources can provide information on the relative magnitude and influence of each source and its impact on in-stream water quality conditions. This section discusses the potential sources of fecal coliform to Chester Creek, University Lake and Westchester Lagoon.

4.1 Point Sources, Nonpoint Sources, and Natural Sources

The Alaska 303(d) impaired waters list identifies urban runoff as the primary source of fecal coliform to Chester Creek, University Lake, and Westchester Lagoon. Snowmelt and rainfall transport bacteria that is deposited and accumulated on the surface of residential and urban areas. Likely sources of the accumulated bacteria are waterfowl, domestic animals (e.g., cats and dogs) and native animals (e.g., moose, bear, etc.). Animals can deposit fecal matter directly into the watershed streams or on the land surface where it is available for overland transport in surface runoff. MOA (1990) concludes that pet and waterfowl feces appear to the major sources of fecal coliform for runoff in the Anchorage area. Additionally, cracked or leaking sanitary sewer lines, failing on site septic systems, and indigent people living near the creek may also contribute fecal coliform bacteria to Chester Creek

Wildlife may be a considerable source of fecal coliform to Chester Creek, University Lake, and Westchester Lagoon, both through direct deposition and deposition on watershed surfaces; however, it is difficult to estimate fecal coliform contributions from wildlife in the Anchorage area. It is not feasible to isolate wildlife populations for the Chester Creek watershed due to the mobility and large home ranges of the wildlife throughout the area. Additionally, while fecal coliform production of many agricultural animals has been researched, there is little or no information on the bacteria production rates of wildlife species native to the Anchorage area.

Although the information is not available to quantify the direct loading from wildlife sources in the watershed, Alaska Department of Fish and Game (ADF&G) provided qualitative estimates of wildlife populations in the Anchorage area that are used to provide general background on the types of animals that may be contributing to the fecal coliform impairments in the area. The following summarizes the information provided by ADF&G (Rick Sinnott, personal communication, 1/30/03):

- Approximately 200 to 300 moose live in the Anchorage Bowl, not including moose that live solely in Fort Richardson or Chugach State Park, and as many as 1,000 moose are in the Anchorage Bowl in winter.
- About 2,000 Canada geese inhabit the Anchorage Bowl. Most of these geese are located west of Lake Otis Boulevard and north of Tudor Road (i.e., Fish Creek area) in grassy parks, school grounds, and athletic fields in April and July-October and in bogs, ponds, and lakes in May-July.
- Thousands more Canada and other geese fly through the area in spring and fall, primarily in the Anchorage Coastal Wildlife Refuge (located on the Turnagain Arm and including Potter Marsh).
- Anchorage may contain 2,000 or more mallards in the winter, with most located in open creeks (Ship Creek and Chester Creek).
- Anchorage also has several thousand pigeons, primarily downtown and midtown.
- At most, there are 100 to 150 beavers in the Anchorage Bowl.
- Latest counts showed no more than 6 brown bears and 30-40 black bears in the Anchorage Bowl.

Septic systems have the potential to contribute fecal coliform to receiving waters through surface breakouts and subsurface malfunctions. Failing septic systems located in close proximity to receiving waterbodies are more likely to impact in-stream conditions. The majority of septic systems in the Anchorage area are located more than 100 feet away from any streams and the majority of the houses (more than 95 percent) in the Chester Creek watershed are connected to city sewer and do not use onsite septic systems. Additionally, 99 to 100 percent of homes built close to the stream are connected to city sewer (Kevin Kleweno, ADEC, Division of Environmental Health, Drinking Water & Wastewater Program, personal communication to Timothy Stevens, ADEC, January 31, 2003). Therefore, DEC believes septic systems have no or insignificant contribution of fecal coliform to Chester Creek.

An ongoing water quality study conducted by the University of Alaska on the spatial, temporal, and phase distribution of fecal coliform in Chester Creek indicates the number of indigent people living near the creek has been drastically reduced by an intensive city wide effort to remove homeless camps from city parks and greenbelts. As a result of this ongoing action the potential for fecal coliform contribution by indigent people has been eliminated as a significant source of fecal coliform impacting Chester Creek.

The University of Alaska study also investigated the potential of leaking sewer lines to contribute fecal coliform to Chester Creek. Based on selection criteria and field observations two sewer line stream crossings were chosen for sampling and analysis. Ground water and surface water samples were collected above and below the stream crossings for analysis. Preliminary data indicate these sewer lines are not contributing fecal coliform to Chester Creek.

Storm water is traditionally considered a nonpoint source, carrying pollutants to receiving waters through surface runoff. However, when storm water is permitted and carried through conveyances to discrete discharges to streams, it is considered a point source. Unlike most constant point sources (e.g., waste water treatment plant (WWTP) discharges), storm water is precipitation-driven and impacts the receiving stream during times of surface runoff. The MOA is subject to an NPDES storm water permit that covers all of the storm drains in the Chester Creek watershed and therefore the storm water runoff that occurs within the MOS is considered a point source for regulatory purposes. Storm water runoff that occurs outside of the MOA boundaries is considered a nonpoint source.

5.0 TECHNICAL APPROACH

Developing TMDLs requires a combination of technical analysis, practical understanding of important watershed processes, and interpretation of watershed loadings and receiving water responses to those loadings. In identifying the technical approach for development of fecal coliform TMDL for Chester Creek, University Lake, and Westchester Lagoon, the following core set of principles was identified and applied:

- ***The TMDLs must be based on scientific analysis and reasonable and acceptable assumptions.*** All major assumptions have been made based on available data and in consultation with appropriate agency staff.

- ***The TMDLs must use the best available data.*** All available data in the watershed were reviewed and were used in the analysis where possible or appropriate.

- ***Methods should be clear and as simple as possible to facilitate explanation to stakeholders.*** All methods and major assumptions used in the analysis are described. The TMDL document has been presented in a format accessible by a wide range of audiences, including the public and interested stakeholders.

The technical approach used to estimate the loading capacity, existing loads, and load allocations presented below relies on these principles and provides a TMDL calculation that uses the best available information to represent watershed and in-stream processes.

5.1 Modeling Approach

This section presents the hydrologic and water quality modeling approach employed to estimate in-stream fecal coliform counts and loadings in the Chester Creek watershed, including University Lake and Westchester Lagoon. A watershed model is essentially a series of algorithms applied to watershed characteristics and meteorological data to simulate naturally occurring land-based processes over an extended period of time, including hydrology and pollutant transport. Many watershed models are also capable of simulating in-stream processes using the land-based calculations as input. Once a model has been adequately set up and calibrated for a watershed it can be used to quantify the existing loading of pollutants from subwatersheds. Models can also be used to assess the potential benefits of various restoration scenarios (e.g., implementation of certain best management practices).

The relevant numeric water quality criteria for fecal coliform are presented in Section 2. Since the water quality criteria are based upon a 30-day period, a requirement of the technical approach was that it would simulate daily in-stream fecal coliform counts. Given the criteria and the urban character of the watershed, as well as previous modeling efforts made by MOA, the Storm Water Management Model (SWMM) (Huber and Dickinson, 2001) was selected to estimate fecal coliform counts in Chester Creek. SWMM simulates the quantity and quality of runoff produced by storms in urban watersheds. SWMM simulates real storm events based on rainfall and other meteorological inputs, such as evaporation and temperature, and watershed transport, storage and management practices to predict runoff quantity and quality. At the subwatershed scale, SWMM provides for evaluation of in-stream conditions, which allows for the direct comparison with relevant water quality standards.

SWMM is comprised of several computational blocks, or modules, of which the Rain, Temperature, Runoff and Transport blocks were used for the Chester Creek study. These modules essentially generate surface runoff and route it to the stream channel based on user-defined inputs such as precipitation, land use, and topography. Various hydrologic, pollutant buildup/washoff, and in-channel parameters must also be specified by the user. SWMM represents the stream network system as a series of links and nodes with the links representing stream or channel segments and nodes representing contributing subcatchment inlet points. Consequently, the model represents Chester Creek as a series of hydrologically connected subwatersheds.

Hydrologic and water quality simulations of the watershed were performed for Chester Creek. The modeling approach included continuous simulation of rainfall and runoff, as well as in-stream fecal coliform counts. Once the model was calibrated, it was used to evaluate the existing conditions in Chester Creek, University Lake, and Westchester Lagoon and to develop allocation scenarios that result in attainment of Alaska's water quality standards.

5.2 Model Configuration

As mentioned above the SWMM model was configured for the Chester Creek watershed as a series of hydrologically connected subwatersheds. Configuration of the model involved subdivision of the watershed into modeling units, followed by continuous simulation of flow and water quality for these units using meteorological and land use information. This section summarizes the configuration process and key components of the model and more detailed information is provided in Appendix A.

5.2.1 Watershed Subdivision

To simulate watershed loadings and resulting counts of fecal coliform, the Chester Creek watershed was divided into numerous modeling subcatchments using spatial (map) data and tabular data provided by MOA. The modeling subcatchments for the lower and upper Chester Creek subwatersheds are shown in and Figures 5-1 and 5-3, respectively. Figures 5-2 and 5-4 display the impervious land cover classes found in the lower and upper Chester Creek subwatersheds, respectively. Hydrology and fecal coliform for the headwaters subwatershed of the Chester Creek basin was not simulated in SWMM. Estimated stream flow and observed fecal coliform concentration discharging from the headwaters subwatershed, referred to as boundary conditions, were instead used as input into the model.

5.2.2 Watershed Parameters

Required input data for each subcatchment include area, imperviousness, slope, Manning's roughness coefficient, a conceptual subcatchment width (total width of overland flow), depression storage, and infiltration parameters. These data have been computed and estimated by MOA for SWMM modeling applications of Chester Creek. The MOA SWMM parameter values were compiled for each land cover class within each subcatchment in the Chester Creek watershed. The land cover classes reflect the degree of imperviousness for a given cover type. Watershed parameters were lumped, that is spatially weighted or averaged, for each modeling subcatchment. Since information about the storm drain network's hydraulic characteristics (such as pipe diameter and roughness characteristics) were not available, the Runoff block was set up to "route" runoff to each subcatchment outlet.

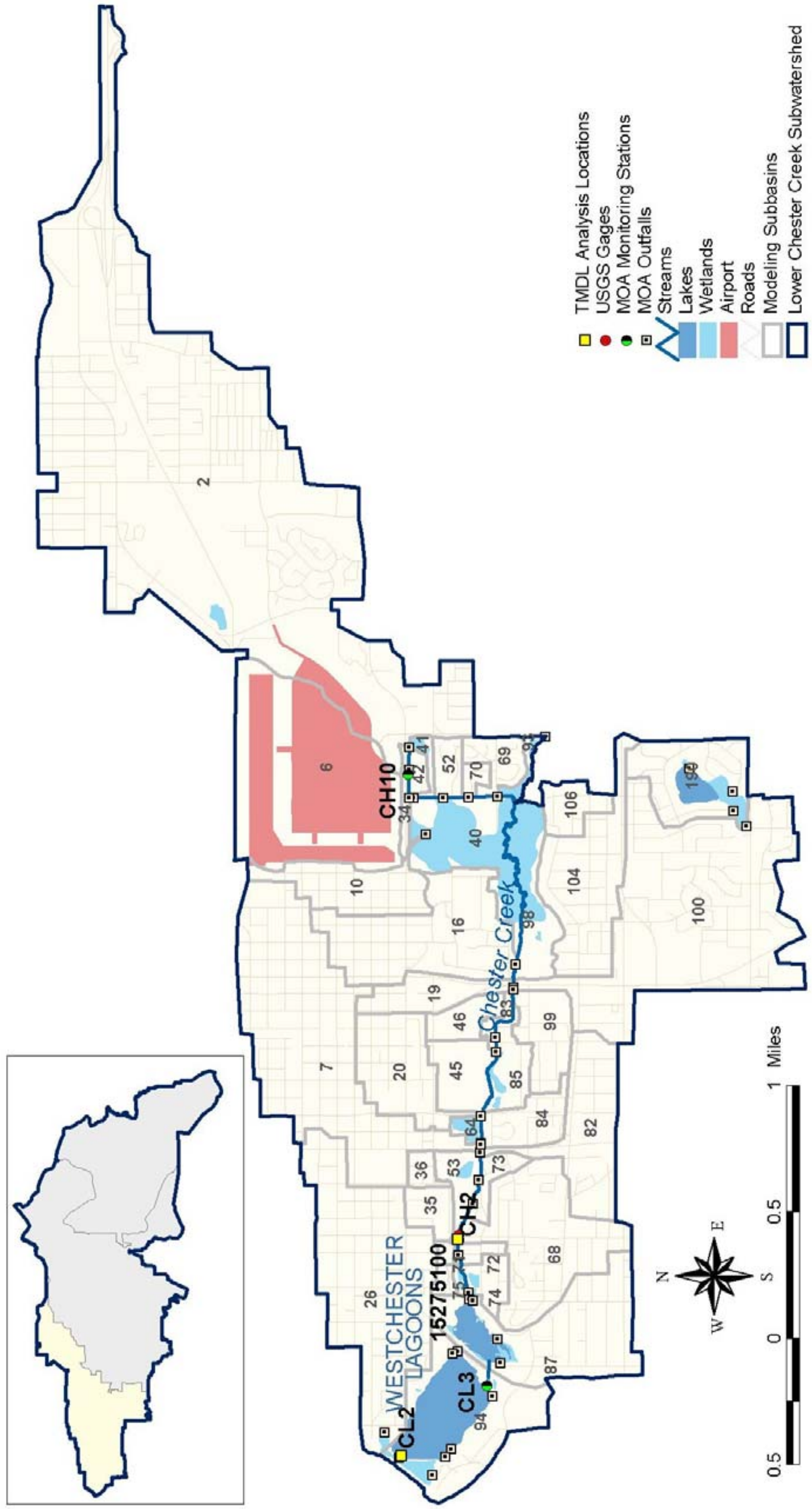


Figure 5-1. SWMM subcatchments in the lower Chester Creek subwatershed.

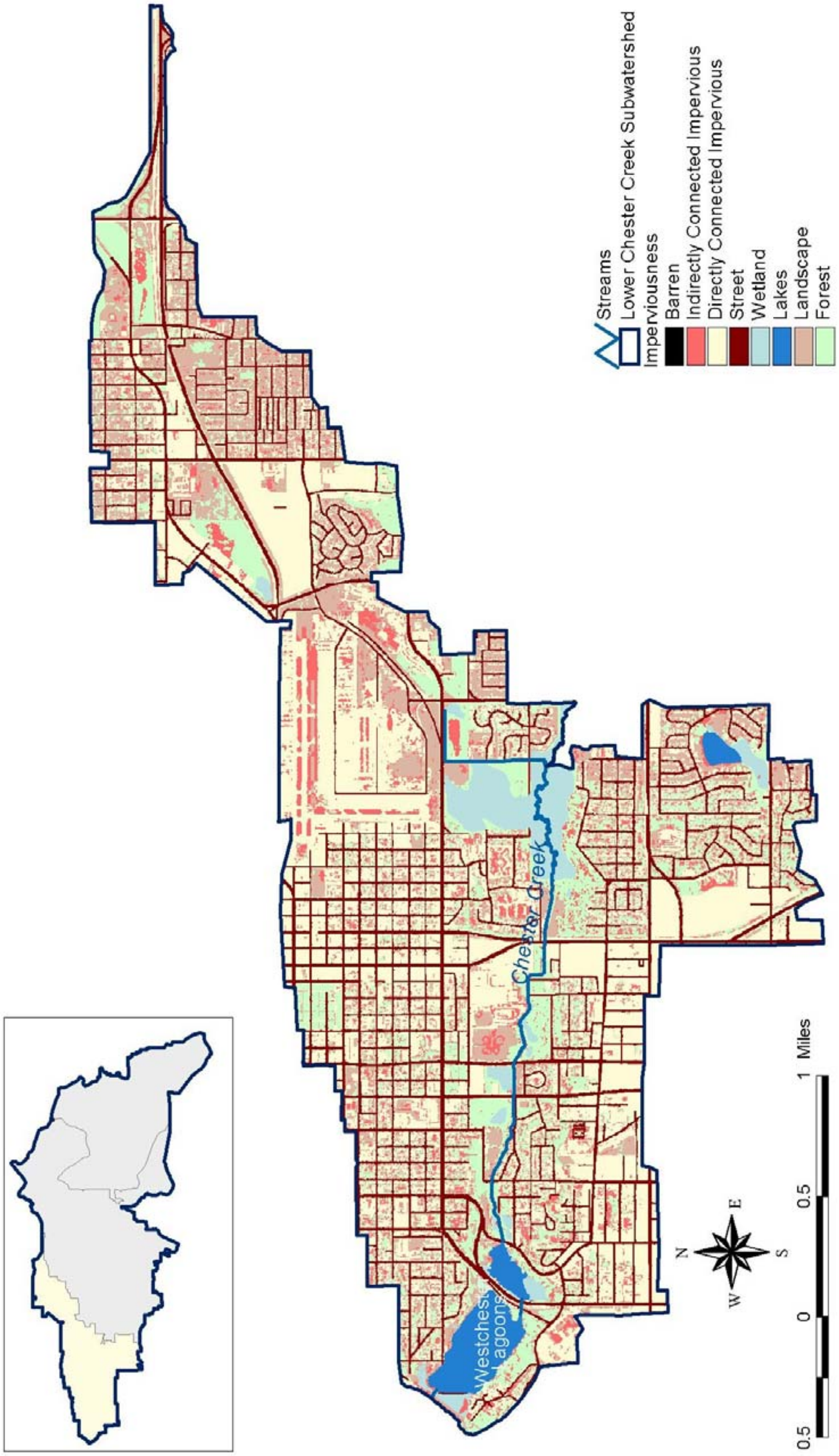


Figure 5-2. Imperviousness within the lower Chester Creek subwatershed.

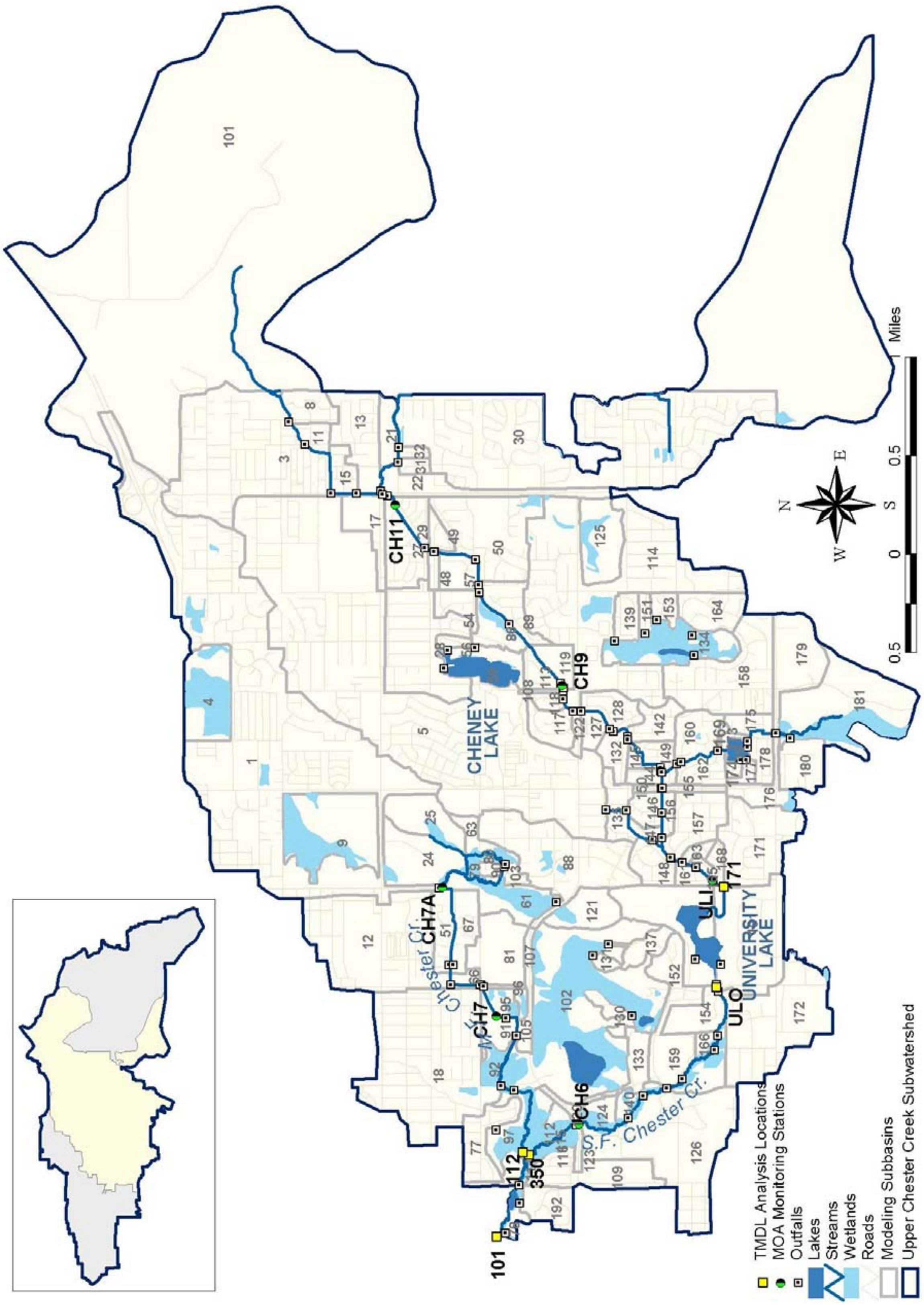


Figure 5-3. SWMM subcatchments in the upper Chester Creek subwatershed.

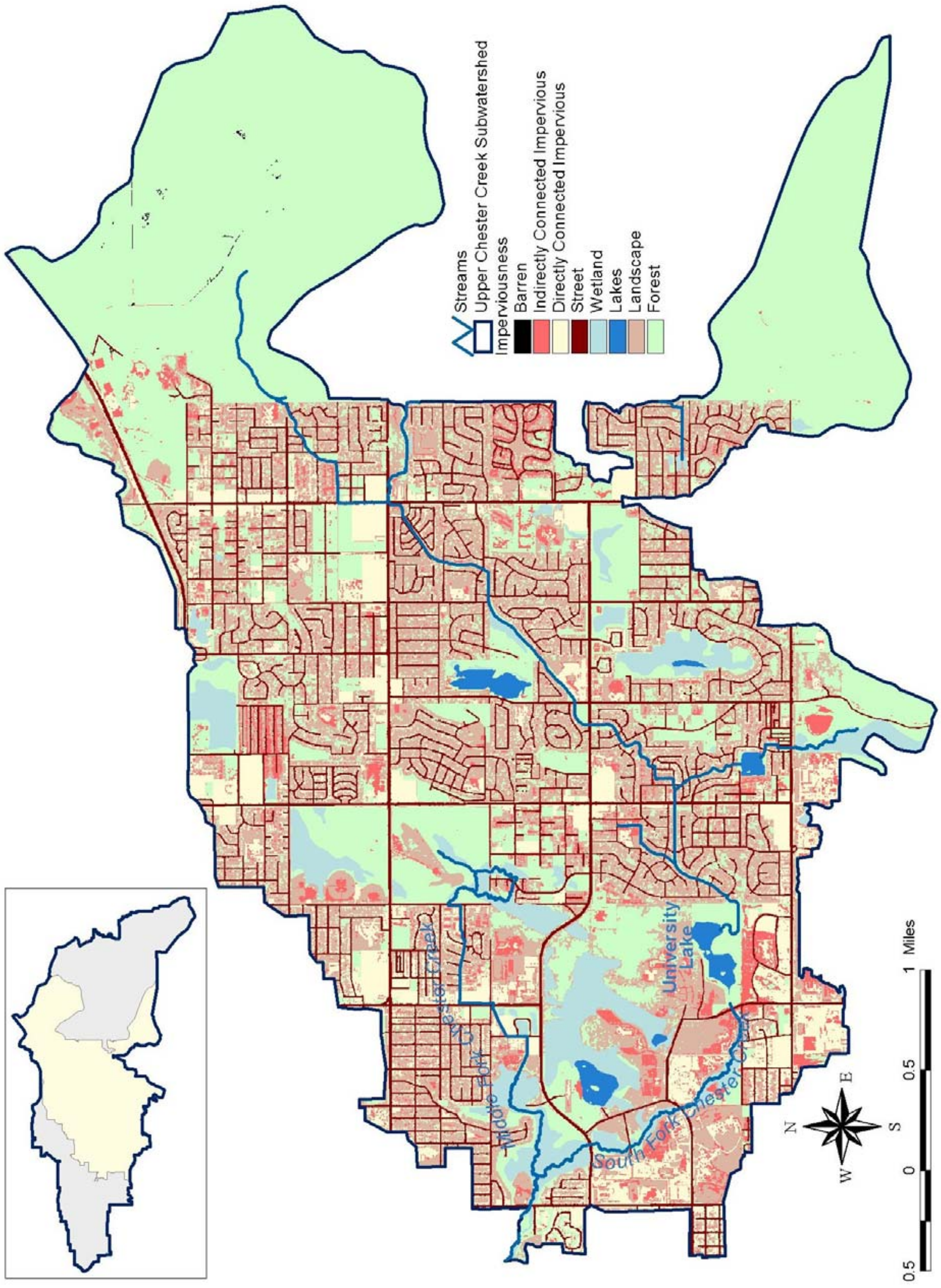


Figure 5-4. Imperviousness within the upper Chester Creek subwatershed.

5.2.3 Meteorological Data

Daily precipitation and temperature data, available from the National Climatic Data Center (NCDC) weather station at the Ted Stevens International Airport from 1952 through 2003, were used for the Chester Creek watershed SWMM modeling.

5.3 Model Calibration

After the model was configured, calibration was performed at multiple locations in the watershed. Calibration is the adjustment or fine-tuning of model parameters to reproduce observations. Model calibration focused on two main areas: hydrology and water quality. Upon completion of the calibration at selected locations, a calibrated data set containing parameter values for modeled sources and pollutants was developed. This data set was applied to areas for which calibration data were not available.

5.3.1 Hydrologic Calibration

Hydrology was the first model component calibrated. The hydrologic calibration involved a comparison of model results to in-stream flow observations recorded at the USGS stream gage (15275100) located near Arctic Boulevard (see Figure 3-1). This is the only operative stream gage in the entire Chester Creek watershed. This gage recorded daily mean flow from June 17, 1966 through September 30, 1993, and from October 1, 1998 to September 30, 2000. The stream gage was not operational from October 1, 1993 to September 30, 1998. The period of hydrologic calibration was therefore selected as July 1, 1987 to September 30, 1993. This period is deemed sufficient to calibrate the hydrologic response of Chester Creek to rainfall events.

Key considerations addressed during the hydrologic calibration included the high-flow/low-flow distribution, storm flows, and seasonal variation. The calibration involved the adjustment of surface runoff and depression storage parameters within the range of accepted values. The results of the hydrologic calibration are presented in Appendix A. The model adequately captures baseflow conditions, most storm events, and snowmelt events. The model over predicts several periods of streamflow, possibly due to rainfall that was recorded at the weather station that did not actually occur in the watershed.

5.3.2 Water Quality Calibration

After hydrology had been sufficiently calibrated, water quality calibration was performed. The approach taken to calibrate water quality focused on matching trends identified during the water quality analysis summarized in Section 3.0. Daily average in-stream counts estimated by the model were compared to observed data collected at several locations within the watershed (see Table 3-1 and Figure 5-5). Modeled versus observed in-stream fecal coliform counts were directly compared during calibration. The water quality calibration consisted of executing the watershed model, comparing water quality time-series output to available water quality observation data, and adjusting the model water quality parameters within the range of acceptable values. The following fecal coliform monitoring station data were used in the water quality calibration: CH7, CH9, ULO, ULI, CH6, CH2, CL3, and CL2.

The calibrated parameters characterize the buildup and washoff of fecal coliform for individual land uses in the Chester Creek watershed. Fecal coliform buildup is dependent upon the accumulation rate and the time allotted for constituent storage. The landscape impervious cover class was assigned the greatest fecal build-up rate, followed by forest, wetland, lake, indirectly connected impervious, directly connected impervious, and street cover types. Additionally, a monthly street sweeping time interval with a fifty percent efficiency (based on the MOA SWMM input data), was assumed for streets, directly connected impervious and indirectly connected impervious land covers during April, May, and June. Washoff is a nonlinear function of fecal coliform storage, surface runoff, and parameters that describe fecal susceptibility to washoff. High concentration peaks may occur when enough time has elapsed for significant buildup, which then becomes part of the runoff and pollutant load of the next storm event. A thorough presentation of the SWMM water quality model parameters, and the calibration results, are given in Appendix A.

5.4 Model Application

After hydrologic and water quality calibration were completed, the model was run for a five-year period, January 1, 1996 through December 31, 2000, to determine existing and allowable fecal counts. This five-year period was chosen because it includes below average (1998), average (1996; 2000), and above average (1997) total annual rainfalls.

Output from the model was evaluated at seven “analysis points” within the watershed. These points were selected to represent water quality within the various subwatersheds as well as University Lake and Westchester Lagoon. The purpose of evaluating water quality at multiple sites is to identify the load reductions that are necessary to ensure that water quality standards are met throughout the watershed (rather than just at its most downstream point). The results of the analysis and the various TMDL components are presented in Section 6.0 for Chester Creek, Section 7.0 for University Lake, and Section 8.0 for Westchester Lagoon.

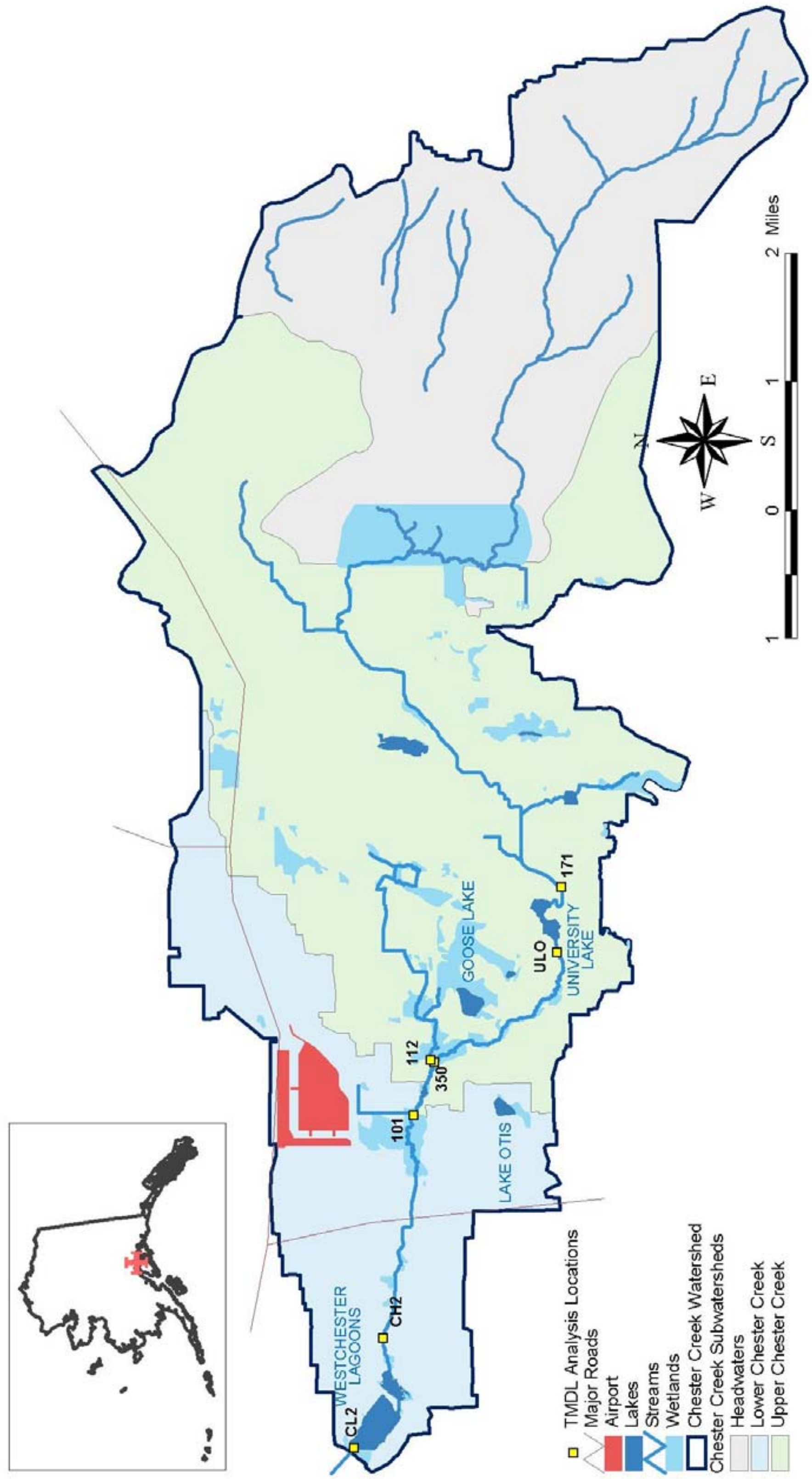


Figure 5-5. TMDL analysis point locations for the Chester Creek, University Lake and Westchester Lagoon TMDLs.

6.0 CHESTER CREEK ALLOCATION ANALYSIS

One purpose in developing a TMDL is to determine a water's loading capacity, or the greatest amount of loading that a water can receive without violating water quality standards [40 CFR §130.2(f)]. The loading capacity is then allocated to the sum of individual waste load allocations (WLAs) for point sources and load allocations (LAs) for nonpoint sources and natural background loads. In addition, the TMDL must also include a margin of safety (MOS), either implicitly or explicitly, that accounts for the uncertainty in the relationship between pollutant loads and the quality of the receiving waterbody. Conceptually, this definition can be denoted by the equation

TMDL = Loading Capacity = Σ WLAs + Σ LAs + MOS

The following sections describe how these components were derived for the Chester Creek TMDL.

6.1 Identification of Loading Capacity

The calibrated SWMM model was used to determine the existing and allowable loads of fecal coliform for the Chester Creek TMDL analysis points 112, 171, 350, 101, and CH2 (see Figures 5-1, 5-3, and 5-5). The SWMM model was also used to assess the effectiveness of various implementation scenarios that are described in more detail below. The results of the TMDL and implementation modeling scenarios for the five TMDL assessment points are presented graphically in Figures 6-1 through 6-10. For each TMDL assessment point, existing fecal coliform loads and the three scenario loads are compared to both the 30-day geometric mean standard of 20 FC/100 mL and to the 10 percent not-to-exceed standard of 40 FC/100 mL. Monthly loading capacities were then identified for each assessment point that will result in meeting <u>both</u> components of the standard, as discussed in more detail below.

The 30-day geometric mean standard of 20 FC/100 mL is expressed as a daily allowable load that varies according to daily flow volume. Figures 6-1, 6-3, 6-5, 6-7, and 6-9 show that the loading capacity varies seasonally, with the greatest capacity typically present in the summer months (higher flows), and the lowest capacity typically present in the winter months (lower flows). The figures also indicate that existing loads usually exceed the loading capacity, although this does not hold true for certain months at certain assessment points.

It should also be noted that Figure 6-7 shows that the loading capacity at TMDL assessment point 101 is much less variable than the other assessment points. This is due to the fact assessment point 101 is located in very close proximity to the confluence of the North Fork of Chester Creek with the main stem of Chester Creek and therefore experiences a relatively constant base flow with some attenuation of storm flows. Consequently, the loading capacity, which is dependent on stream flow, is less variable over time.

The 10 percent not-to-exceed standard of 40 FC/100 mL is graphically expressed as the percentage of daily simulated fecal coliform counts that exceed the standard in a particular 30-day period. Figures 6-2, 6-6, and 6-8, representing TMDL analysis points 112, 350, and 101, respectively, show that simulated daily fecal coliform counts generally meet the not-to-exceed standard during winter months. However, during the remainder of the year, simulated fecal coliform counts greatly exceed the standard. Figure 6-10, representing TMDL analysis point CH2, shows that simulated fecal coliform counts are almost always greater than the not-to-exceed standard. Similarly, one hundred percent of the simulated existing fecal coliform counts for TMDL analysis point 171 (South Fork Chester Creek; shown in Figure 6-4) also exceed the standard.

As mentioned previously, monthly loading capacities were identified to ensure compliance with both components of the water quality standard for the entire modeling period (January 1, 1996 through

December 31, 2000). Fecal coliform reductions required by the 30-day geometric mean standard were assessed by computing a running 30-day geometric mean for simulated daily fecal coliform loading estimated by SWMM and comparing those loads to the loading capacity derived from the 30-day geometric mean standard of 20 FC/100 mL. Reductions were calculated for those days when the existing load was greater than the loading capacity and results were summed by month.

The 10 percent not-to-exceed standard of 40 FC/100 mL was assessed by first examining the simulated daily output according to a continuously running 30-day period. The standard allows only 10 percent, or no more than 3 observations, within a 30-day period to exceed the 40 FC/100 mL threshold. Using a running 30-day assessment period covering the entire period of simulated SWMM output, daily loading values were queried and ranked. For each running 30-day period, the fourth-ranked loading value was identified, and if it exceeded the standard, reductions were calculated such that it and all subsequent non-allowable exceedances were reduced to the 40 FC/100 mL level.

Figures 6-1 through 6-10 and show that, with the exception of TMDL analysis point 101, the 30-day geometric mean standard is typically more restrictive than the 10 percent not-to-exceed standard. However, the 10 percent not-to-exceed standard is more restrictive in certain months for TMDL analysis points 112 and 101. Therefore, the summary of existing fecal coliform loads, wasteload allocations, and required reductions presented in Tables 6-1 through 6-5 are based on whichever component of the standard is most restrictive. In this way the final TMDL monthly allocations identify the reductions necessary to achieve both the 30-day geometric mean standard and the 10 percent not-to-exceed standard. Finally, it should be noted that the annual loads and percent reductions presented in Tables 6-1 through 6-5 are solely to allow comparison with other TMDL assessment points on Chester Creek. The monthly allocations present the “official” TMDL loads.

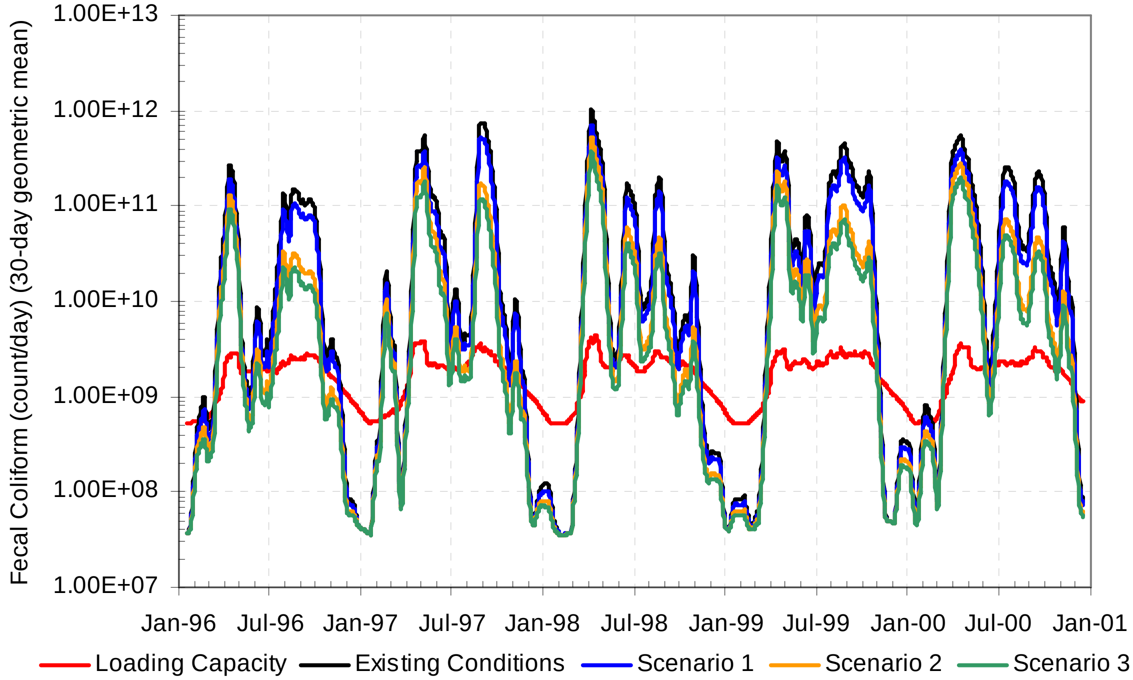


Figure 6-1. Evaluation of the 30-day geometric mean standard at TMDL analysis point 112 on the Middle Fork of Chester Creek.

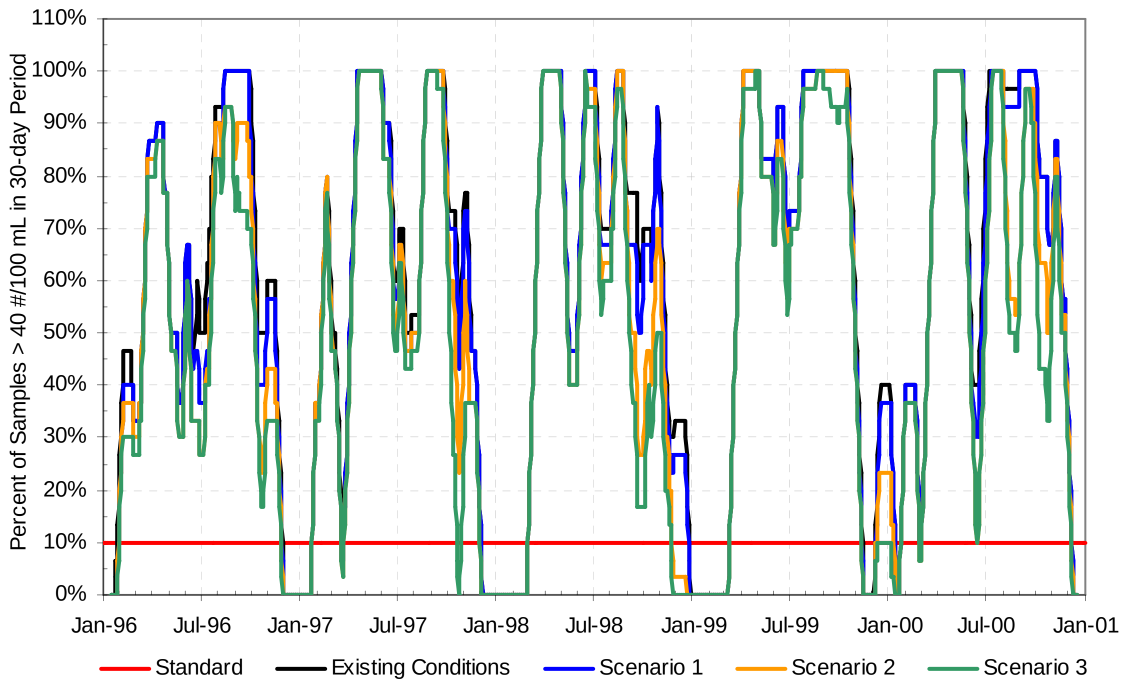


Figure 6-2. Evaluation of the 30-day not-to-exceed standard at TDML analysis point 112 on the Middle Fork of Chester Creek.

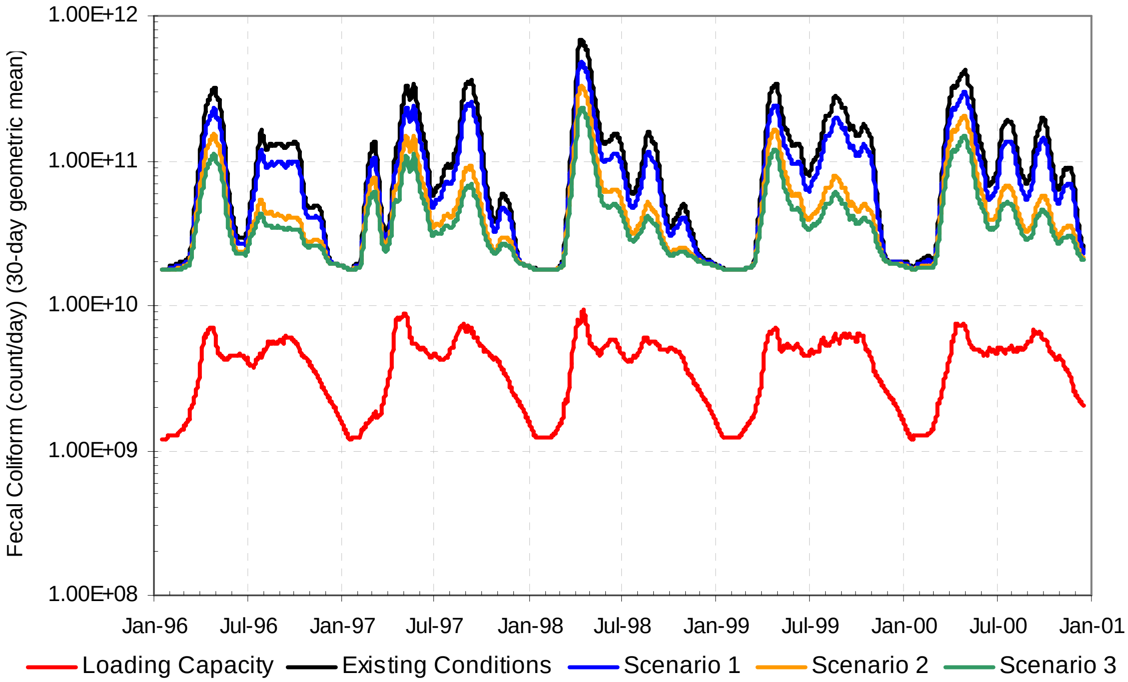


Figure 6-3. Evaluation of the 30-day geometric mean standard at TMDL analysis point 171 on the South Fork of Chester Creek.

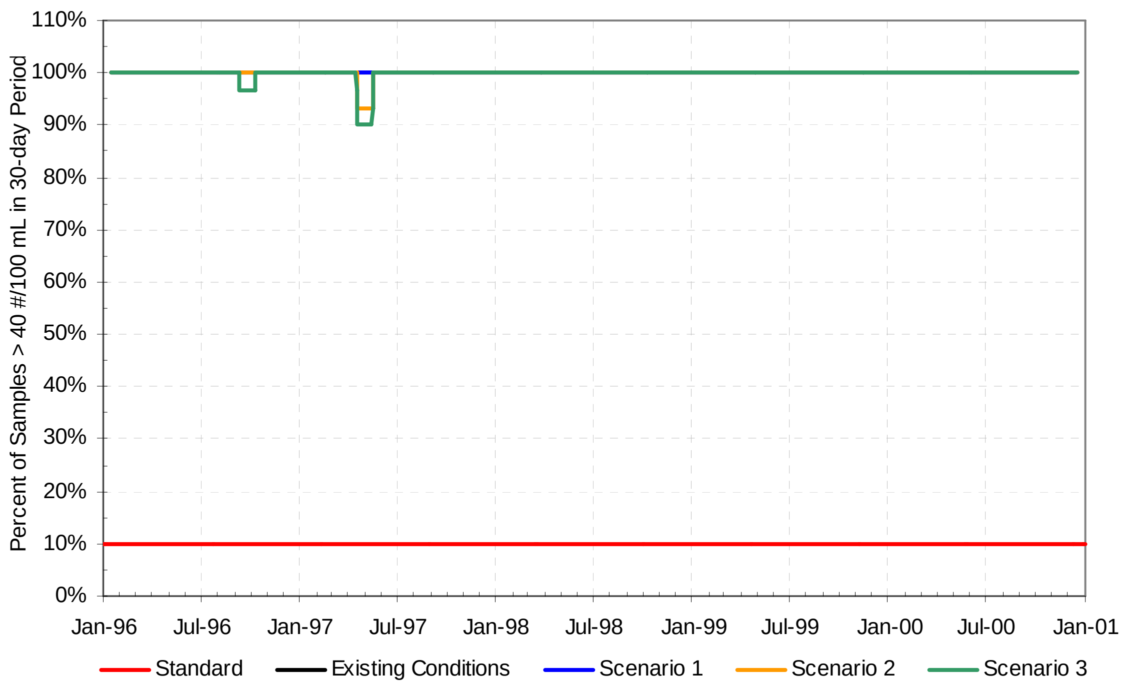


Figure 6-4. Evaluation of the 30-day not-to-exceed standard at TMDL analysis point 171 on the South Fork of Chester Creek.

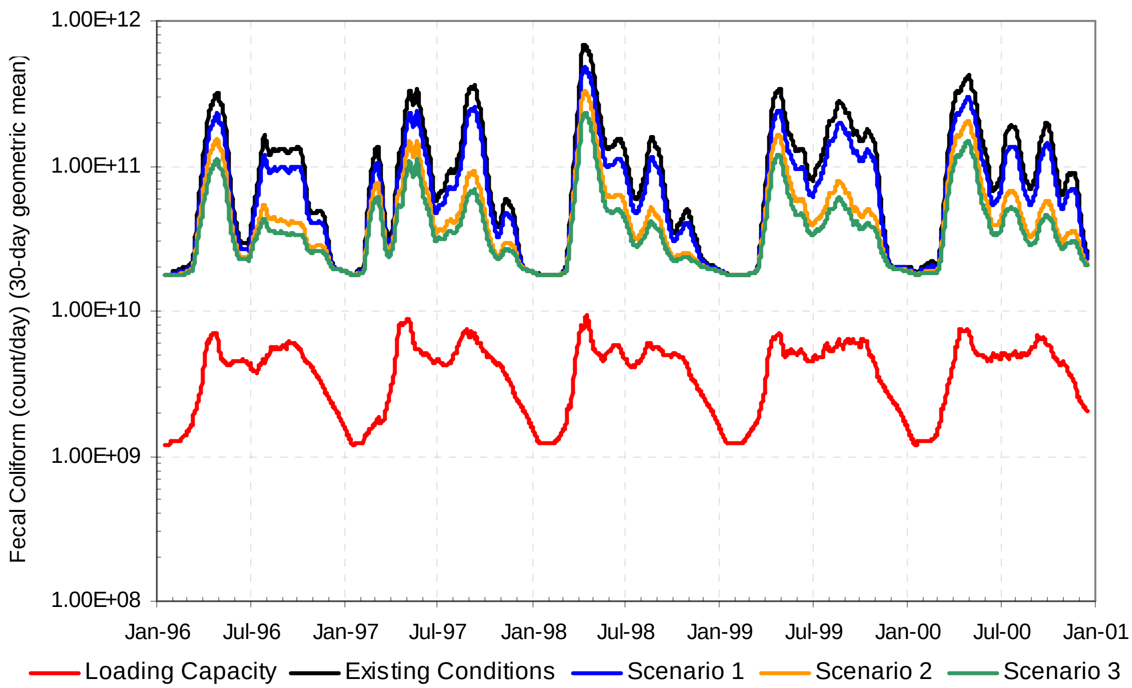


Figure 6-5. Evaluation of the 30-day geometric mean standard at TMDL analysis point 350 on the South Fork of Chester Creek.

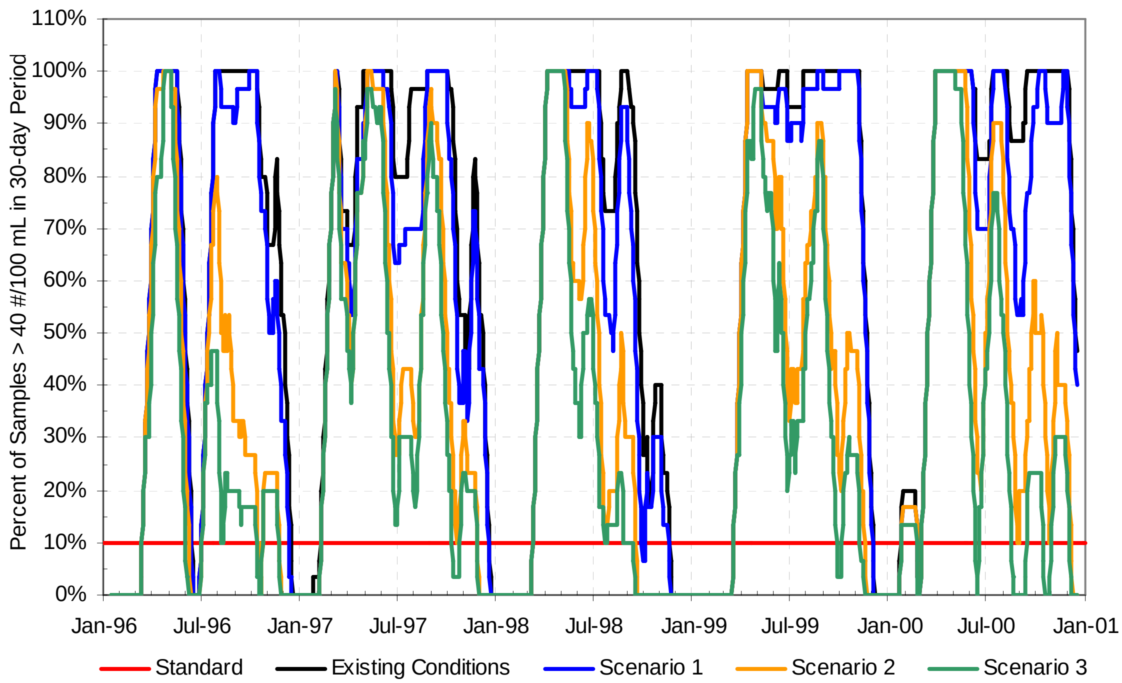


Figure 6-6. Evaluation of the 30-day not-to-exceed standard at TMDL analysis point 350 on the South Fork of Chester Creek.

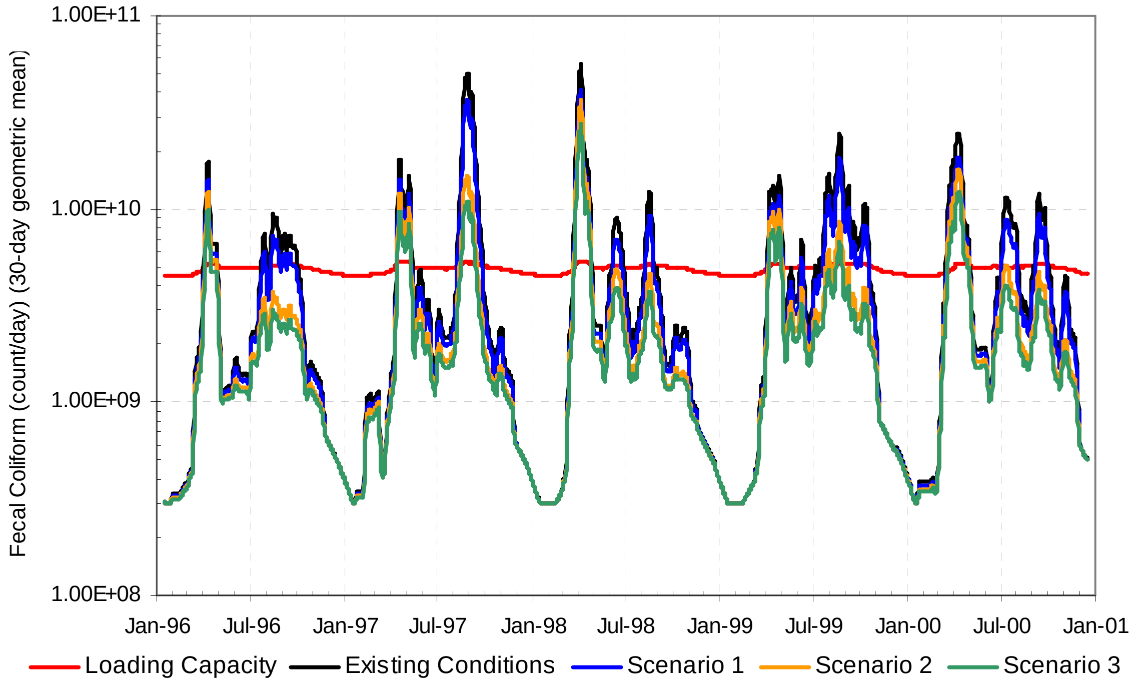


Figure 6-7. Evaluation of the 30-day geometric mean standard at TMDL analysis point 101 on Chester Creek.

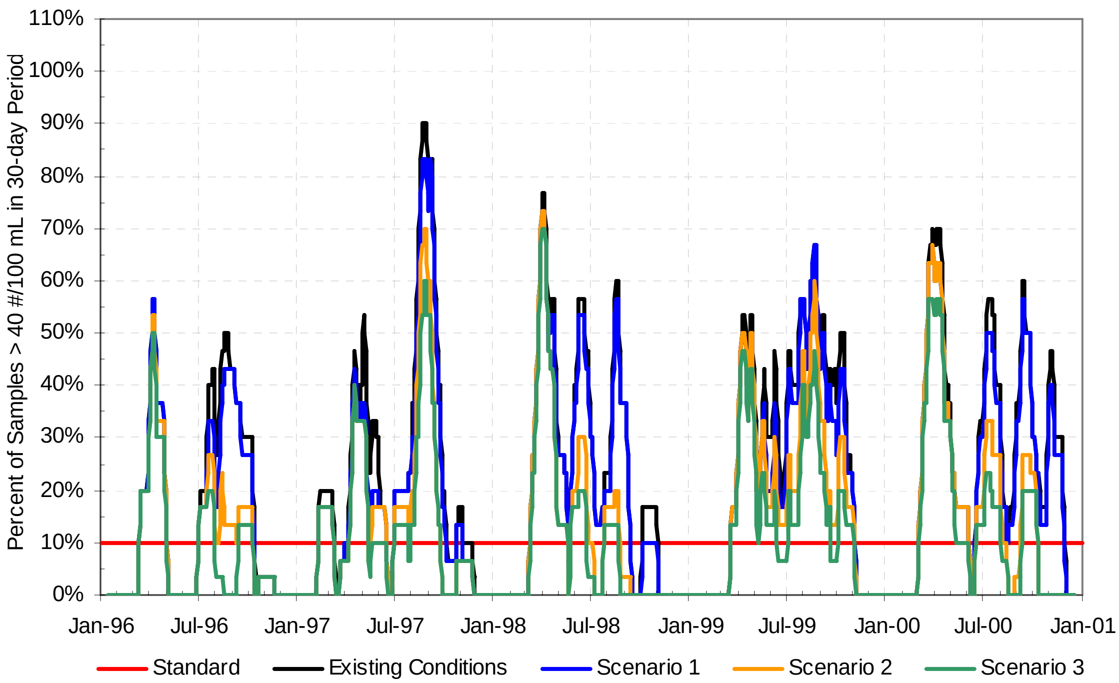


Figure 6-8. Evaluation of the 30-day not-to-exceed standard at TMDL analysis point 101 on Chester Creek.

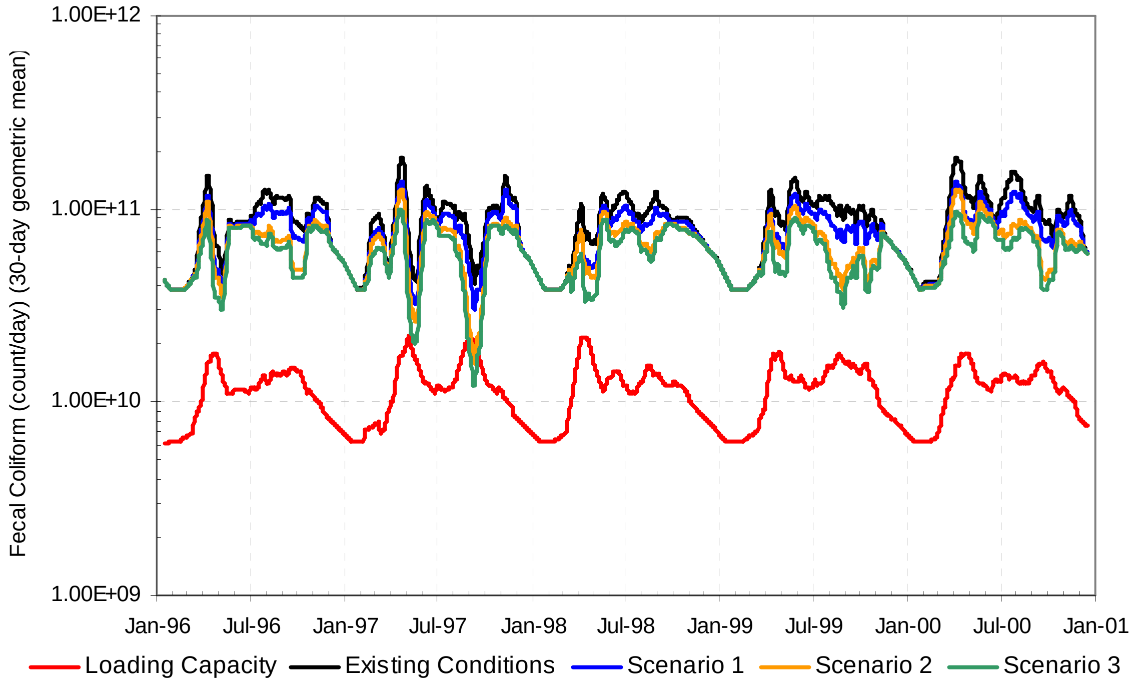


Figure 6-9. Evaluation of the 30-day geometric mean standard at TMDL analysis point CH2 on Chester Creek.

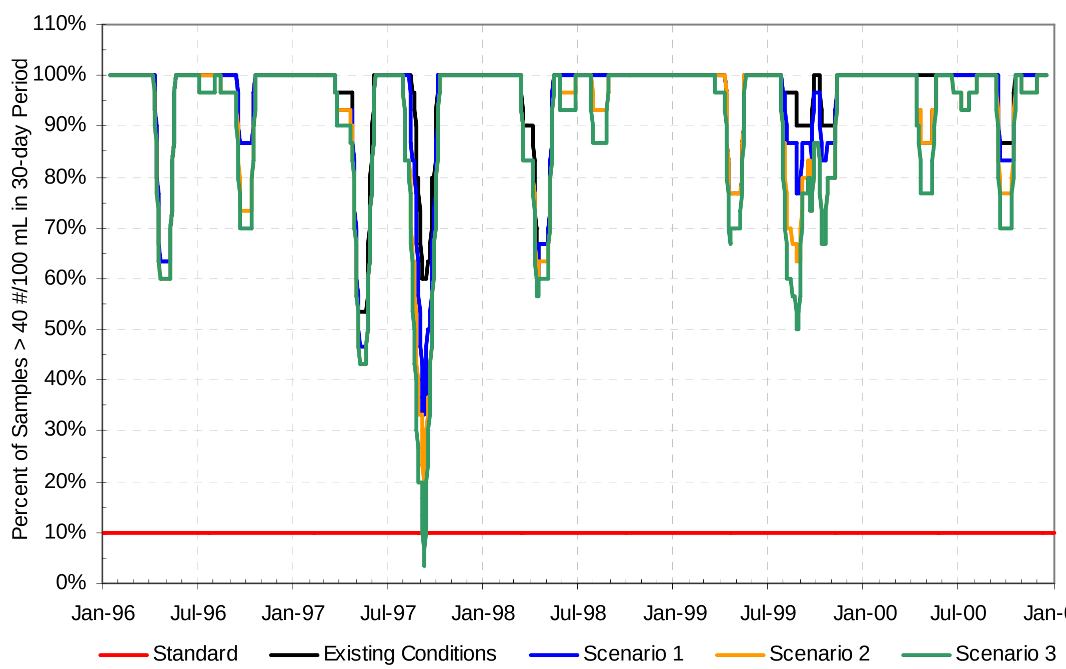


Figure 6-10. Evaluation of the 30-day not-to-exceed standard at TMDL analysis point CH2 on Chester Creek.

6.2 Load Allocation

Nonpoint sources are typically represented by loads carried to receiving waters through surface runoff resulting from precipitation events. However, because stormwater discharges in the MOA are regulated by a NPDES stormwater permit for municipal separate storm sewer systems (MS4), watershed loads delivered to Chester Creek through stormwater conveyances are addressed through the wasteload allocation component of this TMDL. Because the Chester Creek watershed includes only negligible loading from outside of the municipality that is essentially contributions from wildlife, a load allocation of zero has been set for this TMDL. In other words, all of the human sources of fecal coliform will be captured under the storm water permit and the wasteload allocation and that is why the load allocation is zero.

The rationale that loadings from outside the municipality are essentially natural background is based on previous studies (e.g., Dorava and Love, 1999; Frenzel and Couvillion, 2002), the 1988 to 1993 sampling that indicates geometric means of 5 to 8 counts/100 mL in this area, and more recent sampling at a site located on Fort Richardson. The Fort Richardson site (see Figure 3-1) has been sampled for fecal coliform 74 times over a 25-week period between July 1, 2004 and December 31, 2004 and the geometric mean of that data set is 4.38 FC/100ml. There are no known human sources of fecal coliform above the Fort Richardson site

6.3 Wasteload Allocation

The only permitted source of fecal coliform in the Chester Creek watershed is storm water runoff. The MOA is subject to an MS4 permit that regulates storm water discharges and EPA policy and regulation indicate that storm water runoff regulated by the NPDES program through an MS4 permit must be addressed through wasteload allocations in a TMDL (USEPA, 2002). Therefore, the Chester Creek TMDL establishes wasteload allocations for watershed loads of fecal coliform. The wasteload allocation is the loading capacity minus the margin of safety.

The fecal coliform wasteload allocations for Chester Creek, provided as monthly allocations for each the Chester Creek TMDL analysis points, are presented in Tables 6-1 to 6-5. As discussed previously, the tables present monthly wasteload allocations and required reductions for the most restrictive standard for each TMDL assessment point. For example, Table 6-1, representing TMDL analysis point 112, shows that the 10 percent not-to-exceed standard is more restrictive in the months of January, February, and December, and therefore, a greater level of reduction is required for these months relative to the 30-day geometric mean standard. The tables suggest that the greatest monthly fecal coliform loads to Chester Creek, and consequently the greatest required reductions, occur during the spring and summer months. The winter months represent the lowest fecal coliform loads to Chester Creek and also, therefore, require the lowest percent reductions from existing loads.

Future wasteload allocations are not established because ADEC does not anticipate any future permits for the discharge of fecal coliform to Chester Creek. Additionally, if data or information from future monitoring efforts can be used to identify and quantify stormwater or natural loads that are not delivered through the stormwater conveyances, the TMDL and its allocations will be revised accordingly.

Table 6-1. Summary of the Middle Fork Chester Creek TMDL (Analysis Point 112).

Month	Existing (FC/month)	Loading Capacity (FC/month)	Margin of Safety (FC/month)	Waste Load Allocation (FC/month)	Required Reduction
Jan	**3.11E+09**	**2.90E+09**	**2.90E+08**	**2.61E+09**	**7%**
Feb	**1.45E+12**	**4.78E+11**	**4.78E+10**	**4.30E+11**	**67%**
Mar	8.51E+11	3.21E+10	3.21E+09	2.89E+10	96%
Apr	9.58E+12	8.85E+10	8.85E+09	7.96E+10	99%
May	2.99E+12	6.75E+10	6.75E+09	6.08E+10	98%
Jun	1.10E+12	6.44E+10	6.44E+09	5.80E+10	94%
Jul	2.05E+12	6.55E+10	6.55E+09	5.90E+10	97%
Aug	5.13E+12	8.10E+10	8.10E+09	7.29E+10	98%
Sep	5.12E+12	8.07E+10	8.07E+09	7.26E+10	98%
Oct	1.15E+12	6.69E+10	6.69E+09	6.02E+10	94%
Nov	2.01E+11	4.23E+10	4.23E+09	3.81E+10	79%
Dec	**2.50E+10**	**1.80E+10**	**1.80E+09**	**1.62E+10**	**28%**
Annual	2.82E+13	6.46E+11	6.46E+10	5.81E+11	98%

Bold denotes monthly loading capacities identified using not-to-exceed standard.
Annual loads are given in FC/year.

Table 6-2. Summary of the South Fork Chester Creek TMDL (Analysis Point 171).

Month	Existing (FC/month)	Loading Capacity (FC/month)	Margin of Safety (FC/month)	Waste Load Allocation (FC/month)	Required Reduction
Jan	5.18E+11	3.63E+10	3.63E+09	3.27E+10	93%
Feb	7.55E+11	3.75E+10	3.75E+09	3.38E+10	95%
Mar	2.01E+12	7.25E+10	7.25E+09	6.53E+10	96%
Apr	9.06E+12	1.97E+11	1.97E+10	1.77E+11	98%
May	6.87E+12	1.66E+11	1.66E+10	1.49E+11	98%
Jun	2.91E+12	1.46E+11	1.46E+10	1.32E+11	95%
Jul	3.23E+12	1.43E+11	1.43E+10	1.28E+11	96%
Aug	4.75E+12	1.74E+11	1.74E+10	1.56E+11	96%
Sep	4.92E+12	1.78E+11	1.78E+10	1.60E+11	96%
Oct	2.86E+12	1.52E+11	1.52E+10	1.37E+11	95%
Nov	1.57E+12	9.81E+10	9.81E+09	8.83E+10	94%
Dec	6.37E+11	5.80E+10	5.80E+09	5.22E+10	91%
Annual	4.01E+13	1.46E+12	1.46E+11	1.31E+12	96%

Annual loads are given in FC/year.

Table 6-3. Summary of the South Fork Chester Creek TMDL (Analysis Point 350).

Month	Existing (FC/month)	Loading Capacity (FC/month)	Margin of Safety (FC/month)	Waste Load Allocation (FC/month)	Required Reduction
Jan	6.42E+10	5.71E+10	5.71E+09	5.14E+10	11%
Feb	1.32E+11	5.96E+10	5.96E+09	5.36E+10	55%
Mar	9.09E+11	1.15E+11	1.15E+10	1.04E+11	87%
Apr	4.66E+12	2.99E+11	2.99E+10	2.69E+11	94%
May	2.88E+12	2.53E+11	2.53E+10	2.27E+11	91%
Jun	1.08E+12	2.29E+11	2.29E+10	2.06E+11	79%
Jul	1.26E+12	2.28E+11	2.28E+10	2.05E+11	82%
Aug	2.28E+12	2.77E+11	2.77E+10	2.49E+11	88%
Sep	2.22E+12	2.77E+11	2.77E+10	2.49E+11	88%
Oct	1.15E+12	2.37E+11	2.37E+10	2.13E+11	79%
Nov	5.77E+11	1.55E+11	1.55E+10	1.39E+11	73%
Dec	1.28E+11	9.01E+10	9.01E+09	8.11E+10	30%
Annual	1.73E+13	2.27E+12	2.27E+11	2.05E+12	87%

Annual loads are given in FC/year.

Table 6-4. Summary of the Chester Creek TMDL (Analysis Point 101).

Month	Existing (FC/month)	Loading Capacity (FC/month)	Margin of Safety (FC/month)	Waste Load Allocation (FC/month)	Required Reduction
Jan	**9.59E+09**	**8.69E+09**	**8.69E+08**	**7.82E+09**	**9%**
Feb	**1.26E+11**	**1.04E+11**	**1.04E+10**	**9.35E+10**	**18%**
Mar	**7.76E+11**	**4.02E+11**	**4.02E+10**	**3.62E+11**	**48%**
Apr	**4.28E+12**	**1.26E+12**	**1.26E+11**	**1.13E+12**	**71%**
May	**2.69E+11**	**1.50E+11**	**1.50E+10**	**1.35E+11**	**44%**
Jun	**2.69E+11**	**1.74E+11**	**1.74E+10**	**1.56E+11**	**36%**
Jul	**4.87E+11**	**2.76E+11**	**2.76E+10**	**2.49E+11**	**43%**
Aug	**9.51E+11**	**4.09E+11**	**4.09E+10**	**3.68E+11**	**57%**
Sep	**8.30E+11**	**3.89E+11**	**3.89E+10**	**3.51E+11**	**53%**
Oct	**2.85E+11**	**1.82E+11**	**1.82E+10**	**1.64E+11**	**36%**
Nov	**1.44E+11**	**1.01E+11**	**1.01E+10**	**9.11E+10**	**30%**
Dec	1.63E+10	1.63E+10	1.63E+09	1.47E+10	0%
Annual	**8.44E+12**	**3.47E+12**	**3.47E+11**	**3.12E+12**	**59%**

Bold denotes monthly loading capacities identified using not-to-exceed standard.
Annual loads are given in FC/year.

Table 6-5. Summary of the Chester Creek TMDL (Analysis Point CH2).

Month	Existing (FC/month)	Loading Capacity (FC/month)	Margin of Safety (FC/month)	Waste Load Allocation (FC/month)	Required Reduction
Jan	1.21E+12	1.80E+11	1.80E+10	1.62E+11	85%
Feb	1.23E+12	1.85E+11	1.85E+10	1.66E+11	85%
Mar	1.98E+12	2.75E+11	2.75E+10	2.48E+11	86%
Apr	3.40E+12	5.03E+11	5.03E+10	4.53E+11	85%
May	2.84E+12	4.39E+11	4.39E+10	3.95E+11	85%
Jun	3.14E+12	3.73E+11	3.73E+10	3.35E+11	88%
Jul	3.45E+12	3.87E+11	3.87E+10	3.49E+11	89%
Aug	3.28E+12	4.58E+11	4.58E+10	4.12E+11	86%
Sep	2.69E+12	4.55E+11	4.55E+10	4.09E+11	83%
Oct	2.80E+12	3.91E+11	3.91E+10	3.52E+11	86%
Nov	2.91E+12	2.91E+11	2.91E+10	2.62E+11	90%
Dec	1.74E+12	2.13E+11	2.13E+10	1.92E+11	88%
Annual	3.07E+13	4.15E+12	4.15E+11	3.73E+12	86%

Annual loads are given in FC/year.

6.4 Margin of Safety

The margin of safety accounts for any uncertainty concerning the relationship between pollutant loading and receiving water quality and is a required component of a TMDL. The margin of safety can be implicit (e.g., incorporated into the TMDL analysis through conservative assumptions) or explicit (e.g., expressed in the TMDL as a portion of the loading) or a combination of both. For the Chester Creek TMDL, 10 percent of the loading capacity was explicitly reserved for the margin of safety.

6.5 Seasonal Variation

A TMDL must consider seasonal variation in the derivation of the allocation. By using continuous simulation (daily modeling), seasonal hydrologic and source loading variability was inherently considered. The fecal coliform counts simulated for each day of the modeling time period were compared to TMDL targets and an allocation that would meet these targets for every day was developed. Allowable loads were also specified by month. Modeling results agree with fecal coliform data collected within the Chester Creek watershed in that spring and summer months account for the greatest loading of fecal coliform to Chester Creek, and that winter months typically account for lower fecal coliform contributions to the creek.

6.6 Implementation Scenarios

Three implementation scenarios, selected with consultation with ADEC, were simulated with the calibrated SWMM model. These scenarios are:

- Scenario 1 – Public education. Informing the public about the benefits of “cleaning up” after their pets was assumed to result in a 30 percent decrease in the surface build up of fecal coliform on landscaped, street, directly connected, and indirectly connected impervious land cover types.

- Scenario 2 – Increased street sweeping frequency and efficiency. Street sweeping frequency was increased from monthly to weekly intervals and the efficiency was assumed to increase to eighty percent.

- Scenario 3 – A combination of Scenario 1 and Scenario 2.

Tables 6-6 through 6-15, and Figures 6-11 through 6-20 summarize the results of the implementation scenarios for each of the analysis points in Chester Creek. Table elements in bold type denote that the 10 percent no-to-exceed standard applies for the given month. The tables show that a combination of education and increased street sweeping frequency and efficiency (TMDL scenario 3) could have a significant impact in reducing fecal coliform loading to Chester Creek. Simulation results suggest that an annual percent reduction ranging from 74 percent at analysis point 112 to 29 percent at analysis point CH2 is possible with the implementation of TMDL scenario 3. For each TMDL analysis point, additional reduction in fecal coliform beyond that provided by the TMDL scenarios is required (see Tables 6-7, 6-9, 6-11, 6-13, and 6-15). For example, as presented in Table 6-15, TMDL analysis point CH2 requires an additional 58 percent reduction in fecal coliform on an annual basis to comply with the 30-day geometric mean standard. Significant additional monthly reductions are required at this site to meet water quality standards.

The tables also show decreasing fecal coliform reductions moving downstream in the watershed. This is due to the greater occurrence of lakes and wetlands in the middle to lower portion of the watershed and therefore a greater contribution of fecal coliform contribution from waterfowl relative to the upper portion of the basin. Since the scenarios simulate changes only to the urbanized areas in the watershed they do not impact loadings from wetlands, lakes or forested areas.

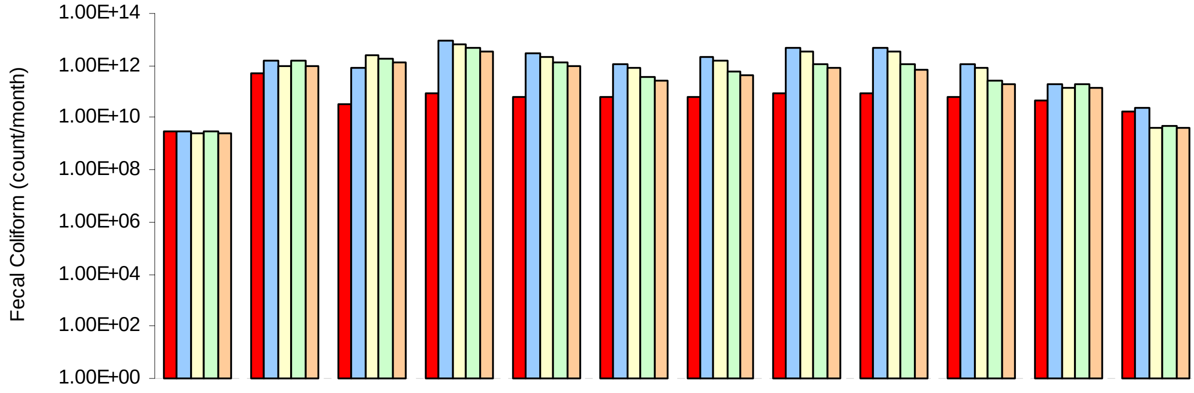
Table 6-6. Implementation Scenarios for TMDL Analysis Point 112, Middle Fork Chester Creek.

Scenario 1 Month	Existing (FC/month)	Post-Scenario (FC/month)	Percent Reduction
January	**3.11E+09**	**2.52E+09**	**19%**
February	**1.45E+12**	**1.01E+12**	**30%**
March	8.51E+11	6.06E+11	29%
April	9.58E+12	6.69E+12	30%
May	2.99E+12	2.10E+12	30%
June	1.10E+12	7.78E+11	29%
July	2.05E+12	1.45E+12	30%
August	5.13E+12	3.60E+12	30%
September	5.12E+12	3.58E+12	30%
October	1.15E+12	8.13E+11	29%
November	2.01E+11	1.47E+11	27%
December	**2.50E+10**	**1.78E+10**	**29%**
Annual	2.82E+13	1.98E+13	30%
Scenario 2 **Month**	**Existing (FC/month)**	**Post-Scenario (FC/month)**	**Percent Reduction**
January	**3.11E+09**	**3.11E+09**	**0%**
February	**1.45E+12**	**1.45E+12**	**0%**
March	8.51E+11	4.49E+11	47%
April	9.58E+12	4.87E+12	49%
May	2.99E+12	1.43E+12	52%
June	1.10E+12	3.92E+11	64%
July	2.05E+12	5.78E+11	72%
August	5.13E+12	1.20E+12	77%
September	5.12E+12	1.06E+12	79%
October	1.15E+12	2.50E+11	78%
November	2.01E+11	2.01E+11	0%
December	**2.50E+10**	**2.50E+10**	**0%**
Annual	2.82E+13	1.04E+13	63%
Scenario 3 **Month**	**Existing (FC/month)**	**Post-Scenario (FC/month)**	**Percent Reduction**
January	**3.11E+09**	**2.52E+09**	**19%**
February	**1.45E+12**	**1.01E+12**	**30%**
March	8.51E+11	3.21E+11	62%
April	9.58E+12	3.40E+12	64%
May	2.99E+12	1.00E+12	66%
June	1.10E+12	2.78E+11	75%
July	2.05E+12	4.10E+11	80%
August	5.13E+12	8.46E+11	84%
September	5.12E+12	7.43E+11	85%
October	1.15E+12	1.78E+11	85%
November	2.01E+11	1.47E+11	27%
December	**2.50E+10**	**1.78E+10**	**29%**
Annual	2.82E+13	7.33E+12	74%

Table 6-7. Summary of TMDL Scenarios for TMDL Analysis Point 112, Middle Fork Chester Creek.

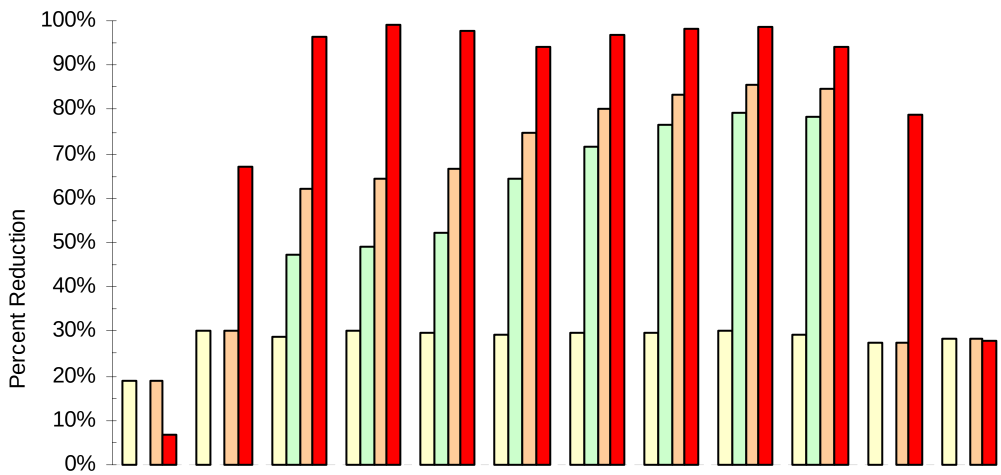
Month	Required Reduction	Scenario 1 Reduction	Scenario 2 Reduction	Scenario 3 Reduction	Additional Reduction
Jan	**7%**	**19%**	**0%**	**19%**	**0%**
Feb	**67%**	**30%**	**0%**	**30%**	**37%**
Mar	96%	29%	47%	62%	34%
Apr	99%	30%	49%	64%	35%
May	98%	30%	52%	66%	31%
Jun	94%	29%	64%	75%	19%
Jul	97%	30%	72%	80%	17%
Aug	98%	30%	77%	84%	15%
Sep	98%	30%	79%	85%	13%
Oct	94%	29%	78%	85%	10%
Nov	79%	27%	0%	27%	52%
Dec	**28%**	**29%**	**0%**	**29%**	**0%**
Annual	98%	30%	63%	74%	24%

Bold type indicates that the 10 percent not-to-exceed standard applies for the month.
Annual loads are given in FC/year.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Loading Capacity	2.90E+09	4.78E+11	3.21E+10	8.85E+10	6.75E+10	6.44E+10	6.55E+10	8.10E+10	8.07E+10	6.69E+10	4.23E+10	1.80E+10
Existing Conditions	3.11E+09	1.45E+12	8.51E+11	9.58E+12	2.99E+12	1.10E+12	2.05E+12	5.13E+12	5.12E+12	1.15E+12	2.01E+11	2.50E+10
Scenario 1	2.52E+09	1.01E+12	2.70E+12	6.69E+12	2.10E+12	7.78E+11	1.45E+12	3.60E+12	3.58E+12	8.13E+11	1.47E+11	4.19E+09
Scenario 2	3.11E+09	1.45E+12	1.93E+12	4.87E+12	1.43E+12	3.92E+11	5.78E+11	1.20E+12	1.06E+12	2.50E+11	2.01E+11	4.88E+09
Scenario 3	2.52E+09	1.01E+12	1.35E+12	3.40E+12	1.00E+12	2.78E+11	4.10E+11	8.46E+11	7.43E+11	1.78E+11	1.47E+11	4.19E+09

Figure 6-11. Comparison of monthly loading capacities evaluated by the most restrictive standard to existing loads and TMDL scenario loads at TMDL analysis point 112 on the Middle Fork of Chester Creek.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Scenario 1	19%	30%	29%	30%	30%	29%	30%	30%	30%	29%	27%	29%
Scenario 2	0%	0%	47%	49%	52%	64%	72%	77%	79%	78%	0%	0%
Scenario 3	19%	30%	62%	64%	66%	75%	80%	84%	85%	85%	27%	29%
Required Reduction	7%	67%	96%	99%	98%	94%	97%	98%	98%	94%	79%	28%

Figure 6-12. Comparison of monthly loading reductions provided by the TMDL scenarios and loading reductions required by the most restrictive standard at TMDL analysis point 112 on the Middle Fork of Chester Creek.

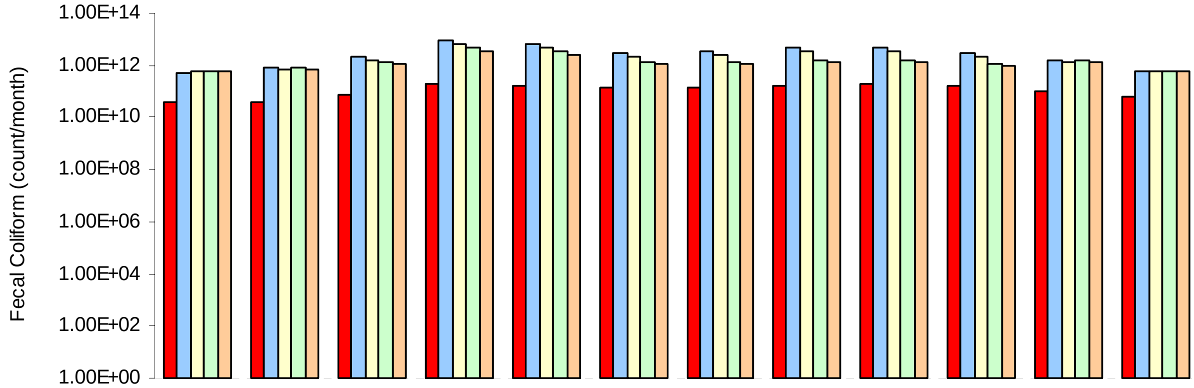
Table 6-8. Implementation Scenarios for TMDL Analysis Point 171, South Fork Chester Creek.

Scenario 1 Month	Existing (FC/month)	Post-Scenario (FC/month)	Percent Reduction
January	5.18E+11	5.14E+11	1%
February	7.55E+11	6.93E+11	8%
March	2.01E+12	1.64E+12	18%
April	9.06E+12	6.50E+12	28%
May	6.87E+12	4.97E+12	28%
June	2.91E+12	2.22E+12	24%
July	3.23E+12	2.46E+12	24%
August	4.75E+12	3.50E+12	26%
September	4.92E+12	3.60E+12	27%
October	2.86E+12	2.20E+12	23%
November	1.57E+12	1.30E+12	17%
December	6.37E+11	6.12E+11	4%
Annual	4.01E+13	3.02E+13	25%
Scenario 2			
Month	**Existing (FC/month)**	**Post-Scenario (FC/month)**	**Percent Reduction**
January	5.18E+11	5.18E+11	0%
February	7.55E+11	7.55E+11	0%
March	2.01E+12	1.36E+12	32%
April	9.06E+12	4.50E+12	50%
May	6.87E+12	3.24E+12	53%
June	2.91E+12	1.42E+12	51%
July	3.23E+12	1.39E+12	57%
August	4.75E+12	1.61E+12	66%
September	4.92E+12	1.52E+12	69%
October	2.86E+12	1.19E+12	58%
November	1.57E+12	1.57E+12	0%
December	6.37E+11	6.37E+11	0%
Annual	4.01E+13	1.95E+13	51%
Scenario 3			
Month	**Existing (FC/month)**	**Post-Scenario (FC/month)**	**Percent Reduction**
January	5.18E+11	5.14E+11	1%
February	7.55E+11	6.93E+11	8%
March	2.01E+12	1.16E+12	42%
April	9.06E+12	3.29E+12	64%
May	6.87E+12	2.44E+12	65%
June	2.91E+12	1.17E+12	60%
July	3.23E+12	1.15E+12	64%
August	4.75E+12	1.29E+12	73%
September	4.92E+12	1.22E+12	75%
October	2.86E+12	1.02E+12	64%
November	1.57E+12	1.30E+12	17%
December	6.37E+11	6.12E+11	4%
Annual	4.01E+13	1.57E+13	61%

Table 6-9. Summary of TMDL Scenarios for TMDL Analysis Point 171, South Fork Chester Creek.

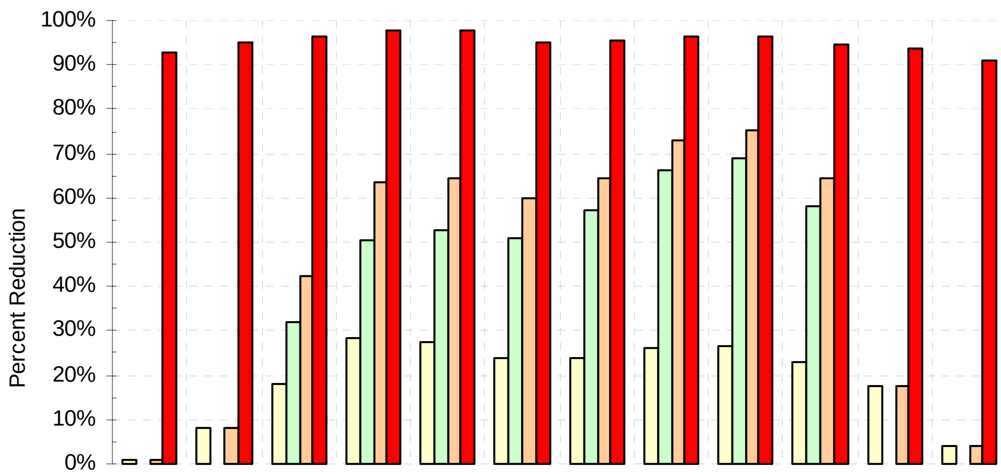
Month	Required Reduction	Scenario 1 Reduction	Scenario 2 Reduction	Scenario 3 Reduction	Additional Reduction
January	93%	1%	0%	1%	92%
February	95%	8%	0%	8%	87%
March	96%	18%	32%	42%	54%
April	98%	28%	50%	64%	34%
May	98%	28%	53%	65%	33%
June	95%	24%	51%	60%	35%
July	96%	24%	57%	64%	31%
August	96%	26%	66%	73%	23%
September	96%	27%	69%	75%	21%
October	95%	23%	58%	64%	30%
November	94%	17%	0%	17%	76%
December	91%	4%	0%	4%	87%
Annual	96%	25%	51%	61%	36%

Annual loads are given in FC/year.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Loading Capacity	3.63E+10	3.75E+10	7.25E+10	1.97E+11	1.66E+11	1.46E+11	1.43E+11	1.74E+11	1.78E+11	1.52E+11	9.81E+10	5.80E+10
Existing Conditions	5.18E+11	7.55E+11	2.01E+12	9.06E+12	6.87E+12	2.91E+12	3.23E+12	4.75E+12	4.92E+12	2.86E+12	1.57E+12	6.37E+11
Scenario 1	5.58E+11	6.93E+11	1.64E+12	6.50E+12	4.97E+12	2.22E+12	2.46E+12	3.50E+12	3.60E+12	2.20E+12	1.30E+12	6.12E+11
Scenario 2	5.60E+11	7.55E+11	1.36E+12	4.50E+12	3.24E+12	1.42E+12	1.39E+12	1.61E+12	1.52E+12	1.19E+12	1.57E+12	6.37E+11
Scenario 3	5.58E+11	6.93E+11	1.16E+12	3.29E+12	2.44E+12	1.17E+12	1.15E+12	1.29E+12	1.22E+12	1.02E+12	1.30E+12	6.12E+11

Figure 6-13. Comparison of monthly loading capacities evaluated by the most restrictive standard to existing loads and TMDL scenario loads at TMDL analysis point 171 on the South Fork of Chester Creek.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Scenario 1	1%	8%	18%	28%	28%	24%	24%	26%	27%	23%	17%	4%
Scenario 2	0%	0%	32%	50%	53%	51%	57%	66%	69%	58%	0%	0%
Scenario 3	1%	8%	42%	64%	65%	60%	64%	73%	75%	64%	17%	4%
Required Reduction	93%	95%	96%	98%	98%	95%	96%	96%	96%	95%	94%	91%

Figure 6-14. Comparison of monthly loading reductions provided by the TMDL scenarios and loading reductions required by the most restrictive standard at TMDL analysis point 171 on the South Fork of Chester Creek.

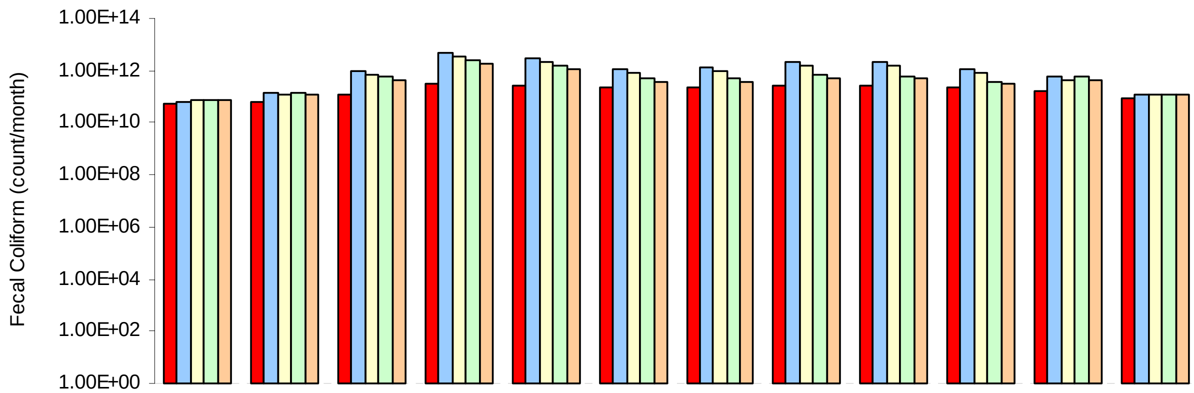
Table 6-10. Implementation Scenarios for TMDL Analysis Point 350, South Fork Chester Creek.

Month	Existing (FC/month)	Post-Scenario (FC/month)	Percent Reduction
Scenario 1			
January	6.42E+10	6.34E+10	1%
February	1.32E+11	1.15E+11	13%
March	9.09E+11	6.97E+11	23%
April	4.66E+12	3.31E+12	29%
May	2.88E+12	2.04E+12	29%
June	1.08E+12	7.96E+11	27%
July	1.26E+12	9.28E+11	26%
August	2.28E+12	1.63E+12	28%
September	2.22E+12	1.59E+12	28%
October	1.15E+12	8.44E+11	26%
November	5.77E+11	4.45E+11	23%
December	1.28E+11	1.16E+11	10%
Annual	1.73E+13	1.26E+13	27%
Scenario 2			
Month	**Existing (FC/month)**	**Post-Scenario (FC/month)**	**Percent Reduction**
January	6.42E+10	6.42E+10	0%
February	1.32E+11	1.32E+11	0%
March	9.09E+11	5.92E+11	35%
April	4.66E+12	2.63E+12	44%
May	2.88E+12	1.45E+12	50%
June	1.08E+12	4.96E+11	54%
July	1.26E+12	4.95E+11	61%
August	2.28E+12	7.03E+11	69%
September	2.22E+12	6.17E+11	72%
October	1.15E+12	3.94E+11	66%
November	5.77E+11	5.77E+11	0%
December	1.28E+11	1.28E+11	0%
Annual	1.73E+13	8.19E+12	53%
Scenario 3			
Month	**Existing (FC/month)**	**Post-Scenario (FC/month)**	**Percent Reduction**
January	6.42E+10	6.34E+10	1%
February	1.32E+11	1.15E+11	13%
March	9.09E+11	4.64E+11	49%
April	4.66E+12	1.89E+12	59%
May	2.88E+12	1.05E+12	63%
June	1.08E+12	3.84E+11	65%
July	1.26E+12	3.87E+11	69%
August	2.28E+12	5.31E+11	77%
September	2.22E+12	4.68E+11	79%
October	1.15E+12	3.17E+11	72%
November	5.77E+11	4.45E+11	23%
December	1.28E+11	1.16E+11	10%
Annual	1.73E+13	6.16E+12	64%

Table 6-11. Summary of TMDL Scenarios for TMDL Analysis Point 350 on the South Fork Chester Creek.

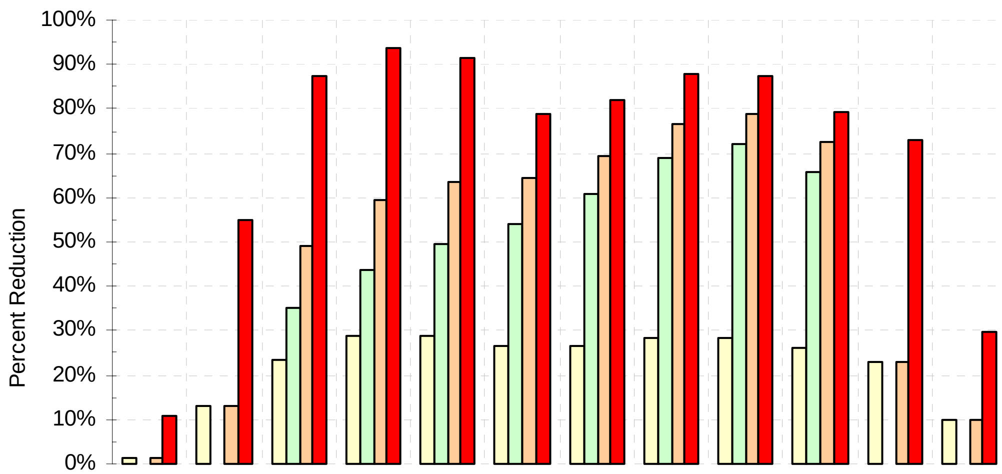
Month	Required Reduction	Scenario 1 Reduction	Scenario 2 Reduction	Scenario 3 Reduction	Additional Reduction
January	11%	1%	0%	1%	10%
February	55%	13%	0%	13%	42%
March	87%	23%	35%	49%	38%
April	94%	29%	44%	59%	34%
May	91%	29%	50%	63%	28%
June	79%	27%	54%	65%	14%
July	82%	26%	61%	69%	13%
August	88%	28%	69%	77%	11%
September	88%	28%	72%	79%	9%
October	79%	26%	66%	72%	7%
November	73%	23%	0%	23%	50%
December	30%	10%	0%	10%	20%
Annual	87%	27%	53%	64%	22%

Annual loads are given in FC/year.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Loading Capacity	5.71E+10	5.96E+10	1.15E+11	2.99E+11	2.53E+11	2.29E+11	2.28E+11	2.77E+11	2.77E+11	2.37E+11	1.55E+11	9.01E+10
Existing Conditions	6.42E+10	1.32E+11	9.09E+11	4.66E+12	2.88E+12	1.08E+12	1.26E+12	2.28E+12	2.22E+12	1.15E+12	5.77E+11	1.28E+11
Scenario 1	6.83E+10	1.15E+11	6.97E+11	3.31E+12	2.04E+12	7.96E+11	9.28E+11	1.63E+12	1.59E+12	8.44E+11	4.45E+11	1.16E+11
Scenario 2	6.88E+10	1.32E+11	5.92E+11	2.63E+12	1.45E+12	4.96E+11	4.95E+11	7.03E+11	6.17E+11	3.94E+11	5.77E+11	1.28E+11
Scenario 3	6.83E+10	1.15E+11	4.64E+11	1.89E+12	1.05E+12	3.84E+11	3.87E+11	5.31E+11	4.68E+11	3.17E+11	4.45E+11	1.16E+11

Figure 6-15. Comparison of monthly loading capacities evaluated by the most restrictive standard to existing loads and TMDL scenario loads at TMDL analysis point 350 on the South Fork of Chester Creek.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Scenario 1	1%	13%	23%	29%	29%	27%	26%	28%	28%	26%	23%	10%
Scenario 2	0%	0%	35%	44%	50%	54%	61%	69%	72%	66%	0%	0%
Scenario 3	1%	13%	49%	59%	63%	65%	69%	77%	79%	72%	23%	10%
Required Reduction	11%	55%	87%	94%	91%	79%	82%	88%	88%	79%	73%	30%

Figure 6-16. Comparison of monthly loading reductions provided by the TMDL scenarios and loading reductions required by the most restrictive standard at TMDL analysis point 350 on the South Fork of Chester Creek.

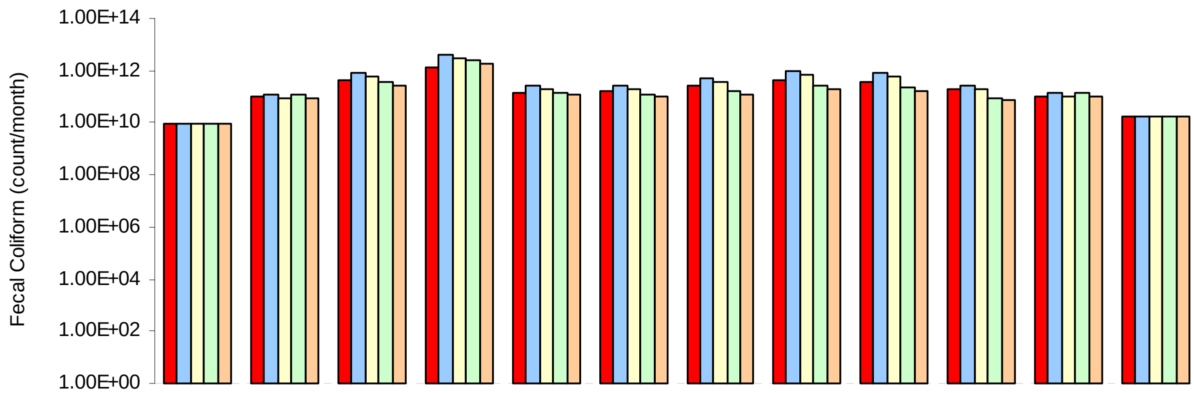
Table 6-12. Implementation Scenarios for TMDL Analysis Point 101 on Chester Creek.

Scenario 1			
Month	**Existing (FC/month)**	**Post-Scenario (FC/month)**	**Percent Reduction**
January	**9.59E+09**	**9.58E+09**	**0%**
February	**1.26E+11**	**9.07E+10**	**28%**
March	**7.76E+11**	**5.45E+11**	**30%**
April	**4.28E+12**	**2.99E+12**	**30%**
May	**2.69E+11**	**1.96E+11**	**27%**
June	**2.69E+11**	**1.97E+11**	**27%**
July	**4.87E+11**	**3.48E+11**	**29%**
August	**9.51E+11**	**6.73E+11**	**29%**
September	**8.30E+11**	**5.89E+11**	**29%**
October	**2.85E+11**	**2.08E+11**	**27%**
November	**1.44E+11**	**1.07E+11**	**26%**
December	1.46E+10	1.45E+10	1%
Annual	**8.44E+12**	**5.97E+12**	**29%**
Scenario 2			
Month	**Existing (FC/month)**	**Post-Scenario (FC/month)**	**Percent Reduction**
January	**9.59E+09**	**9.59E+09**	**0%**
February	**1.26E+11**	**1.26E+11**	**0%**
March	**7.76E+11**	**3.87E+11**	**50%**
April	**4.28E+12**	**2.58E+12**	**40%**
May	**2.69E+11**	**1.48E+11**	**45%**
June	**2.69E+11**	**1.22E+11**	**55%**
July	**4.87E+11**	**1.69E+11**	**65%**
August	**9.51E+11**	**2.72E+11**	**71%**
September	**8.30E+11**	**2.18E+11**	**74%**
October	**2.85E+11**	**8.43E+10**	**70%**
November	**1.44E+11**	**1.44E+11**	**0%**
December	1.46E+10	1.46E+10	0%
Annual	**8.44E+12**	**4.27E+12**	**49%**
Scenario 3			
Month	**Existing (FC/month)**	**Post-Scenario (FC/month)**	**Percent Reduction**
January	**9.59E+09**	**9.58E+09**	**0%**
February	**1.26E+11**	**9.07E+10**	**28%**
March	**7.76E+11**	**2.74E+11**	**65%**
April	**4.28E+12**	**1.81E+12**	**58%**
May	**2.69E+11**	**1.12E+11**	**58%**
June	**2.69E+11**	**9.45E+10**	**65%**
July	**4.87E+11**	**1.26E+11**	**74%**
August	**9.51E+11**	**1.99E+11**	**79%**
September	**8.30E+11**	**1.62E+11**	**81%**
October	**2.85E+11**	**6.83E+10**	**76%**
November	**1.44E+11**	**1.07E+11**	**26%**
December	1.46E+10	1.45E+10	1%
Annual	**8.44E+12**	**3.06E+12**	**64%**

Table 6-13. Summary of TMDL Scenarios for TMDL Analysis Point 101 on Chester Creek.

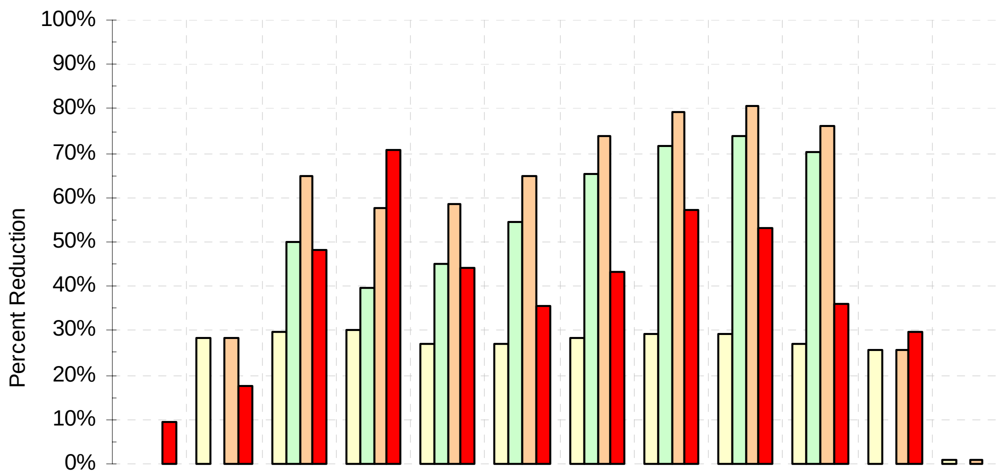
Month	Required Reduction	Scenario 1 Reduction	Scenario 2 Reduction	Scenario 3 Reduction	Additional Reduction
January	**9%**	**0%**	**0%**	**0%**	**9%**
February	**18%**	**28%**	**0%**	**28%**	**0%**
March	**48%**	**30%**	**50%**	**65%**	**0%**
April	**71%**	**30%**	**40%**	**58%**	**13%**
May	**44%**	**27%**	**45%**	**58%**	**0%**
June	**36%**	**27%**	**55%**	**65%**	**0%**
July	**43%**	**29%**	**65%**	**74%**	**0%**
August	**57%**	**29%**	**71%**	**79%**	**0%**
September	**53%**	**29%**	**74%**	**81%**	**0%**
October	**36%**	**27%**	**70%**	**76%**	**0%**
November	**30%**	**26%**	**0%**	**26%**	**4%**
December	0%	1%	0%	1%	0%
Annual	**59%**	**29%**	**49%**	**64%**	**0%**

Bold type indicates that the 10 percent not-to-exceed standard applies for the month.
Annual loads are given in FC/year.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Loading Capacity	8.69E+09	1.04E+11	4.02E+11	1.26E+12	1.50E+11	1.74E+11	2.76E+11	4.09E+11	3.89E+11	1.82E+11	1.01E+11	1.63E+10
Existing Conditions	9.59E+09	1.26E+11	7.76E+11	4.28E+12	2.69E+11	2.69E+11	4.87E+11	9.51E+11	8.30E+11	2.85E+11	1.44E+11	1.63E+10
Scenario 1	9.58E+09	9.07E+10	5.45E+11	2.99E+12	1.96E+11	1.97E+11	3.48E+11	6.73E+11	5.89E+11	2.08E+11	1.07E+11	1.62E+10
Scenario 2	9.59E+09	1.26E+11	3.87E+11	2.58E+12	1.48E+11	1.22E+11	1.69E+11	2.72E+11	2.18E+11	8.43E+10	1.44E+11	1.63E+10
Scenario 3	9.58E+09	9.07E+10	2.74E+11	1.81E+12	1.12E+11	9.45E+10	1.26E+11	1.99E+11	1.62E+11	6.83E+10	1.07E+11	1.62E+10

Figure 6-17. Comparison of monthly loading capacities evaluated by the most restrictive standard to existing loads and TMDL scenario loads at TMDL analysis point 101 on the South Fork of Chester Creek.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Scenario 1	0%	28%	30%	30%	27%	27%	29%	29%	29%	27%	26%	1%
Scenario 2	0%	0%	50%	40%	45%	55%	65%	71%	74%	70%	0%	0%
Scenario 3	0%	28%	65%	58%	58%	65%	74%	79%	81%	76%	26%	1%
Required Reduction	9%	18%	48%	71%	44%	36%	43%	57%	53%	36%	30%	0%

Figure 6-18. Comparison of monthly loading reductions provided by the TMDL scenarios and loading reductions required by the most restrictive standard at TMDL analysis point 101 on the South Fork of Chester Creek.

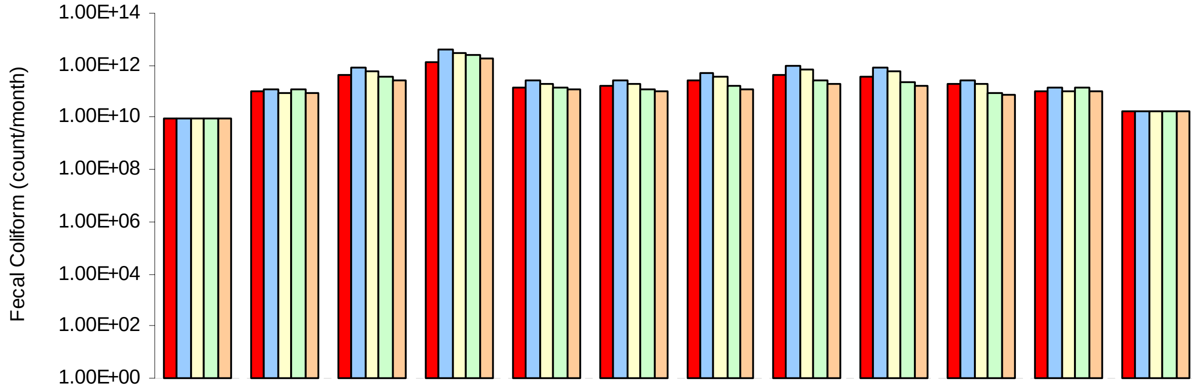
Table 6-14. Implementation Scenarios for TMDL Analysis Point CH2, Chester Creek.

Month	Existing (FC/month)	Post-Scenario (FC/month)	Percent Reduction
Scenario 1			
Month	**Existing (FC/month)**	**Post-Scenario (FC/month)**	**Percent Reduction**
January	1.21E+12	1.21E+12	0%
February	1.23E+12	1.18E+12	4%
March	1.98E+12	1.78E+12	10%
April	3.40E+12	2.61E+12	23%
May	2.84E+12	2.35E+12	17%
June	3.14E+12	2.81E+12	11%
July	3.45E+12	2.96E+12	14%
August	3.28E+12	2.72E+12	17%
September	2.69E+12	2.27E+12	16%
October	2.80E+12	2.53E+12	10%
November	2.91E+12	2.66E+12	9%
December	1.74E+12	1.72E+12	1%
Annual	3.07E+13	2.68E+13	13%
Scenario 2			
Month	**Existing (FC/month)**	**Post-Scenario (FC/month)**	**Percent Reduction**
January	1.21E+12	1.21E+12	0%
February	1.23E+12	1.23E+12	0%
March	1.98E+12	1.73E+12	13%
April	3.40E+12	2.44E+12	28%
May	2.84E+12	2.13E+12	25%
June	3.14E+12	2.53E+12	20%
July	3.45E+12	2.39E+12	31%
August	3.28E+12	1.99E+12	39%
September	2.69E+12	1.65E+12	39%
October	2.80E+12	2.14E+12	24%
November	2.91E+12	2.91E+12	0%
December	1.74E+12	1.74E+12	0%
Annual	3.07E+13	2.40E+13	22%
Scenario 3			
Month	**Existing (FC/month)**	**Post-Scenario (FC/month)**	**Percent Reduction**
January	1.21E+12	1.21E+12	0%
February	1.23E+12	1.18E+12	4%
March	1.98E+12	1.58E+12	20%
April	3.40E+12	1.91E+12	44%
May	2.84E+12	1.84E+12	35%
June	3.14E+12	2.36E+12	25%
July	3.45E+12	2.18E+12	37%
August	3.28E+12	1.78E+12	46%
September	2.69E+12	1.52E+12	44%
October	2.80E+12	2.04E+12	27%
November	2.91E+12	2.66E+12	9%
December	1.74E+12	1.72E+12	1%
Annual	3.07E+13	2.19E+13	29%

Table 6-15. Summary of TMDL Scenarios for TMDL Analysis Point CH2, Chester Creek.

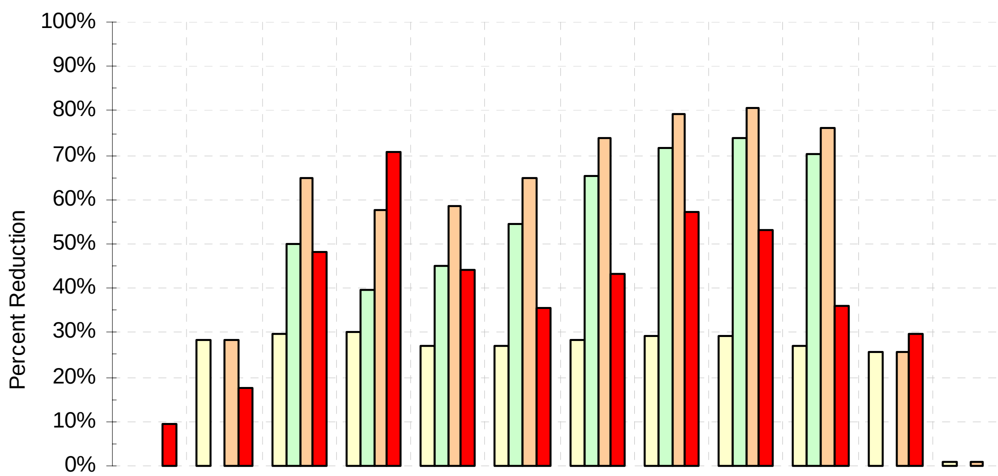
Month	Required Reduction	Scenario 1 Reduction	Scenario 2 Reduction	Scenario 3 Reduction	Additional Reduction
January	85%	0%	0%	0%	85%
February	85%	4%	0%	4%	81%
March	86%	10%	13%	20%	66%
April	85%	23%	28%	44%	42%
May	85%	17%	25%	35%	49%
June	88%	11%	20%	25%	63%
July	89%	14%	31%	37%	52%
August	86%	17%	39%	46%	40%
September	83%	16%	39%	44%	39%
October	86%	10%	24%	27%	59%
November	90%	9%	0%	9%	81%
December	88%	1%	0%	1%	87%
Annual	86%	13%	22%	29%	58%

Annual loads are given in FC/year.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Loading Capacity	8.69E+09	1.04E+11	4.02E+11	1.26E+12	1.50E+11	1.74E+11	2.76E+11	4.09E+11	3.89E+11	1.82E+11	1.01E+11	1.63E+10
Existing Conditions	9.59E+09	1.26E+11	7.76E+11	4.28E+12	2.69E+11	2.69E+11	4.87E+11	9.51E+11	8.30E+11	2.85E+11	1.44E+11	1.63E+10
Scenario 1	9.58E+09	9.07E+10	5.45E+11	2.99E+12	1.96E+11	1.97E+11	3.48E+11	6.73E+11	5.89E+11	2.08E+11	1.07E+11	1.62E+10
Scenario 2	9.59E+09	1.26E+11	3.87E+11	2.58E+12	1.48E+11	1.22E+11	1.69E+11	2.72E+11	2.18E+11	8.43E+10	1.44E+11	1.63E+10
Scenario 3	9.58E+09	9.07E+10	2.74E+11	1.81E+12	1.12E+11	9.45E+10	1.26E+11	1.99E+11	1.62E+11	6.83E+10	1.07E+11	1.62E+10

Figure 6-19. Comparison of monthly loading capacities evaluated by the most restrictive standard to existing loads and TMDL scenario loads at TMDL analysis point CH2 on the South Fork of Chester Creek.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Scenario 1	0%	28%	30%	30%	27%	27%	29%	29%	29%	27%	26%	1%
Scenario 2	0%	0%	50%	40%	45%	55%	65%	71%	74%	70%	0%	0%
Scenario 3	0%	28%	65%	58%	58%	65%	74%	79%	81%	76%	26%	1%
Required Reduction	9%	18%	48%	71%	44%	36%	43%	57%	53%	36%	30%	0%

Figure 6-20. Comparison of monthly loading reductions provided by the TMDL scenarios and loading reductions required by the most restrictive standard at TMDL analysis point CH2 on the South Fork of Chester Creek.

7.0 UNIVERSITY LAKE ALLOCATION ANALYSIS

7.1 Identification of Allowable Loads

The calibrated SWMM model was used to determine existing and allowable loads of fecal coliform for the University Lake TMDL analysis points 171 and ULO (see Figures 5-3 and 5-5). The results of the modeling runs are summarized in Figures 7-1 to 7-4 and Tables 7-1 and 7-2.

Figures 7-1 through 7-4 and Tables 7-1 and 7-2 show that the 30-day geometric mean standard is always more restrictive than the 10 percent not-to-exceed standard. Therefore the final TMDL results (presented below) are based on the reductions necessary to achieve the 30-day geometric mean standard.

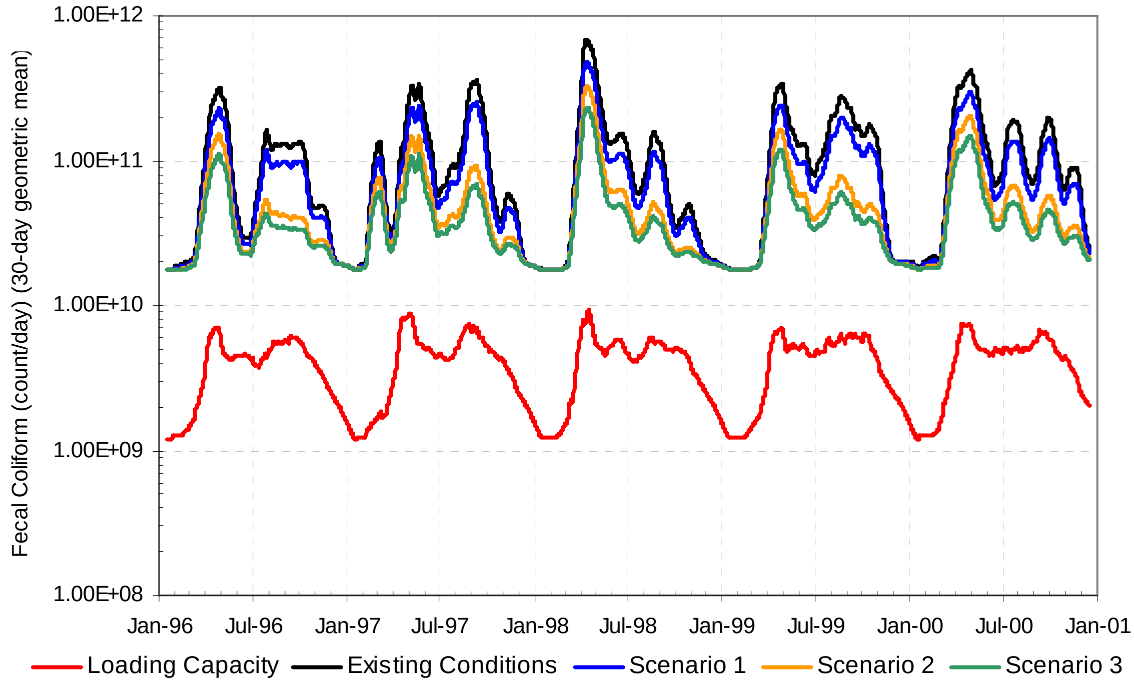


Figure 7-1. Evaluation of the 30-day geometric mean standard at TMDL analysis point 171, located just above University Lake.

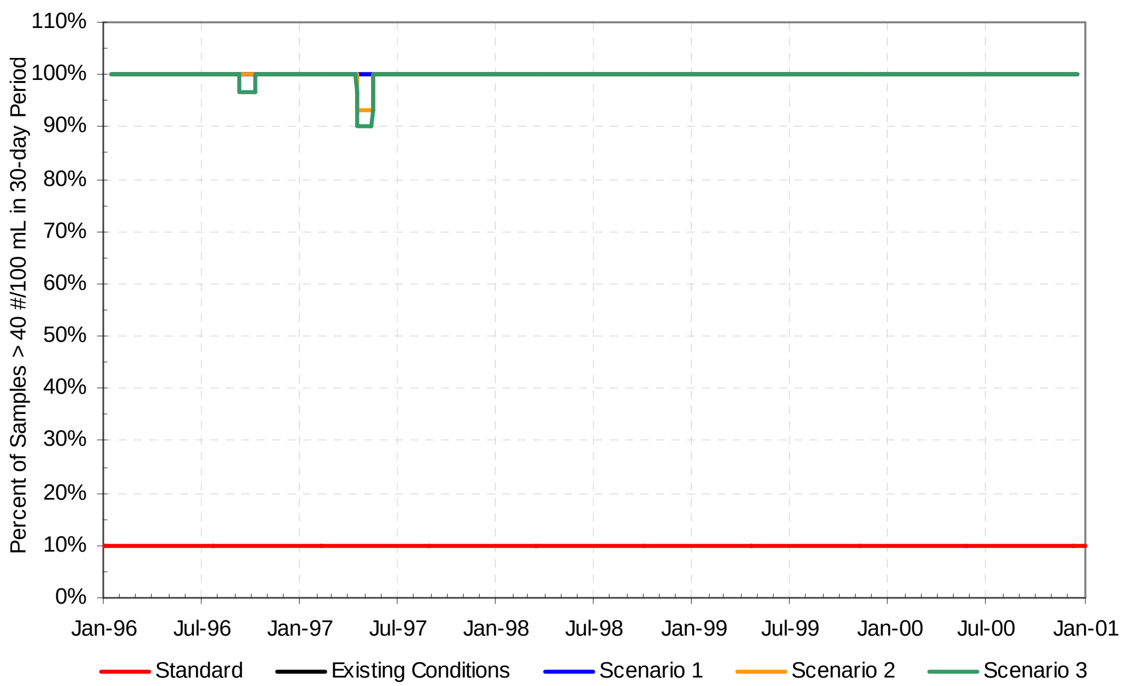


Figure 7-2. Evaluation of the 30-day not-to-exceed standard at TMDL analysis point 171, located just above University Lake.

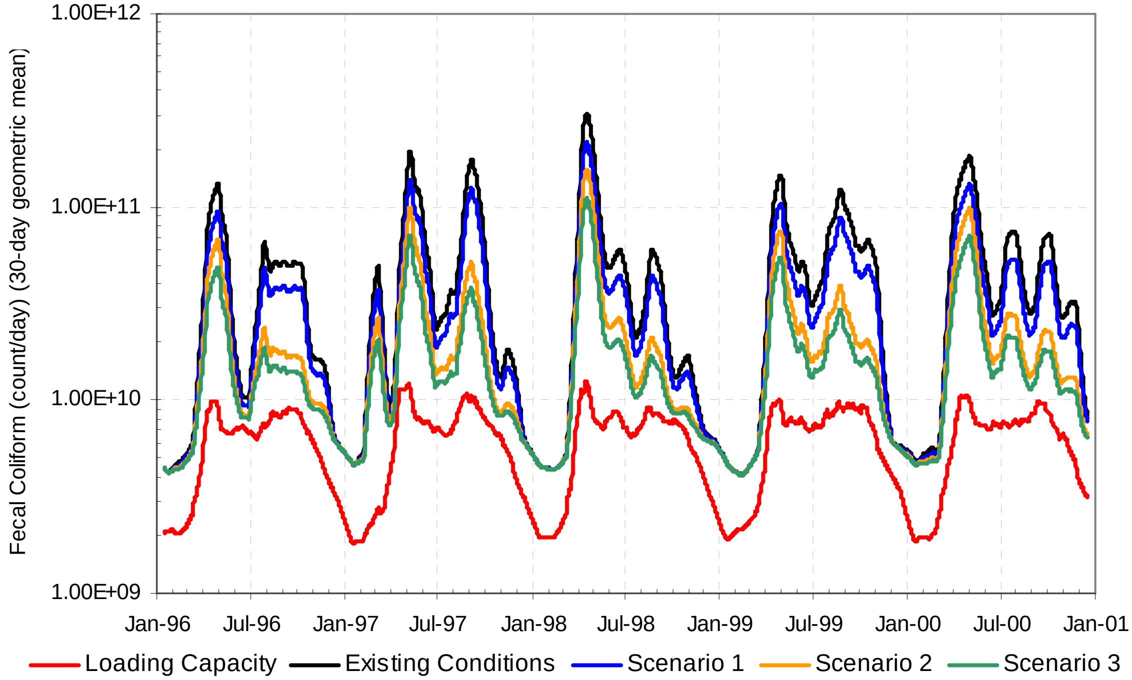


Figure 7-3. Evaluation of the 30-day geometric mean standard at TMDL analysis point ULO, located just below University Lake.

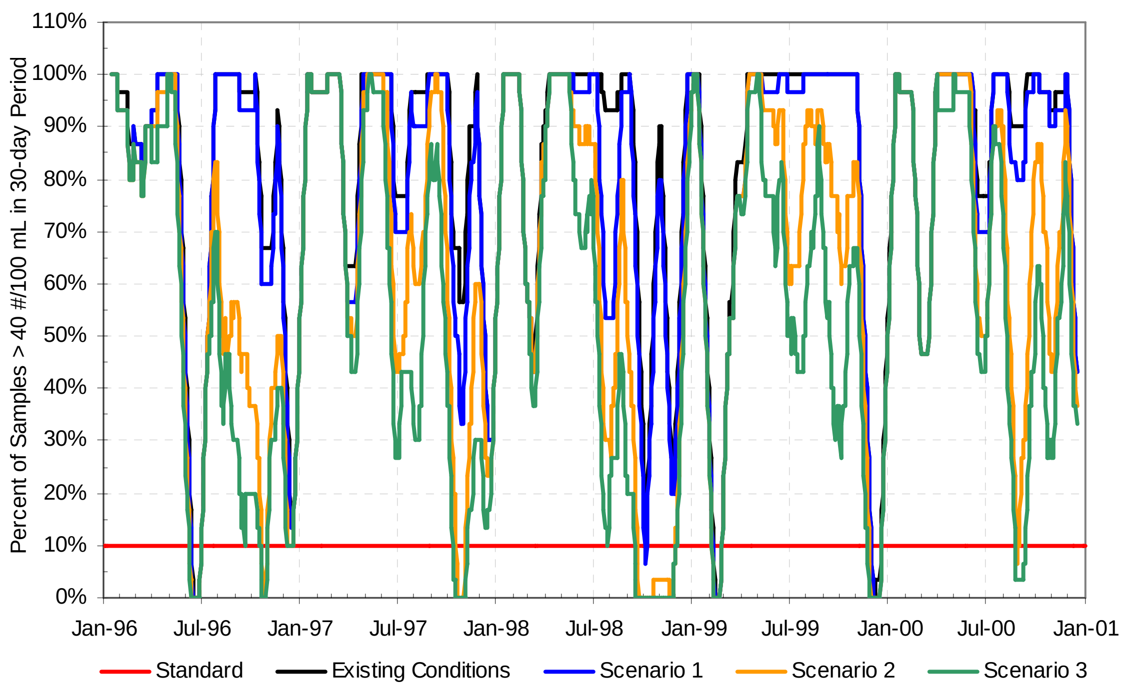


Figure 7-4. Evaluation of the 30-day not-to-exceed standard at TMDL analysis point ULO, located just below University Lake.

7.2 Load Allocation

Nonpoint sources are typically represented by loads carried to receiving waters through surface runoff resulting from precipitation events. However, because stormwater discharges in the MOA are regulated by a NPDES stormwater permit for municipal separate storm sewer systems (MS4), watershed loads delivered to Chester Creek through stormwater conveyances are addressed through the wasteload allocation component of this TMDL. Because the Chester Creek watershed includes only negligible loading from outside of the municipality that is essentially contributions from wildlife, a load allocation of zero has been set for this TMDL.

7.3 Wasteload Allocation

The only permitted source of fecal coliform in the Chester Creek watershed is storm water runoff. The MOA is subject to an MS4 permit that regulates storm water discharges and EPA policy and regulation indicate that storm water runoff regulated by the NPDES program through an MS4 permit must be addressed through wasteload allocations in a TMDL (USEPA, 2002). Therefore, the Chester Creek TMDL establishes wasteload allocations for watershed loads of fecal coliform. The wasteload allocation is the loading capacity minus the margin of safety.

The fecal coliform wasteload allocations for Chester Creek, provided as monthly allocations for the University Lake TMDL analysis points 171 and ULO, are presented in Tables 7-1 and 7-2, respectively. Table 7-1 (TMDL analysis point 171) suggests that fecal coliform loadings to University Lake are large throughout the year, and that the greatest monthly fecal coliform loads occurs during the spring and summer months. Consequently, the greatest required monthly reductions for TMDL analysis point 171 occur during spring and summer months. The winter months represent the lowest fecal coliform loads upstream of University Lake and, therefore, require the lowest percent reductions from existing loads.

Allocations are not established for future loads because ADEC does not anticipate any future permits for the discharge of fecal coliform to Chester Creek. Additionally, if data or information from future monitoring efforts can be used to identify and quantify stormwater or natural loads that are not delivered through the stormwater conveyances, the TMDL and its allocations will be revised accordingly.
The fecal coliform wasteload allocations and a margin of safety for University Lake are provided as seasonal and annual allocations for both of the University Lake TMDL analysis points and are presented in Tables 7-1 and 7-2.

Table 7-1. Summary of the University Lake TMDL, Analysis Point 171.

Month	Existing (FC/month)	Loading Capacity (FC/month)	Margin of Safety (FC/month)	Waste Load Allocation (FC/month)	Required Reduction
Jan	5.18E+11	3.63E+10	3.63E+09	3.27E+10	93%
Feb	7.55E+11	3.75E+10	3.75E+09	3.38E+10	95%
Mar	2.01E+12	7.25E+10	7.25E+09	6.53E+10	96%
Apr	9.06E+12	1.97E+11	1.97E+10	1.77E+11	98%
May	6.87E+12	1.66E+11	1.66E+10	1.49E+11	98%
Jun	2.91E+12	1.46E+11	1.46E+10	1.32E+11	95%
Jul	3.23E+12	1.43E+11	1.43E+10	1.28E+11	96%
Aug	4.75E+12	1.74E+11	1.74E+10	1.56E+11	96%
Sep	4.92E+12	1.78E+11	1.78E+10	1.60E+11	96%
Oct	2.86E+12	1.52E+11	1.52E+10	1.37E+11	95%
Nov	1.57E+12	9.81E+10	9.81E+09	8.83E+10	94%
Dec	6.37E+11	5.80E+10	5.80E+09	5.22E+10	91%
Annual	4.01E+13	1.46E+12	1.46E+11	1.31E+12	96%

Annual loads are given in FC/year.

Table 7-2. Summary of the University Lake TMDL, Analysis Point ULO.

Month	Existing (FC/month)	Loading Capacity (FC/month)	Margin of Safety (FC/month)	Waste Load Allocation (FC/month)	Required Reduction
Jan	1.35E+11	5.71E+10	5.71E+09	5.14E+10	58%
Feb	2.02E+11	5.95E+10	5.95E+09	5.36E+10	71%
Mar	5.97E+11	1.10E+11	1.10E+10	9.92E+10	82%
Apr	3.67E+12	2.80E+11	2.80E+10	2.52E+11	92%
May	3.05E+12	2.48E+11	2.48E+10	2.23E+11	92%
Jun	1.15E+12	2.25E+11	2.25E+10	2.02E+11	80%
Jul	1.24E+12	2.21E+11	2.21E+10	1.99E+11	82%
Aug	1.97E+12	2.65E+11	2.65E+10	2.39E+11	87%
Sep	2.05E+12	2.68E+11	2.68E+10	2.41E+11	87%
Oct	1.14E+12	2.32E+11	2.32E+10	2.09E+11	80%
Nov	5.60E+11	1.53E+11	1.53E+10	1.38E+11	73%
Dec	2.06E+11	9.00E+10	9.00E+09	8.10E+10	56%
Annual	1.60E+13	2.21E+12	2.21E+11	1.99E+12	86%

Annual loads are given in FC/year.

7.4 Implementation Scenarios

The same three implementation scenarios discussed above for the Chester Creek TMDL were used to assess conditions in University Lake.

Tables 7-3 through 7-6 summarize the results of the implementation scenarios for the University Lake analysis points. The tables show that a combination of education and increased street sweeping frequency and efficiency applied to all urbanized areas in the watershed has a significant impact in the reduction of fecal coliform loading to University Lake, with an annual fecal coliform percent reduction of 61 percent. However, significant additional reductions beyond TMDL scenario 3 are required for both TMDL analysis sites in order to comply with both components of the standard.

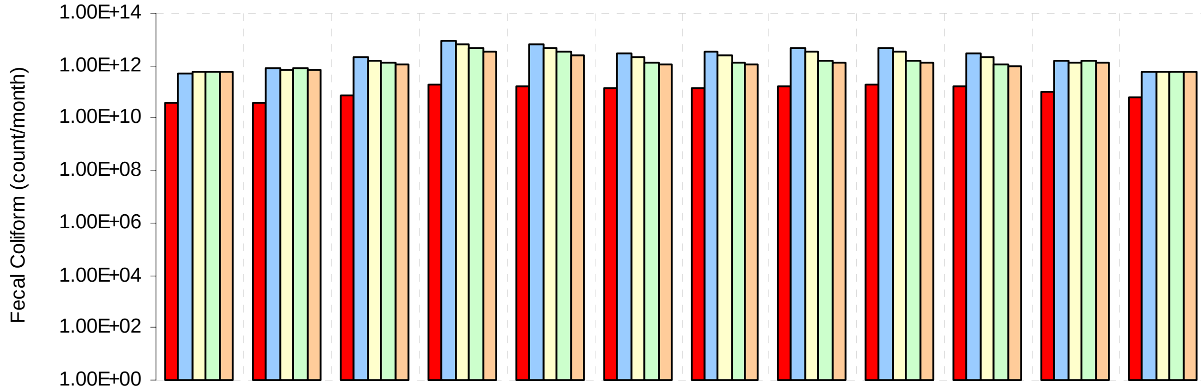
Table 7-3. Implementation Scenarios for University Lake, Analysis Point 171.

Month	Existing (FC/month)	Post-Scenario (FC/month)	Percent Reduction
Scenario 1			
January	5.18E+11	5.14E+11	1%
February	7.55E+11	6.93E+11	8%
March	2.01E+12	1.64E+12	18%
April	9.06E+12	6.50E+12	28%
May	6.87E+12	4.97E+12	28%
June	2.91E+12	2.22E+12	24%
July	3.23E+12	2.46E+12	24%
August	4.75E+12	3.50E+12	26%
September	4.92E+12	3.60E+12	27%
October	2.86E+12	2.20E+12	23%
November	1.57E+12	1.30E+12	17%
December	6.37E+11	6.12E+11	4%
Annual	4.01E+13	3.02E+13	25%
Scenario 2			
Month	**Existing (FC/month)**	**Post-Scenario (FC/month)**	**Percent Reduction**
January	5.18E+11	5.18E+11	0%
February	7.55E+11	7.55E+11	0%
March	2.01E+12	1.36E+12	32%
April	9.06E+12	4.50E+12	50%
May	6.87E+12	3.24E+12	53%
June	2.91E+12	1.42E+12	51%
July	3.23E+12	1.39E+12	57%
August	4.75E+12	1.61E+12	66%
September	4.92E+12	1.52E+12	69%
October	2.86E+12	1.19E+12	58%
November	1.57E+12	1.57E+12	0%
December	6.37E+11	6.37E+11	0%
Annual	4.01E+13	1.95E+13	51%
Scenario 3			
Month	**Existing (FC/month)**	**Post-Scenario (FC/month)**	**Percent Reduction**
January	5.18E+11	5.14E+11	1%
February	7.55E+11	6.93E+11	8%
March	2.01E+12	1.16E+12	42%
April	9.06E+12	3.29E+12	64%
May	6.87E+12	2.44E+12	65%
June	2.91E+12	1.17E+12	60%
July	3.23E+12	1.15E+12	64%
August	4.75E+12	1.29E+12	73%
September	4.92E+12	1.22E+12	75%
October	2.86E+12	1.02E+12	64%
November	1.57E+12	1.30E+12	17%
December	6.37E+11	6.12E+11	4%
Annual	4.01E+13	1.57E+13	61%

Table 7-4. Summary of TMDL Scenarios for University Lake, Analysis Point 171.

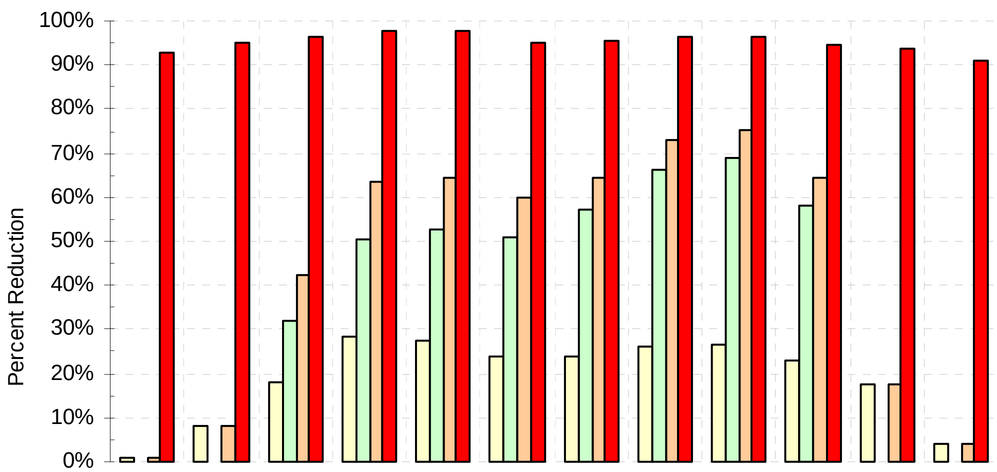
Month	Required Reduction	Scenario 1 Reduction	Scenario 2 Reduction	Scenario 3 Reduction	Additional Reduction
January	93%	1%	0%	1%	92%
February	95%	8%	0%	8%	87%
March	96%	18%	32%	42%	54%
April	98%	28%	50%	64%	34%
May	98%	28%	53%	65%	33%
June	95%	24%	51%	60%	35%
July	96%	24%	57%	64%	31%
August	96%	26%	66%	73%	23%
September	96%	27%	69%	75%	21%
October	95%	23%	58%	64%	30%
November	94%	17%	0%	17%	76%
December	91%	4%	0%	4%	87%
Annual	96%	25%	51%	61%	36%

Annual loads are given in FC/year.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Loading Capacity	3.63E+10	3.75E+10	7.25E+10	1.97E+11	1.66E+11	1.46E+11	1.43E+11	1.74E+11	1.78E+11	1.52E+11	9.81E+10	5.80E+10
Existing Conditions	5.18E+11	7.55E+11	2.01E+12	9.06E+12	6.87E+12	2.91E+12	3.23E+12	4.75E+12	4.92E+12	2.86E+12	1.57E+12	6.37E+11
Scenario 1	5.58E+11	6.93E+11	1.64E+12	6.50E+12	4.97E+12	2.22E+12	2.46E+12	3.50E+12	3.60E+12	2.20E+12	1.30E+12	6.12E+11
Scenario 2	5.60E+11	7.55E+11	1.36E+12	4.50E+12	3.24E+12	1.42E+12	1.39E+12	1.61E+12	1.52E+12	1.19E+12	1.57E+12	6.37E+11
Scenario 3	5.58E+11	6.93E+11	1.16E+12	3.29E+12	2.44E+12	1.17E+12	1.15E+12	1.29E+12	1.22E+12	1.02E+12	1.30E+12	6.12E+11

Figure 7-5. Comparison of monthly loading capacities evaluated by the most restrictive standard to existing loads and TMDL scenario loads at TMDL analysis point 171 on the South Fork of Chester Creek.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Scenario 1	1%	8%	18%	28%	28%	24%	24%	26%	27%	23%	17%	4%
Scenario 2	0%	0%	32%	50%	53%	51%	57%	66%	69%	58%	0%	0%
Scenario 3	1%	8%	42%	64%	65%	60%	64%	73%	75%	64%	17%	4%
Required Reduction	93%	95%	96%	98%	98%	95%	96%	96%	96%	95%	94%	91%

Figure 7-6. Comparison of monthly loading reductions provided by the TMDL scenarios and loading reductions required by the most restrictive standard at TMDL analysis point 171 on the South Fork of Chester Creek.

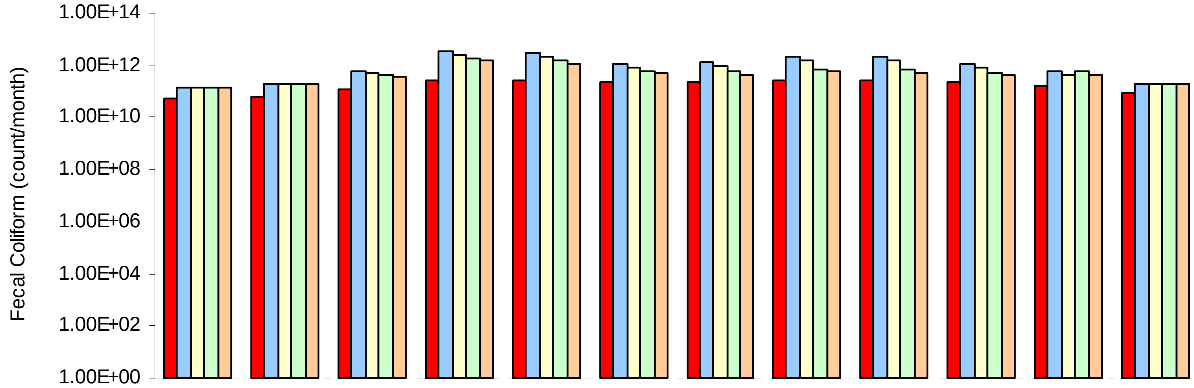
Table 7-5. Implementation Scenarios for University Lake, Analysis Point ULO.

Scenario 1			
Month	**Existing (FC/month)**	**Post-Scenario (FC/month)**	**Percent Reduction**
January	1.35E+11	1.34E+11	1%
February	2.02E+11	1.84E+11	9%
March	5.97E+11	4.87E+11	19%
April	3.67E+12	2.64E+12	28%
May	3.05E+12	2.20E+12	28%
June	1.15E+12	8.72E+11	24%
July	1.24E+12	9.43E+11	24%
August	1.97E+12	1.45E+12	27%
September	2.05E+12	1.50E+12	27%
October	1.14E+12	8.69E+11	24%
November	5.60E+11	4.57E+11	18%
December	2.06E+11	1.95E+11	6%
Annual	1.60E+13	1.19E+13	25%
Scenario 2			
Month	**Existing (FC/month)**	**Post-Scenario (FC/month)**	**Percent Reduction**
January	1.35E+11	1.35E+11	0%
February	2.02E+11	2.02E+11	0%
March	5.97E+11	4.12E+11	31%
April	3.67E+12	1.95E+12	47%
May	3.05E+12	1.52E+12	50%
June	1.15E+12	5.74E+11	50%
July	1.24E+12	5.59E+11	55%
August	1.97E+12	7.18E+11	64%
September	2.05E+12	6.63E+11	68%
October	1.14E+12	4.72E+11	59%
November	5.60E+11	5.60E+11	0%
December	2.06E+11	2.06E+11	0%
Annual	1.60E+13	7.90E+12	51%
Scenario 3			
Month	**Existing (FC/month)**	**Post-Scenario (FC/month)**	**Percent Reduction**
January	1.35E+11	1.34E+11	1%
February	2.02E+11	1.84E+11	9%
March	5.97E+11	3.49E+11	42%
April	3.67E+12	1.43E+12	61%
May	3.05E+12	1.13E+12	63%
June	1.15E+12	4.67E+11	59%
July	1.24E+12	4.59E+11	63%
August	1.97E+12	5.69E+11	71%
September	2.05E+12	5.27E+11	74%
October	1.14E+12	3.98E+11	65%
November	5.60E+11	4.57E+11	18%
December	2.06E+11	1.95E+11	6%
Annual	1.60E+13	6.24E+12	61%

Table 7-6. Summary of TMDL Scenarios for University Lake, Analysis Point ULO.

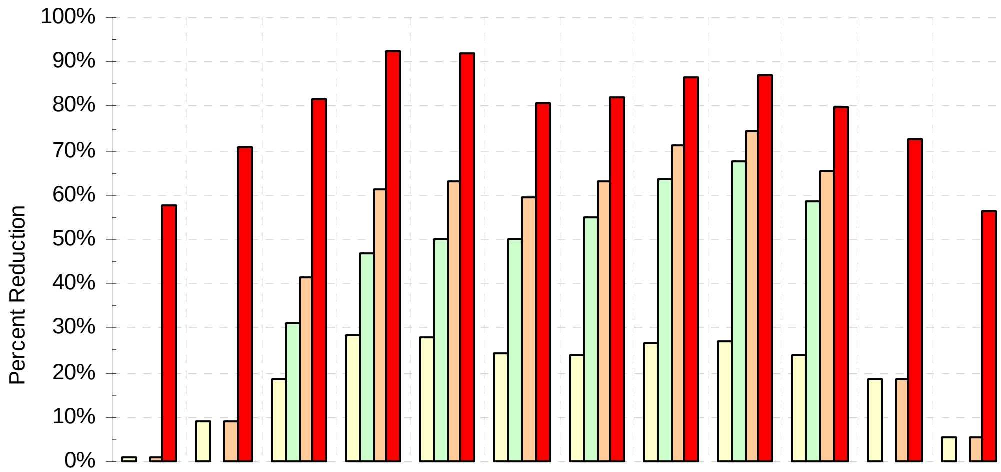
Month	Required Reduction	Scenario 1 Reduction	Scenario 2 Reduction	Scenario 3 Reduction	Additional Reduction
January	58%	1%	0%	1%	57%
February	71%	9%	0%	9%	62%
March	82%	19%	31%	42%	40%
April	92%	28%	47%	61%	31%
May	92%	28%	50%	63%	29%
June	80%	24%	50%	59%	21%
July	82%	24%	55%	63%	19%
August	87%	27%	64%	71%	15%
September	87%	27%	68%	74%	13%
October	80%	24%	59%	65%	15%
November	73%	18%	0%	18%	54%
December	56%	6%	0%	6%	51%
Annual	86%	25%	51%	61%	25%

Annual loads are given in FC/year.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Loading Capacity	5.71E+10	5.95E+10	1.10E+11	2.80E+11	2.48E+11	2.25E+11	2.21E+11	2.65E+11	2.68E+11	2.32E+11	1.53E+11	9.00E+10
Existing Conditions	1.35E+11	2.02E+11	5.97E+11	3.67E+12	3.05E+12	1.15E+12	1.24E+12	1.97E+12	2.05E+12	1.14E+12	5.60E+11	2.06E+11
Scenario 1	1.45E+11	1.84E+11	4.87E+11	2.64E+12	2.20E+12	8.72E+11	9.43E+11	1.45E+12	1.50E+12	8.69E+11	4.57E+11	1.95E+11
Scenario 2	1.46E+11	2.02E+11	4.12E+11	1.95E+12	1.52E+12	5.74E+11	5.59E+11	7.18E+11	6.63E+11	4.72E+11	5.60E+11	2.06E+11
Scenario 3	1.45E+11	1.84E+11	3.49E+11	1.43E+12	1.13E+12	4.67E+11	4.59E+11	5.69E+11	5.27E+11	3.98E+11	4.57E+11	1.95E+11

Figure 7-7. Comparison of monthly loading capacities evaluated by the most restrictive standard to existing loads and TMDL scenario loads at TMDL analysis point ULO on the South Fork of Chester Creek.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Scenario 1	1%	9%	19%	28%	28%	24%	24%	27%	27%	24%	18%	6%
Scenario 2	0%	0%	31%	47%	50%	50%	55%	64%	68%	59%	0%	0%
Scenario 3	1%	9%	42%	61%	63%	59%	63%	71%	74%	65%	18%	6%
Required Reduction	58%	71%	82%	92%	92%	80%	82%	87%	87%	80%	73%	56%

Figure 7-8. Comparison of monthly loading reductions provided by the TMDL scenarios and loading reductions required by the most restrictive standard at TMDL analysis point ULO on the South Fork of Chester Creek.

8.0 WESTCHESTER LAGOONS ALLOCATION ANALYSIS

8.1 Identification of Allowable Loads

The calibrated SWMM model was used to determine existing and allowable loads of fecal coliform for the Westchester Lagoons TMDL analysis points CH2 and CL2 (see Figures 5-1, and 5-5). The results of the modeling runs are summarized in Figures 8-1 to 8-4 and Tables 8-1 and 8-2.

Figures 8-1 through 8-4 and Tables 8-1 through 8-2 show that the 30-day geometric mean standard is typically more restrictive than the 10 percent not-to-exceed standard. However, during January and March at CL2 the 10 percent not-to-exceed standard is more restrictive. Therefore the final TMDL results (presented below) are based on the not-to-exceed reductions for these two months. All other reductions are based on meeting the 30 day geometric mean standard.

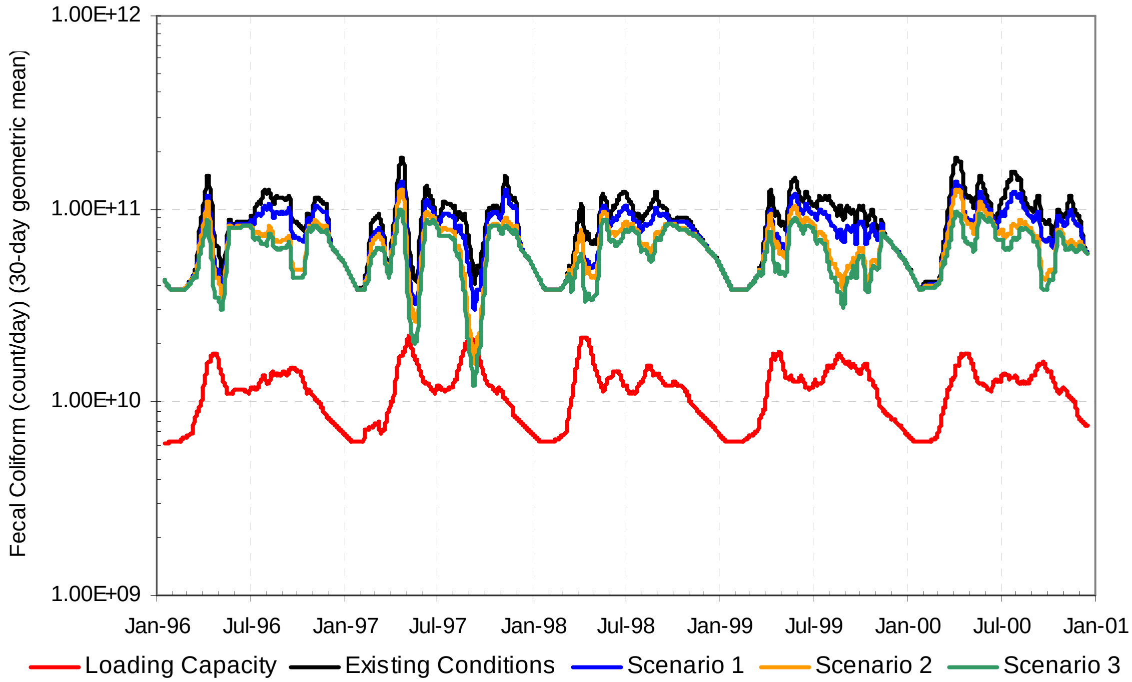


Figure 8-1. Evaluation of the 30-day geometric mean standard at TMDL analysis point CH2.

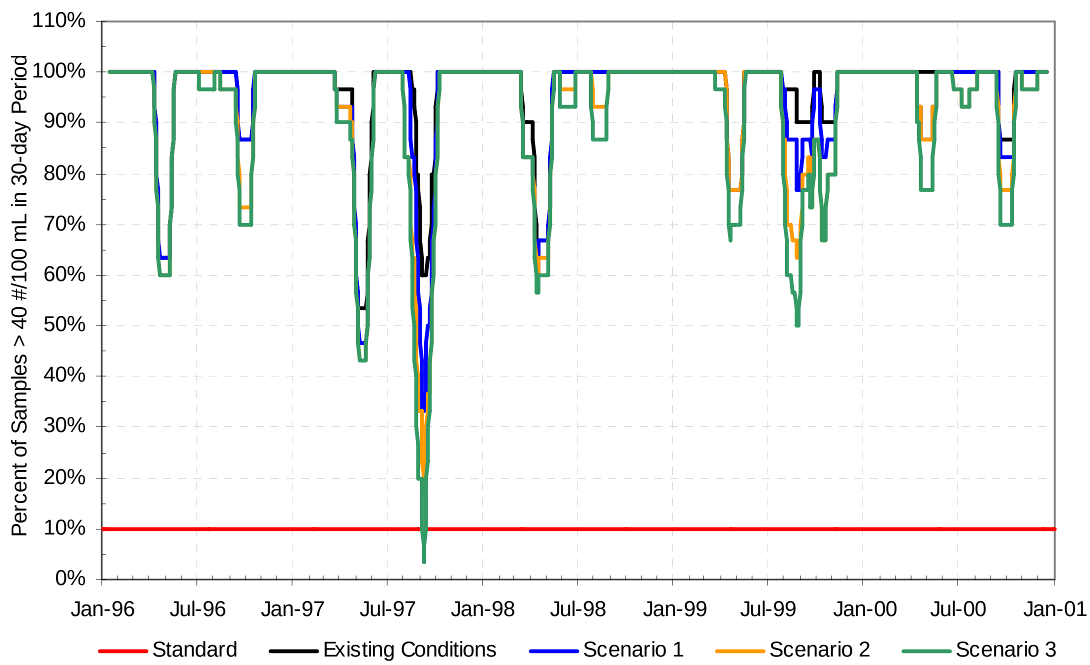


Figure 8-2. Evaluation of the 30-day not-to-exceed standard at TMDL analysis point CH2.

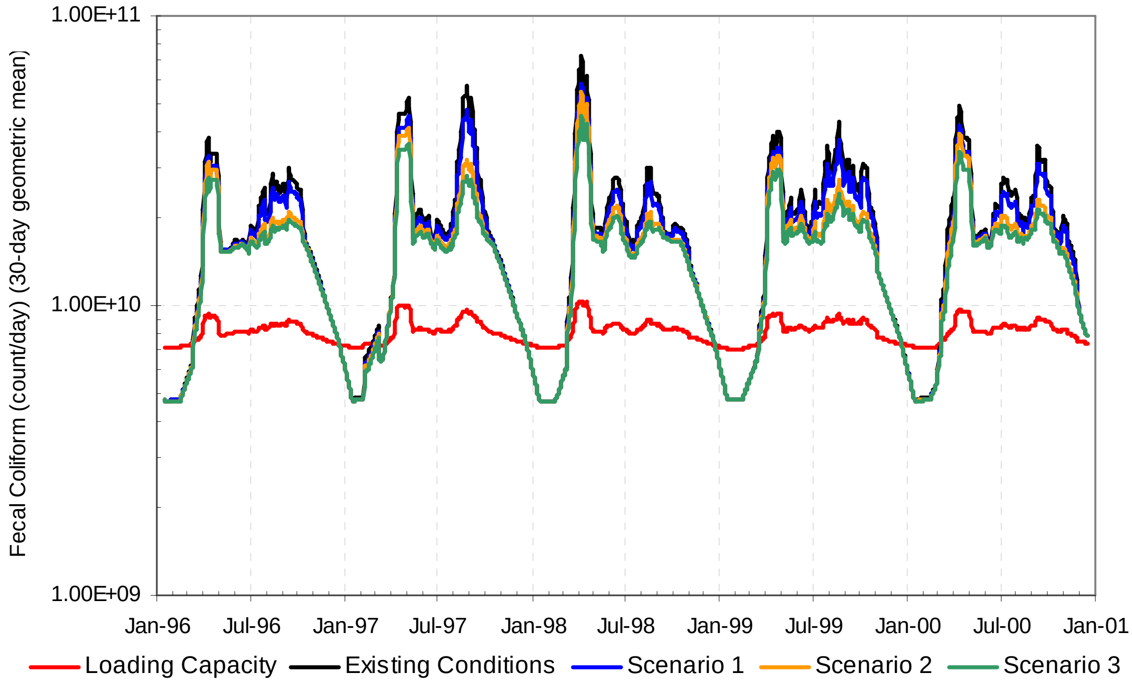


Figure 8-3. Evaluation of the 30-day geometric mean at TMDL analysis point CL2.

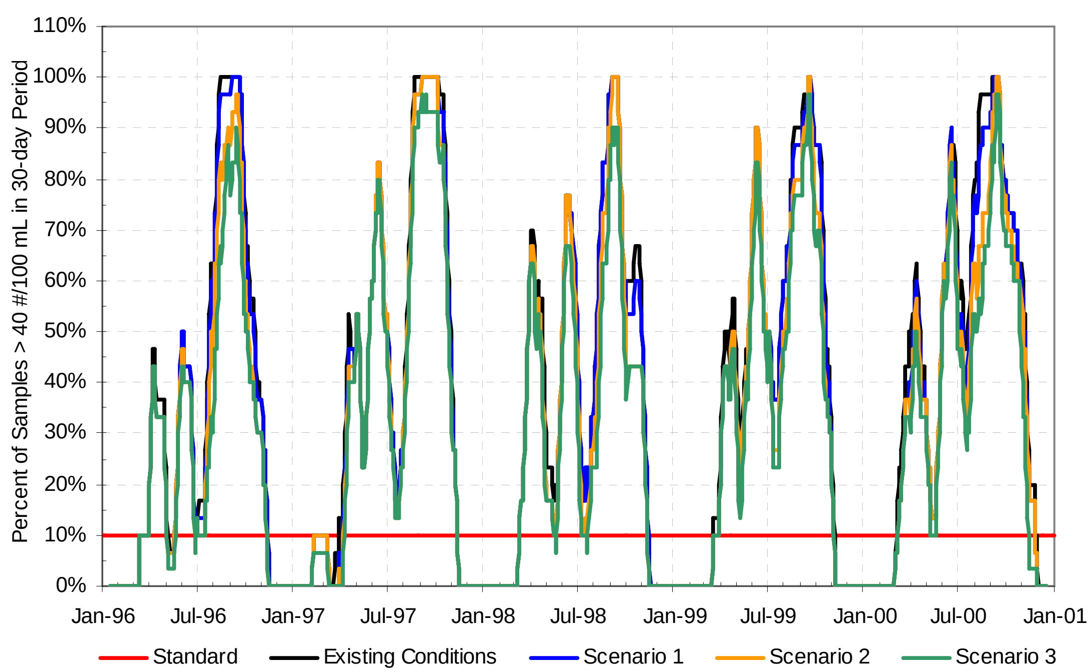


Figure 8-4. Evaluation of the not-to-exceed standard at TMDL analysis point CL2.

8.2 Load Allocation

Nonpoint sources are typically represented by loads carried to receiving waters through surface runoff resulting from precipitation events. However, because stormwater discharges in the MOA are regulated by a NPDES stormwater permit for municipal separate storm sewer systems (MS4), watershed loads delivered to Chester Creek through stormwater conveyances are addressed through the wasteload allocation component of this TMDL. Because the Chester Creek watershed includes loading from outside of the municipality that is essentially contributions from wildlife and are considered natural background, a load allocation of zero has been set for this TMDL.

8.3 Wasteload Allocation

The only permitted source of fecal coliform in the Chester Creek watershed is storm water runoff. The MOA is subject to an MS4 permit that regulates storm water discharges and EPA policy and regulation indicate that storm water runoff regulated by the NPDES program through an MS4 permit must be addressed through wasteload allocations in a TMDL (USEPA, 2002). Therefore, the Chester Creek TMDL establishes wasteload allocations for watershed loads of fecal coliform. The wasteload allocation is the loading capacity minus the margin of safety.

The fecal coliform wasteload allocations for Westchester Lagoon, provided as seasonal and annual allocations for the TMDL analysis points CH2 and CL2, are presented in Tables 8-1 and 8-2, respectively. Table 8-1 (TMDL analysis point CH2) suggests that fecal coliform loadings to Westchester Lagoon are large throughout the year, and that the greatest monthly fecal coliform loads occurs during the spring and summer months. Consequently, the greatest required monthly reductions for TMDL analysis point CH2 occur during spring and summer months. The winter months represent the lowest fecal coliform loads upstream of Westchester Lagoon and, therefore, require the lowest percent reductions from existing loads.

Allocations are not established for future loads because ADEC does not anticipate any future permits for the discharge of fecal coliform to Chester Creek. Additionally, if data or information from future monitoring efforts can be used to identify and quantify stormwater or natural loads that are not delivered through the stormwater conveyances, the TMDL and its allocations will be revised accordingly.
The fecal coliform wasteload allocations and a margin of safety for Westchester Lagoon are provided as seasonal and annual allocations for both of the Westchester Lagoon TMDL analysis points and are presented in Tables 8-1 and 8-2.

The fecal coliform wasteload and load allocations and a margin of safety for Westchester Lagoon are provided as seasonal allocations for both of the analysis points and are presented in Tables 8-1 and 8-2.

Table 8-1. Summary of the Westchester Lagoon TMDL, Analysis Point CH2.

Month	Existing (FC/month)	Loading Capacity (FC/month)	Margin of Safety (FC/month)	Waste Load Allocation (FC/month)	Required Reduction
Jan	1.21E+12	1.80E+11	1.80E+10	1.62E+11	85%
Feb	1.23E+12	1.85E+11	1.85E+10	1.66E+11	85%
Mar	1.98E+12	2.75E+11	2.75E+10	2.48E+11	86%
Apr	3.40E+12	5.03E+11	5.03E+10	4.53E+11	85%
May	2.84E+12	4.39E+11	4.39E+10	3.95E+11	85%
Jun	3.14E+12	3.73E+11	3.73E+10	3.35E+11	88%
Jul	3.45E+12	3.87E+11	3.87E+10	3.49E+11	89%
Aug	3.28E+12	4.58E+11	4.58E+10	4.12E+11	86%
Sep	2.69E+12	4.55E+11	4.55E+10	4.09E+11	83%
Oct	2.80E+12	3.91E+11	3.91E+10	3.52E+11	86%
Nov	2.91E+12	2.91E+11	2.91E+10	2.62E+11	90%
Dec	1.74E+12	2.13E+11	2.13E+10	1.92E+11	88%
Annual	3.07E+13	4.15E+12	4.15E+11	3.73E+12	86%

Annual loads are given in FC/year.

Table 8-2. Summary of the Westchester Lagoon TMDL, Analysis Point CL2.

Month	Existing (FC/month)	Loading Capacity (FC/month)	Margin of Safety (FC/month)	Waste Load Allocation (FC/month)	Required Reduction
Jan	**1.48E+11**	**1.34E+11**	**1.34E+10**	**1.21E+11**	**9%**
Feb	2.14E+11	2.14E+11	2.14E+10	1.93E+11	0%
Mar	**5.41E+11**	**3.34E+11**	**3.34E+10**	**3.01E+11**	**38%**
Apr	1.13E+12	2.80E+11	2.80E+10	2.52E+11	75%
May	6.53E+11	2.58E+11	2.58E+10	2.33E+11	60%
Jun	6.00E+11	2.49E+11	2.49E+10	2.24E+11	59%
Jul	6.64E+11	2.59E+11	2.59E+10	2.33E+11	61%
Aug	8.94E+11	2.71E+11	2.71E+10	2.44E+11	70%
Sep	8.25E+11	2.62E+11	2.62E+10	2.36E+11	68%
Oct	6.14E+11	2.58E+11	2.58E+10	2.32E+11	58%
Nov	3.79E+11	2.33E+11	2.33E+10	2.10E+11	39%
Dec	2.24E+11	2.08E+11	2.08E+10	1.87E+11	7%
Annual	6.63E+12	2.92E+12	2.92E+11	2.63E+12	56%

Bold type indicates that the 10 percent not-to-exceed standard applies for the month.
Annual loads are given in FC/year.

8.4 Implementation Scenarios

Three implementation scenarios, selected with consultation with ADEC, were simulated with the calibrated SWMM model. These scenarios are:

- Scenario 1 – Public education. Informing the public about the benefits of "cleaning up" after their pets was assumed to result in a 30 percent decrease in the surface build up of fecal coliform on landscaped, street, directly connected, and indirectly connected impervious land cover types.

- Scenario 2 – Increased street sweeping frequency and efficiency. Street sweeping frequency was increased from monthly to weekly intervals and the efficiency was assumed to increase to eighty percent efficiency.

- Scenario 3 – A combination of Scenario 1 and Scenario 2.

Tables 8-3 through 8-6 summarize the results of the implementation scenarios for the Westchester Lagoons analysis points. The tables show that a combination of education and increased street sweeping frequency and efficiency applied to all urbanized areas in the watershed has the greatest impact in the reduction of fecal coliform loading to Westchester Lagoons, with a maximum annual fecal coliform percent reduction of 29 percent for TMDL analysis point CH2.

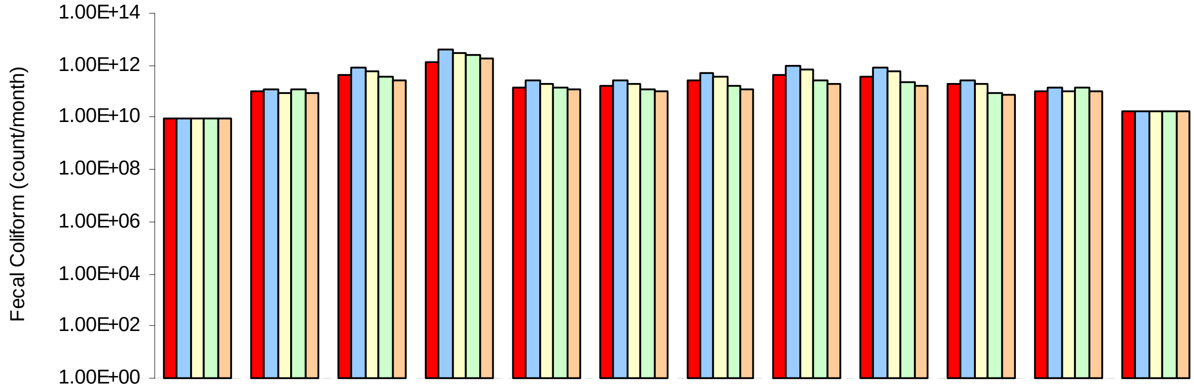
Table 8-3. Implementation Scenarios for Westchester Lagoon, TMDL Analysis Point CH2.

Scenario 1			
Month	**Existing (FC/month)**	**Post-Scenario (FC/month)**	**Percent Reduction**
January	1.21E+12	1.21E+12	0%
February	1.23E+12	1.18E+12	4%
March	1.98E+12	1.78E+12	10%
April	3.40E+12	2.61E+12	23%
May	2.84E+12	2.35E+12	17%
June	3.14E+12	2.81E+12	11%
July	3.45E+12	2.96E+12	14%
August	3.28E+12	2.72E+12	17%
September	2.69E+12	2.27E+12	16%
October	2.80E+12	2.53E+12	10%
November	2.91E+12	2.66E+12	9%
December	1.74E+12	1.72E+12	1%
Annual	3.07E+13	2.68E+13	13%
Scenario 2			
Month	**Existing (FC/month)**	**Post-Scenario (FC/month)**	**Percent Reduction**
January	1.21E+12	1.21E+12	0%
February	1.23E+12	1.23E+12	0%
March	1.98E+12	1.73E+12	13%
April	3.40E+12	2.44E+12	28%
May	2.84E+12	2.13E+12	25%
June	3.14E+12	2.53E+12	20%
July	3.45E+12	2.39E+12	31%
August	3.28E+12	1.99E+12	39%
September	2.69E+12	1.65E+12	39%
October	2.80E+12	2.14E+12	24%
November	2.91E+12	2.91E+12	0%
December	1.74E+12	1.74E+12	0%
Annual	3.07E+13	2.40E+13	22%
Scenario 3			
Month	**Existing (FC/month)**	**Post-Scenario (FC/month)**	**Percent Reduction**
January	1.21E+12	1.21E+12	0%
February	1.23E+12	1.18E+12	4%
March	1.98E+12	1.58E+12	20%
April	3.40E+12	1.91E+12	44%
May	2.84E+12	1.84E+12	35%
June	3.14E+12	2.36E+12	25%
July	3.45E+12	2.18E+12	37%
August	3.28E+12	1.78E+12	46%
September	2.69E+12	1.52E+12	44%
October	2.80E+12	2.04E+12	27%
November	2.91E+12	2.66E+12	9%
December	1.74E+12	1.72E+12	1%
Annual	3.07E+13	2.19E+13	29%

Table 8-4. Summary of TMDL Scenarios for Westchester Lagoon, TMDL Analysis Point CH2.

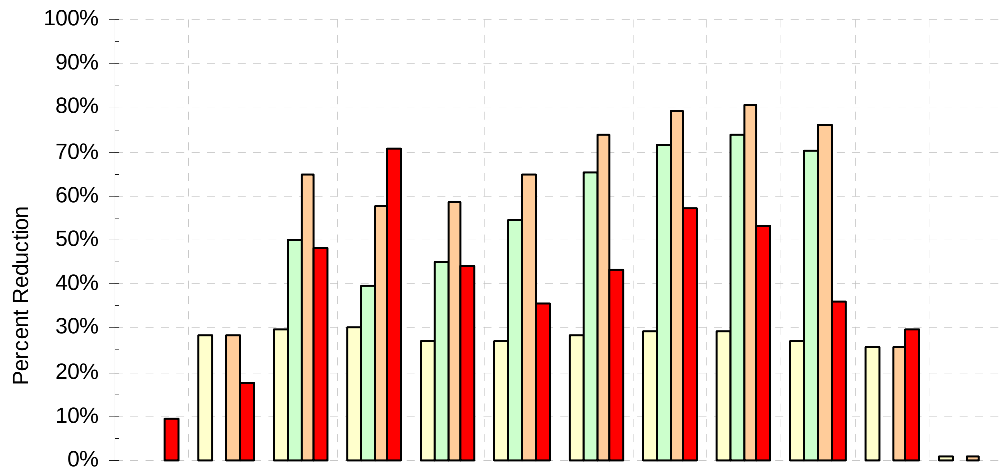
Month	Required Reduction	Scenario 1 Reduction	Scenario 2 Reduction	Scenario 3 Reduction	Additional Reduction
January	85%	0%	0%	0%	85%
February	85%	4%	0%	4%	81%
March	86%	10%	13%	20%	66%
April	85%	23%	28%	44%	42%
May	85%	17%	25%	35%	49%
June	88%	11%	20%	25%	63%
July	89%	14%	31%	37%	52%
August	86%	17%	39%	46%	40%
September	83%	16%	39%	44%	39%
October	86%	10%	24%	27%	59%
November	90%	9%	0%	9%	81%
December	88%	1%	0%	1%	87%
Annual	86%	13%	22%	29%	58%

Annual loads are given in FC/year.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Loading Capacity	8.69E+09	1.04E+11	4.02E+11	1.26E+12	1.50E+11	1.74E+11	2.76E+11	4.09E+11	3.89E+11	1.82E+11	1.01E+11	1.63E+10
Existing Conditions	9.59E+09	1.26E+11	7.76E+11	4.28E+12	2.69E+11	2.69E+11	4.87E+11	9.51E+11	8.30E+11	2.85E+11	1.44E+11	1.63E+10
Scenario 1	9.58E+09	9.07E+10	5.45E+11	2.99E+12	1.96E+11	1.97E+11	3.48E+11	6.73E+11	5.89E+11	2.08E+11	1.07E+11	1.62E+10
Scenario 2	9.59E+09	1.26E+11	3.87E+11	2.58E+12	1.48E+11	1.22E+11	1.69E+11	2.72E+11	2.18E+11	8.43E+10	1.44E+11	1.63E+10
Scenario 3	9.58E+09	9.07E+10	2.74E+11	1.81E+12	1.12E+11	9.45E+10	1.26E+11	1.99E+11	1.62E+11	6.83E+10	1.07E+11	1.62E+10

Figure 8-5. Comparison of monthly loading capacities evaluated by the most restrictive standard to existing loads and TMDL scenario loads at TMDL analysis point CH2 on the South Fork of Chester Creek.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Scenario 1	0%	28%	30%	30%	27%	27%	29%	29%	29%	27%	26%	1%
Scenario 2	0%	0%	50%	40%	45%	55%	65%	71%	74%	70%	0%	0%
Scenario 3	0%	28%	65%	58%	58%	65%	74%	79%	81%	76%	26%	1%
Required Reduction	9%	18%	48%	71%	44%	36%	43%	57%	53%	36%	30%	0%

Figure 8-6. Comparison of monthly loading reductions provided by the TMDL scenarios and loading reductions required by the most restrictive standard at TMDL analysis point CH2 on the South Fork of Chester Creek.

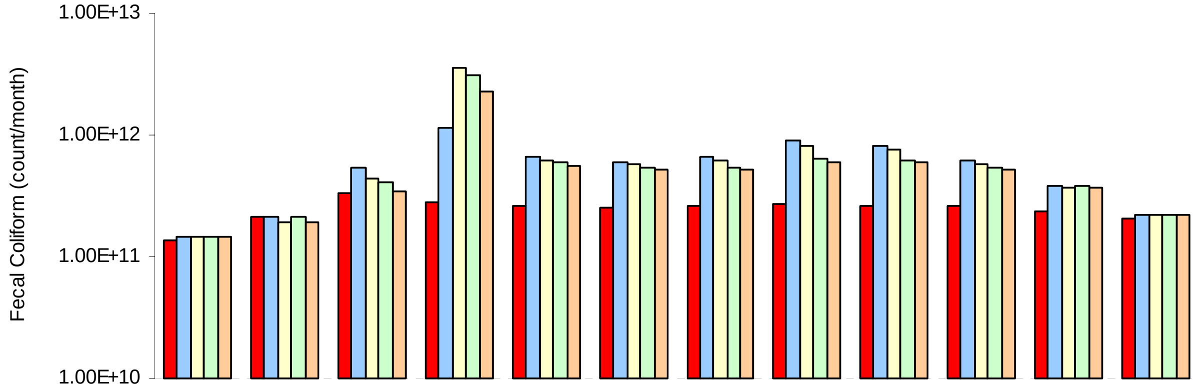
Table 8-5. Implementation Scenarios for Westchester Lagoon, Analysis Point CL2.

Scenario 1			
Month	**Existing (FC/month)**	**Post-Scenario (FC/month)**	**Percent Reduction**
January	**1.48E+11**	**1.48E+11**	**0%**
February	1.49E+11	1.47E+11	1%
March	**5.41E+11**	**4.38E+11**	**19%**
April	1.13E+12	9.97E+11	12%
May	6.53E+11	6.17E+11	6%
June	6.00E+11	5.71E+11	5%
July	6.64E+11	6.17E+11	7%
August	8.94E+11	8.02E+11	10%
September	8.25E+11	7.53E+11	9%
October	6.14E+11	5.85E+11	5%
November	3.79E+11	3.72E+11	2%
December	2.24E+11	2.23E+11	0%
Annual	6.63E+12	6.15E+12	7%
Scenario 2			
Month	**Existing (FC/month)**	**Post-Scenario (FC/month)**	**Percent Reduction**
January	**1.48E+11**	**1.48E+11**	**0%**
February	1.49E+11	1.49E+11	0%
March	**5.41E+11**	**4.03E+11**	**25%**
April	1.13E+12	9.48E+11	16%
May	6.53E+11	5.92E+11	9%
June	6.00E+11	5.37E+11	11%
July	6.64E+11	5.44E+11	18%
August	8.94E+11	6.50E+11	27%
September	8.25E+11	6.20E+11	25%
October	6.14E+11	5.31E+11	13%
November	3.79E+11	3.79E+11	0%
December	2.24E+11	2.24E+11	0%
Annual	6.63E+12	5.63E+12	15%
Scenario 3			
Month	**Existing (FC/month)**	**Post-Scenario (FC/month)**	**Percent Reduction**
January	**1.48E+11**	**1.48E+11**	**0%**
February	1.49E+11	1.47E+11	1%
March	**5.41E+11**	**3.42E+11**	**37%**
April	1.13E+12	8.43E+11	26%
May	6.53E+11	5.66E+11	13%
June	6.00E+11	5.19E+11	13%
July	6.64E+11	5.19E+11	22%
August	8.94E+11	6.07E+11	32%
September	8.25E+11	5.89E+11	29%
October	6.14E+11	5.18E+11	16%
November	3.79E+11	3.72E+11	2%
December	2.24E+11	2.23E+11	0%
Annual	6.63E+12	5.34E+12	19%

Table 8-6. Summary of TMDL Scenarios for Westchester Lagoon, TMDL Analysis Point CL2.

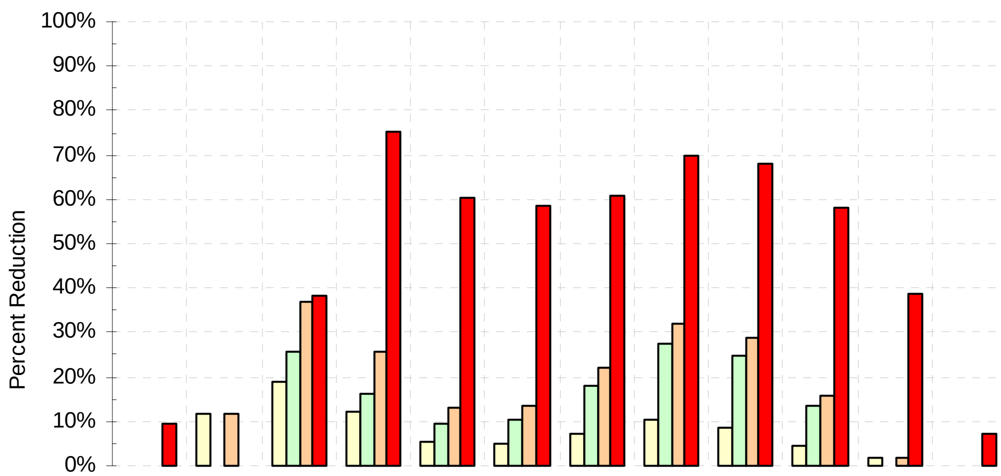
Month	Required Reduction	Scenario 1 Reduction	Scenario 2 Reduction	Scenario 3 Reduction	Additional Reduction
Jan	**9%**	**0%**	**0%**	**0%**	**9%**
Feb	0%	12%	0%	12%	0%
Mar	**38%**	**19%**	**25%**	**37%**	**1%**
Apr	75%	12%	16%	26%	50%
May	60%	6%	9%	13%	47%
Jun	59%	5%	11%	13%	45%
Jul	61%	7%	18%	22%	39%
Aug	70%	10%	27%	32%	38%
Sep	68%	9%	25%	29%	40%
Oct	58%	5%	13%	16%	42%
Nov	39%	2%	0%	2%	37%
Dec	7%	0%	0%	0%	7%
Annual	56%	7%	15%	19%	36%

Bold type indicates that the 10 percent not-to-exceed standard applies for the month.
Annual loads are given in FC/year.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Loading Capacity	1.34E+11	2.14E+11	3.34E+11	2.80E+11	2.58E+11	2.49E+11	2.59E+11	2.71E+11	2.62E+11	2.58E+11	2.33E+11	2.08E+11
Existing Conditions	1.48E+11	2.14E+11	5.41E+11	1.13E+12	6.53E+11	6.00E+11	6.64E+11	8.94E+11	8.25E+11	6.14E+11	3.79E+11	2.24E+11
Scenario 1	1.48E+11	1.90E+11	4.38E+11	3.58E+12	6.17E+11	5.71E+11	6.17E+11	8.02E+11	7.53E+11	5.85E+11	3.72E+11	2.23E+11
Scenario 2	1.48E+11	2.14E+11	4.03E+11	3.08E+12	5.92E+11	5.37E+11	5.44E+11	6.50E+11	6.20E+11	5.31E+11	3.79E+11	2.24E+11
Scenario 3	1.48E+11	1.90E+11	3.42E+11	2.27E+12	5.66E+11	5.19E+11	5.19E+11	6.07E+11	5.89E+11	5.18E+11	3.72E+11	2.23E+11

Figure 8-7. Comparison of monthly loading capacities evaluated by the most restrictive standard to existing loads and TMDL scenario loads at TMDL analysis point CL2 on Westchester Lagoon.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Scenario 1	0%	12%	19%	12%	6%	5%	7%	10%	9%	5%	2%	0%
Scenario 2	0%	0%	25%	16%	9%	11%	18%	27%	25%	13%	0%	0%
Scenario 3	0%	12%	37%	26%	13%	13%	22%	32%	29%	16%	2%	0%
Required Reduction	9%	0%	38%	75%	60%	59%	61%	70%	68%	58%	39%	7%

Figure 8-8. Comparison of monthly loading reductions provided by the TMDL scenarios and loading reductions required by the most restrictive standard at TMDL analysis point CL2 on Westchester Lagoon.

9.0 IMPLEMENTATION

According to EPA policy on addressing regulated storm water in TMDLs (USEPA, 2002), wasteload allocations can be translated to effluent limitations in the applicable permit through the use of best management practices (BMPs). The following discussion summarizes information contained in USEPA (2002).

NPDES permits must contain effluent limits and conditions consistent with the requirements and assumptions of the wasteload allocations in the relevant approved TMDL. Typically, those effluent limitations to control the discharge of pollutants are expressed in numerical form. However, because storm water discharges are due to storm events that are highly variable in frequency and duration and are not easily characterized, EPA's policy recognizes that only in rare cases will it be feasible or appropriate to establish numeric limits for municipal and small construction storm water discharges. Therefore, EPA recommends that for NPDES-regulated municipal and small construction storm water discharges effluent limits should be expressed as BMPs or other similar requirements, rather than as numeric effluent limits. The policy recognizes the need for an iterative approach to control pollutants in storm water discharges. Specifically, the policy anticipates that a suite of BMPs will be used in the initial rounds of permits and that these BMPs will be tailored in subsequent rounds.

Appropriate BMPs will be identified for implementation in the Chester Creek watershed in the relevant storm water permit. Information on the applicability of the BMPs for removal of fecal coliform and on the feasibility of implementation in the Chester Creek watershed will be taken into account when identifying BMPs.

The National Storm water Best Management Practices database (http://www.bmpdatabase.org/) provides access to BMP performance data in a standardized format for over 190 BMP studies conducted over the past fifteen years. The database was developed by the Urban Water Resources Research Council (UWRRC) of American Society of Civil Engineers (ASCE) under a cooperative agreement with the U.S. Environmental Protection Agency.

Some studies on BMP effectiveness have evaluated the ability of certain BMPs to remove fecal coliform and other bacteria. The Center for Watershed Protection has compiled a storm water treatment database containing information from studies conducted from 1990 to the present. Schueler (2000) provides a summary of the information in the database. The included studies do not provide sufficient fecal coliform data to statistically evaluate the effectiveness of BMPs in removing bacteria from urban runoff, but Schueler (2000) indicates that mean fecal coliform removal rates typically range from 65 to 75 percent from ponds and wetlands and 55 percent for filters. Schueler (2000) and SMRC (2000) also reports that water quality swales (including biofilters and wet and dry swales) consistently exported bacteria. Although it is possible that the bacteria thrive in the warm swale soils, the studies do not account for potential sources of bacteria directly to the swales, such as wildlife and domestic pets. Table 9-1 provides examples of BMP removal efficiencies for bacteria. Because information on BMP efficiency for fecal coliform is limited, information in Table 9-1 should be applied with consideration of local knowledge of the environmental conditions and BMP performance in the Anchorage area.

CWP (1997) discusses the use and effectiveness of BMPs in cold climates. Due to the characteristics such as freezing temperatures and snowmelt events, some BMPs are not appropriate or require modifications for use in cold climates. Table 9-2 provides a summary of the applicability of BMPs to colder climates.

Table 9-1. Fecal coliform removal for various BMPs.

BMP Type	Fecal Coliform Bacteria Removal (%)
Detention and Dry Extended Detention Ponds	78
Wet Ponds	70
Shallow Marsh Wetland	76
Submerged Gravel Wetland	78
Filters (excluding vertical sand filters)	37
Infiltration Basins	90
Ditches	5

Adapted from Schueler (2000) and SMRC (2000)

Table 9-2. Applicability of BMPs to cold climate conditions (CWP, 1997).

Type	BMP	Classification	Notes
Ponds	Wet Pond	□	Can be effective, but needs modifications to prevent freezing of outlet pipes. Limited by reduced treatment volume and biological activity in the permanent pool during ice cover.
	Wet ED Pond	□	Some modifications to conveyance structures needed. Extended detention storage provides treatment during the winter season.
	Dry ED Pond	□	Few modifications needed. Although this practice is easily adapted to cold climates, it is not highly recommended overall because of its relatively poor warm season performance.
Wetlands	Shallow Marsh	□	In climates where significant ice formation occurs, shallow marshes are not effective winter BMPs. Most of the treatment storage is taken up by ice, and the system is bypassed.
	Pond/Wetland System	□	Pond/Wetland systems can be effective, especially if some ED storage is provided. Modifications for both pond and wetland systems apply to these BMPs. This includes changes in wetland plant selection and planting.
	ED Wetland	□	See Wet ED Pond. Also needs modifications to wetland plant species.
Infiltration	Porous Pavement	□	This practice is restricted in cold climates. It cannot be used on any pavement that is sanded, because the pavement will clog.
	Infiltration Trench	□	Can be effective, but may be restricted by groundwater quality concerns related to infiltrating chlorides. Also, frozen ground conditions may inhibit the infiltration capacity of the ground.
	Infiltration Basin	□	See infiltration trench.

Type	BMP	Classification	Notes
Filtering Systems	Surface Sand Filter	□	Frozen ground considerations, combined with frost heave concerns, make this type of system relatively ineffective during the winter season.
	Underground Sand Filter	□	When placed below the frost line, these systems can function effectively in cold climates.
	Perimeter Sand Filter	□	See Surface Sand Filter.
	Bioretention	□	Problems functioning during the winter season because of reduced infiltration. It has some value for snow storage on parking lots, however.
	Submerged Gravel Wetlands	□	Some concerns of bypass during winter flows. Has been used in relatively cold regions with success., but not tested in a wide range of conditions.
Open Channel Systems	Grassed Channel	□	Reduced effectiveness in the winter season because of dormant vegetation and reduced infiltration. Valuable for snow storage.
	Dry Swale	□	Reduced effectiveness in the winter season because of dormant vegetation and reduced infiltration. Very valuable for snow storage and meltwater infiltration.
	Wet Swale	□	Reduced effectiveness in the winter season because of dormant vegetation. Can be valuable for snow storage.
	Vegetated Filter Strip	□	See Dry Swale.

ED: Extended Detention
□ Easily applied to cold climates; can be effective during the winter season.
□ Can be used in cold climates with significant modifications; moderately effective during the winter season.
□ Very difficult to use in cold climates. Generally not recommended.

10.0 MONITORING

Follow-up monitoring for a TMDL is important in tracking the progress of TMDL implementation and subsequent water quality response as well as in evaluating any assumptions made during TMDL development. Monitoring results can be used to support any necessary future TMDL revisions and to track BMP effectiveness. Most importantly, monitoring will track the water quality of Chester Creek to evaluate future attainment of water quality standards.

USEPA (2002) outlines EPA regulatory requirements for and provides guidance on establishing WLAs for storm water in TMDLs. The memorandum also provides information on the implementation of effluent limitations through NPDES permits consistent with the TMDL WLAs. The policy outlined affirms the appropriateness of an iterative, adaptive management BMP approach, whereby permits include effluent limits (e.g., a combination of structural and non-structural BMPs) that address storm water discharges, implement mechanisms to evaluate the performance of such controls, and make adjustments (i.e., more stringent controls or specific BMPs) as necessary to protect water quality.

USEPA (2002) indicates that where BMPs are used to implement the WLAs, the NPDES permit should require the monitoring necessary to assess if the expected load reductions attributed to BMP implementation are achieved (e.g., BMP performance data), although the permitting authority has the discretion under EPA’s regulations to decide the frequency of such monitoring. EPA recommends that such permits require collecting data on the performance of the BMPs. The monitoring data can provide a basis for revised management measures and indicate any necessary adjustments to the BMPs. Any monitoring for storm water required as part of the permit should be consistent with the state’s overall assessment and monitoring strategy.

11.0 PUBLIC COMMENTS AND RESPONSIVENESS SUMMARY

The fecal coliform bacteria Total Maximum Daily Load (TMDL) for the Chester Creek watershed, including University Lake and Westchester Lagoon, was developed over several years with extensive opportunity for feedback from affected parties. In 1993, Alaska's Department of Environmental Conservation (DEC) published an assessment of Chester Creek, based on consultation with the Municipality of Anchorage (MOA) and others. This assessment assembled much of the information on the watershed that was used develoing this document. In 1999, DEC developed, with the Environmental Protection Agency (EPA) and its contractor (Tetratech) and through consulting with MOA, an approach for developing fecal coliform bacteria TMDLs that would be appropriate for Anchorage area streams. Using this document, DEC consulted with the MOA, Alaska Department of Transportation (ADOT), and the University of Alaska to finalize the approach for developing the Chester Creek TMDL, along with TMDLs for six other Anchorage streams. TMDL development began in July 2002. Drafts were shared with the MOA and other key stakeholders for feedback through emails, meetings, and phone conversations. To the extent possible and relevant, DEC revised the TMDLs based on the stakeholder comments. TMDLs on the other six Anchorage Streams were submitted in May 2004. The Chester Creek TMDL was not submitted at that time as DEC determined it was more appropriate to complete it in conjunction with University Lake and Westchester Lagoon TMDLs, which did not begin development until June 2004.

DEC completed the public draft TMDL for Chester Creek, University Lake and Westchester Lagoon in March 2005. Copies were provided to the MOA, Alaska Department of Transportation and others (University of Alaska). ADEC published a public notice on these TMDLs on the State of Alaska’s website on April 7, 2005 and in the Anchorage Daily News, on April 10, 2005. A fact sheet describing the TMDL was also posted on ADEC’s website, along with the draft TMDL. The public comment period was open from April 7, 2005 through May 6, 2005, and a public meeting was held on April 22, 2005 at the Anchorage DEC office. In addition, DEC sent electronic copies of the draft TMDL to the MOA, ADOT, and all relevant federal, state, and local agencies, and the major citizen group involved with Anchorage water quality issues (Anchorage Waterways Council) which has cooperated with DEC and MOA in monitoring fecal coliform in Chester Creek and other Anchorage Streams.

The TMDL process had extensive stakeholder involvement early and throughout the process, which accounts for the limited amount of public comment received during the public notice period. The only comments received during the public notice period were via email and phone conversations from the Municipality of Anchorage. To the extent practical, these comments were addressed and incorporated into the Final TMDL. DEC responded to MOA's comments in a letter of May 2005 (included in submittal packet). As indicated in the letter, DEC revised the TMDL to better describe the process used to identify fecal coliform bacteria sources. The MOA also commented on the appropriateness of Alaska's Water Quality Standards. This comment was passed on to DEC's Standards Program for consideration in future changes to the standards. In regards to a MOA comment on load allocations, DEC responded that the TMDL assigns the maximum waste load allocation possible to the municipal storm water system, providing the Municipality the most flexibility in Best Management Practices (BMPs) implementation. In regards to a MOA comment on technical assumptions, DEC explained that the TMDL used the best data and models available; and shares the Municipality's desire to continue to improve data and models used in developing and implementing the TDML.

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APPENDIX A: SWMM CALIBRATION

Introduction

The Storm Water Management Model (SWMM) simulates real storm events based on rainfall and other meteorological inputs, such as evaporation and temperature, and watershed transport, storage and management practices to predict runoff quantity and quality. At the subwatershed scale, SWMM provides for evaluation of in-stream conditions, which allows for the direct comparison with relevant water quality standards.

SWMM is comprised of several computational blocks, or modules, of which the Rain, Temperature, Runoff and Transport blocks were used for the Chester Creek study. These modules essentially generate surface runoff and route it to the stream channel based on user-defined inputs such as precipitation, land use, and topography. Various hydrologic, pollutant buildup/washoff, and in-channel parameters must also be specified by the user. SWMM represents the stream network system as a series of links and nodes with the links representing stream or channel segments and nodes representing contributing subcatchment inlet points. Consequently, the model represents Chester Creek as a series of hydrologically connected subwatersheds.

Hydrologic and water quality simulations of the watershed were performed for Chester Creek. The modeling approach included continuous simulation of rainfall and runoff, as well as in-stream fecal coliform counts. Calibration of the Storm Water Management Model (SWMM) consisted of calibrating hydrologic response and water quality. This appendix describes the calibration of these two components.

Model Configuration

To simulate watershed loadings and resulting counts of fecal coliform, the Chester Creek watershed was divided into numerous modeling subcatchments using spatial (map) data and tabular data provided by MOA. The modeling subcatchments for the lower and upper Chester Creek subwatersheds are shown in Section 5 of the main report. Figures 5-2 and 5-4 display the impervious land cover classes found in the lower and upper Chester Creek subwatersheds, respectively. Hydrology and fecal coliform for the headwaters subwatershed of the Chester Creek basin was not simulated in SWMM. Estimated stream flow and observed fecal coliform concentration discharging from the headwaters subwatershed, referred to as boundary conditions, were instead used as input into the model.

Required input data for each subcatchment include area, imperviousness, slope, Manning’s roughness coefficient, a conceptual subcatchment width (total width of overland flow), depression storage, and infiltration parameters. These data were previously estimated by MOA for SWMM modeling applications of Chester Creek. The MOA SWMM parameter values were compiled for each land cover class within each subcatchment in the Chester Creek watershed. The land cover classes reflect the degree of imperviousness for a given cover type. Watershed parameters were lumped, that is spatially weighted or averaged, for each modeling subcatchment. Since information about the storm drain network’s hydraulic characteristics (such as pipe diameter and roughness characteristics) were not available, the Runoff block was set up to “route” runoff to each subcatchment outlet.

Daily precipitation and temperature data, available from the National Climatic Data Center (NCDC) weather station at the Ted Stevens International Airport from 1952 through 2003, were used for the Chester Creek watershed SWMM modeling.

Hydrologic Calibration

The hydrologic calibration involved a comparison of model results to in-stream flow observations recorded at the USGS stream gage (15275100) located near Arctic Boulevard (see Figure 3-1 in the main report). This is the only operative stream gage in the entire Chester Creek watershed. This gage recorded daily mean flow from June 17, 1966 through September 30, 1993, and from October 1, 1998 to September 30, 2000. The stream gage was not operational from October 1, 1993 to September 30, 1998. The period of hydrologic calibration was therefore selected as July 1, 1987 to September 30, 1993. This period is deemed sufficient to calibrate the hydrologic response of Chester Creek to rainfall events. The results of the hydrologic calibration are shown in Figures A-1 through A-4. Figure A-1 shows a comparison of the observed versus simulated average monthly stream flow for the calibration period, and displays a very good level of agreement (R^2 = 0.99).

Graphical comparisons of observed versus simulated mean monthly streamflow are presented in Figures A-2 and A-3. These figures show a good level of agreement between observed and simulated mean monthly streamflow. Additionally, an observed versus simulated flow duration analysis is presented in Figure A-4. With the exception of the very lowest flows, the model adequately describes flow variability within the Chester Creek watershed.

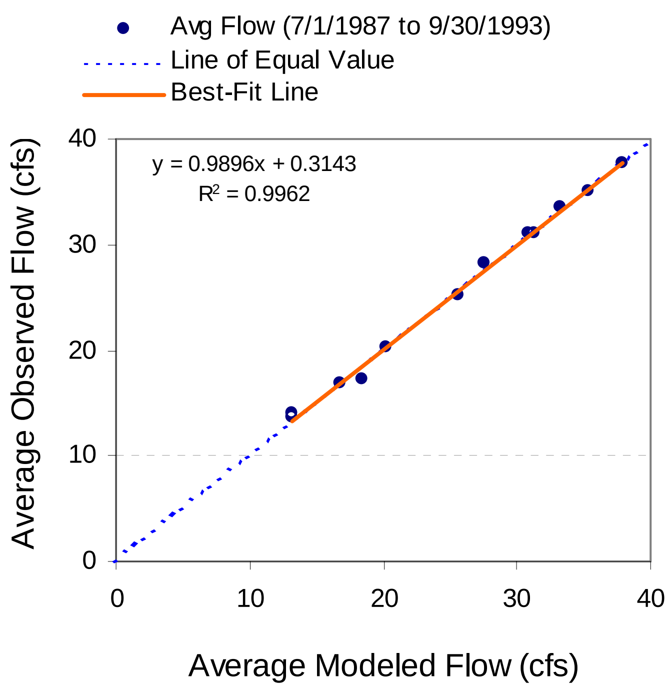


Figure A-1. Statistical comparison between observed versus simulated mean monthly stream flow, 1987 – 1993.

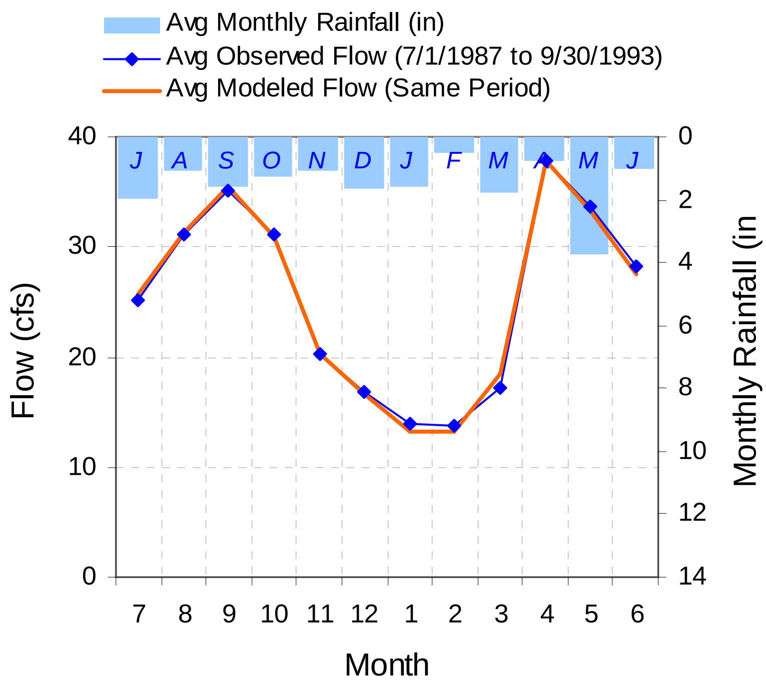


Figure A-2. Observed versus simulated mean monthly stream flow, 1987 - 1993.

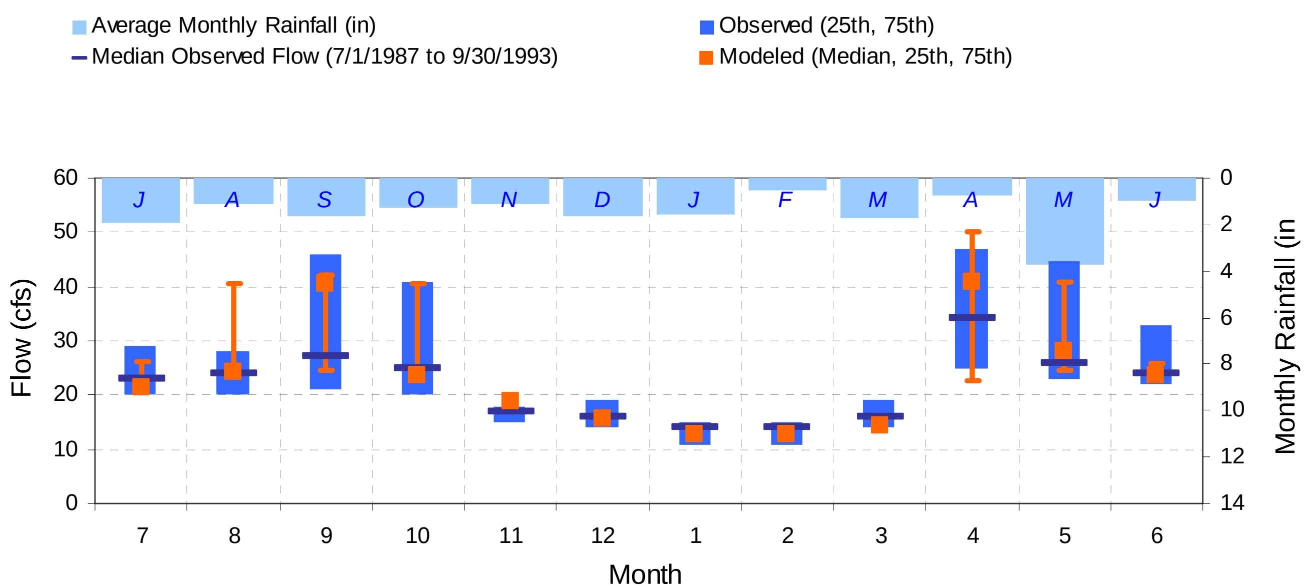


Figure A-3. Observed versus simulated 25th percentile, 75th percentile, and median monthly streamflow, 1987 - 1993.

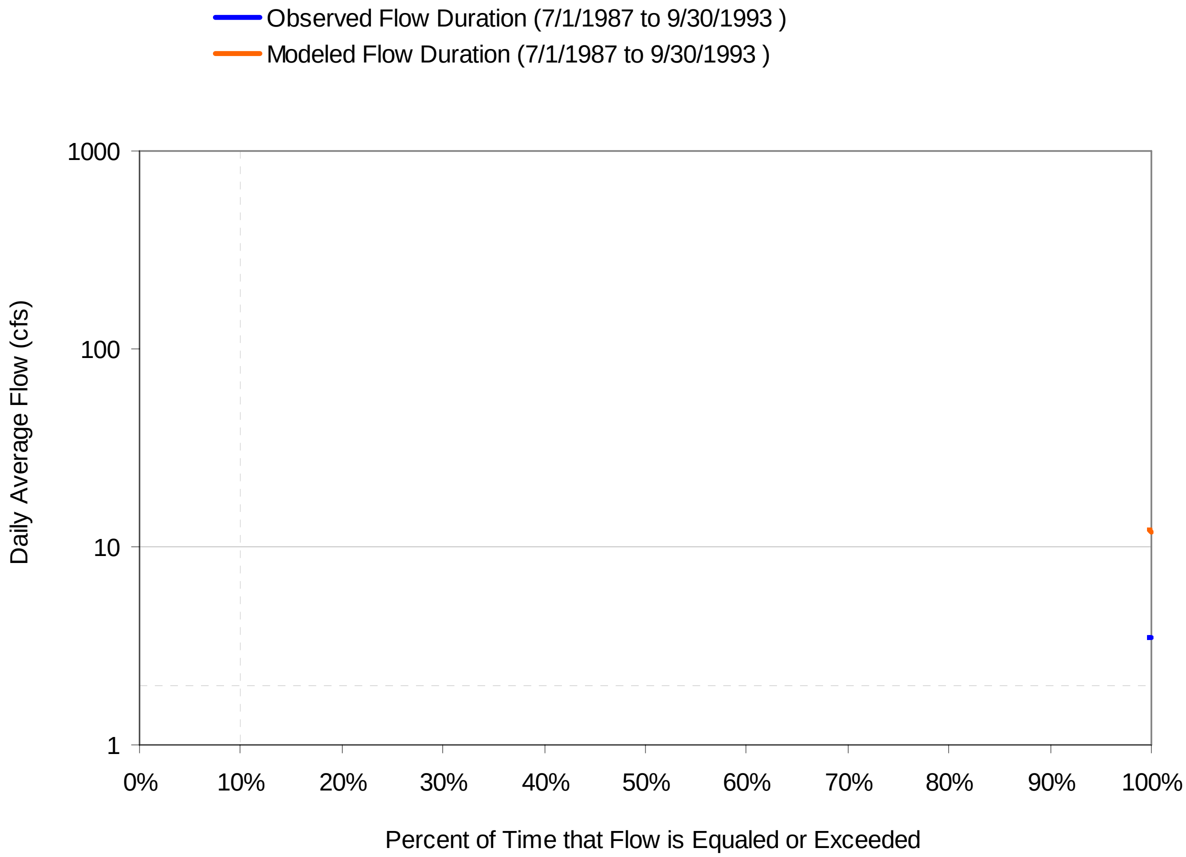


Figure A-4. Observed versus simulated flow duration, 1987 - 1993.

Seasonal and annual differences between observed versus simulated stream flow are summarized in Tables A-1 and A-2. Table A-1 shows that simulated flow for the calibration period agrees well with observed stream flow data. A statistical summary of the hydrologic calibration is presented in Table A-2. Table A-2 shows that the greatest errors occur in simulated summer storm volumes, yet these errors are within recommended calibration parameters (Lumb et al., 1994). Over all, the hydrologic calibration appears adequate in that it reflects the total water yield, annual variability, and magnitude of individual storm events in the basin. All recommended criteria are met except for the 10 percent highest flow criteria, which is underestimated by the SWMM. This error is most likely related to the precipitation record, where larger, more intense storms may have occurred somewhere within the watershed buy may not have not been recorded by the rain gage.

Table A-1. Comparison of Observed and Simulated Monthly Flow Statistics.

MONTH	OBSERVED FLOW (CFS)				MODELED FLOW (CFS)			
	MEAN	MEDIAN	25TH	75TH	MEAN	MEDIAN	25TH	75TH
Jul	25.17	23.00	20.00	29.00	25.64	21.50	21.00	26.20
Aug	31.10	24.00	20.00	28.00	31.36	24.20	23.10	40.50
Sep	35.13	27.00	21.00	46.00	35.39	40.60	24.60	42.20
Oct	31.14	25.00	20.00	40.75	30.92	23.70	23.10	40.50
Nov	20.33	17.00	15.00	18.00	20.24	18.80	18.60	19.10
Dec	16.86	16.00	14.00	19.00	16.72	15.50	15.40	15.60
Jan	13.97	14.00	11.00	15.00	13.19	12.80	12.70	12.80
Feb	13.68	14.00	11.00	15.00	13.18	12.70	12.70	12.80
Mar	17.25	16.00	14.00	19.00	18.40	14.40	14.20	14.70
Apr	37.77	34.00	25.00	47.00	37.84	40.70	22.50	50.15
May	33.62	26.00	23.00	44.75	33.22	28.15	24.60	40.90
Jun	28.28	24.00	22.00	33.00	27.60	23.55	23.10	25.88

Table A-2. Statistical Summary of Hydrologic Calibration for USGS Station 15275100, at Arctic Boulevard, Anchorage, Alaska (MOA Fecal Monitoring Site CH2).

6.25-Year Analysis Period: 7/1/1987 to 9/30/1993 Flow volumes are (inches/year) for upstream drainage area			
Total Simulated In-stream Flow:	**0.936**	Total Observed In-stream Flow:	**0.937**
Total of simulated highest 10% flows:	**0.184**	Total of Observed highest 10% flows:	**0.227**
Total of Simulated lowest 50% flows:	**0.304**	Total of Observed Lowest 50% flows:	**0.285**
Simulated Summer Flow Volume (months 7-9):	**0.317**	Observed Summer Flow Volume (7-9):	**0.314**
Simulated Fall Flow Volume (months 10-12):	**0.200**	Observed Fall Flow Volume (10-12):	**0.202**
Simulated Winter Flow Volume (months 1-3):	**0.130**	Observed Winter Flow Volume (1-3):	**0.130**
Simulated Spring Flow Volume (months 4-6):	**0.288**	Observed Spring Flow Volume (4-6):	**0.291**
Total Simulated Storm Volume:	**0.154**	Total Observed Storm Volume:	**0.153**
Simulated Summer Storm Volume (7-9):	**0.065**	Observed Summer Storm Volume (7-9):	**0.079**
Errors (Simulated-Observed)	*Error Statistics*	*Recommended Criteria*	
Error in total volume:	**-0.13**	**10**	
Error in 50% lowest flows:	**6.44**	**10**	
Error in 10% highest flows:	**-23.51**	**15**	
Seasonal volume error - Summer:	**1.08**	**30**	
Seasonal volume error - Fall:	**-0.68**	**30**	
Seasonal volume error - Winter:	**-0.22**	**30**	
Seasonal volume error - Spring:	**-1.02**	**30**	
Error in storm volumes:	**0.31**	**30**	
Error in summer storm volumes:	**-20.94**	**50**	

Water Quality Calibration

After hydrology was sufficiently calibrated, water quality calibration was performed. Modeled versus observed in-stream concentrations were directly compared during model calibration. The water quality calibration consisted of executing the watershed model, comparing water quality time series output to available water quality observation data, and adjusting pollutant loading and in-stream water quality parameters within a reasonable range. The objective was to best simulate the observed data, as well as to obtain modeling output within the range of all observations (i.e., the observed minimum and maximum water quality concentrations should be within the range of the simulated minimum and maximums). The adequacy of the water quality calibration was assessed through comparison to observed water quality data.

Simulation of fecal coliform bacteria concentrations often presents a challenge for watershed modeling. Observed concentrations tend to be highly variable in both space and time - due to both natural variability and analytical uncertainty. Further, instream concentrations may be elevated by sources which cannot explicitly be included in the model (e.g., illicit connections to storm sewers or illegal dumping into storm drain systems), or which may be included in the model in a general way, but have large and unmonitored variability (e.g., wildlife sources). The watershed models represent average loads from the land surface as a washoff process. In addition, background loading is represented as a ground water concentration. In fact, the load attributed to ground water includes both true ground water load and other unmodeled sources of loading that are not flow-dependent.

Adjusted water quality parameters within the model included the daily surface fecal coliform accumulation factors (called QFACT1, QFACT2, and QFACT3), surface washoff factors (called WASHPO, and RCOEFF), and the instream decay rate coefficient.

A power-linear function was used to estimate the daily build up of fecal coliform, and is given in the expression below:

$$\text{PSHED} = \text{QFACT3} \times t^{(\text{QFACT2})}$$

where,

PSHED = fecal accumulation rate, #FC/ac
QFACT3 = third build up factor, FC/acre
QFACT2 = second build up factor, dimensionless
t = time interval, day

Fecal coliform washoff is dependent upon the amount of fecal coliform available to be removed during a runoff event, and may be expressed as an exponential function as:

$$\text{POFF} = -\text{RCOEF} \times R^{(\text{WASHPO})} \times \text{PSHED}$$

where,

POFF = fecal coliform load washed off at time t, quantity/second
PSHED = quantity of fecal coliform available for washoff at time t
RCOEF = washoff coefficient
R = runoff rate in inches/hour.

The calibrated SWMM water quality parameters are presented in Table A-3 according to impervious land cover type.

Table A-3. SWMM Water Quality Parameters Used in the Chester Creek Watershed.

MOA Impervious Classification	QFACT1	QFACT2	QFACT3	WASHPO	RCOEF	REFF[1]
Barren	1.37E8	0.6	1.70E6	1.9	0.7	0.5
ICI	1.70E8	0.7	1.50E6	1.9	0.7	0.5
DCI	6.26E8	0.7	2.00E5	1.9	0.7	0.5
Street	2.00E7	0.7	2.00E5	1.9	0.7	0.5
Wetland	8.35E10	0.8	3.10E6	1.9	0.7	0
Lake	1.75E7	0.8	2.00E5	1.9	0.7	0
Landscape	1.67E9	0.8	3.67E7	1.9	0.7	0.5
Forest	8.23E9	0.8	5.19E6	1.9	0.7	0

[1]REFF is the efficiency fraction of street sweeping practices. A value of 0.5 is equal to 50 % efficiency.

The values of WASHPO and RCOEF given in Table A-3 are representative of long duration, low intensity rainfall events that are characteristic of the storm events that typically occur within Anchorage, Alaska.

Water quality calibration adequacy was primarily assessed through review of time-series plots. Looking at a time series plot of modeled versus observed data provides more insight into the nature of the system and is more useful in water quality calibration than a statistical comparison. Flow (or rainfall) and water quality can be compared simultaneously, and thus can provide insight into conditions during the monitoring period (dry period versus storm event). The response of the model to storm events can be studied and compared to observations (data permitting). Ensuring that the storm events are represented within the range of the data over time is the most practical and meaningful means of assessing the quality of a calibration. Furthermore, due to the relative lack of water quality monitoring data, it was not possible to make statistical comparisons of the predicted and observed data.

Water quality calibration involved the examination of observed and predicted data at eight calibration sites, as shown in Figure 3-1 in the main report. These sites correspond to the following MOA fecal coliform water quality monitoring stations: CH7, CH9, ULI, ULO, CH6, CH2, CL3, and CL2.

Figures A-5 through A-12 present the results of the model calibration for each of the MOA fecal coliform monitoring stations. Simulation results show a reasonable general agreement between observed and simulated fecal coliform concentrations and the model is deemed suitable for use in TMDL development.

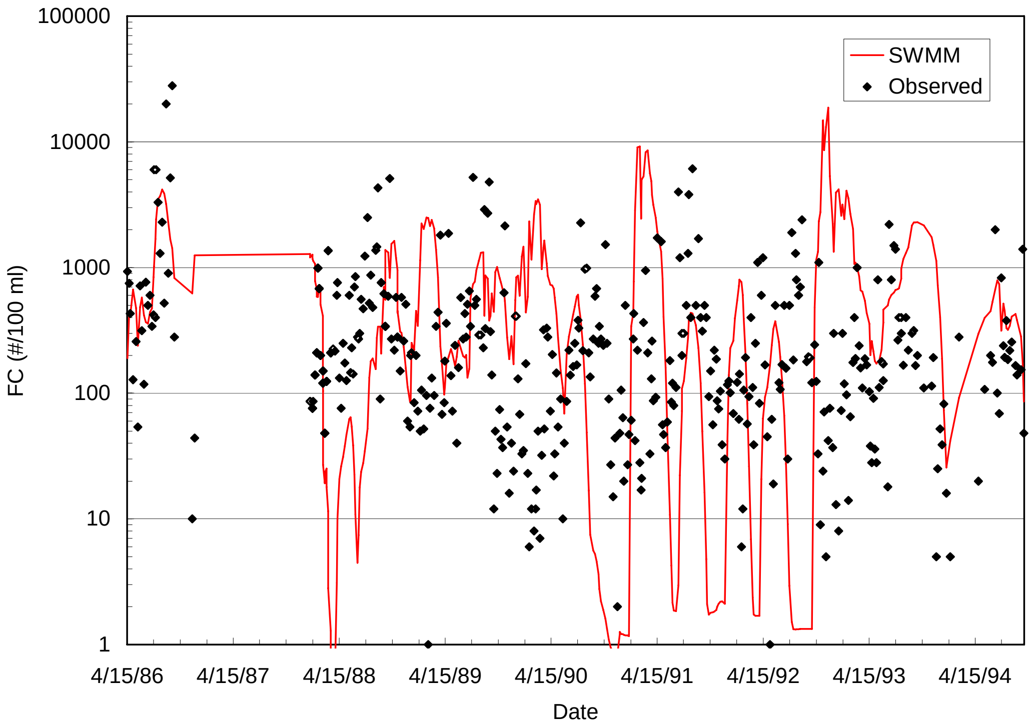


Figure A-5. Observed versus simulated fecal coliform at monitoring station CH7.

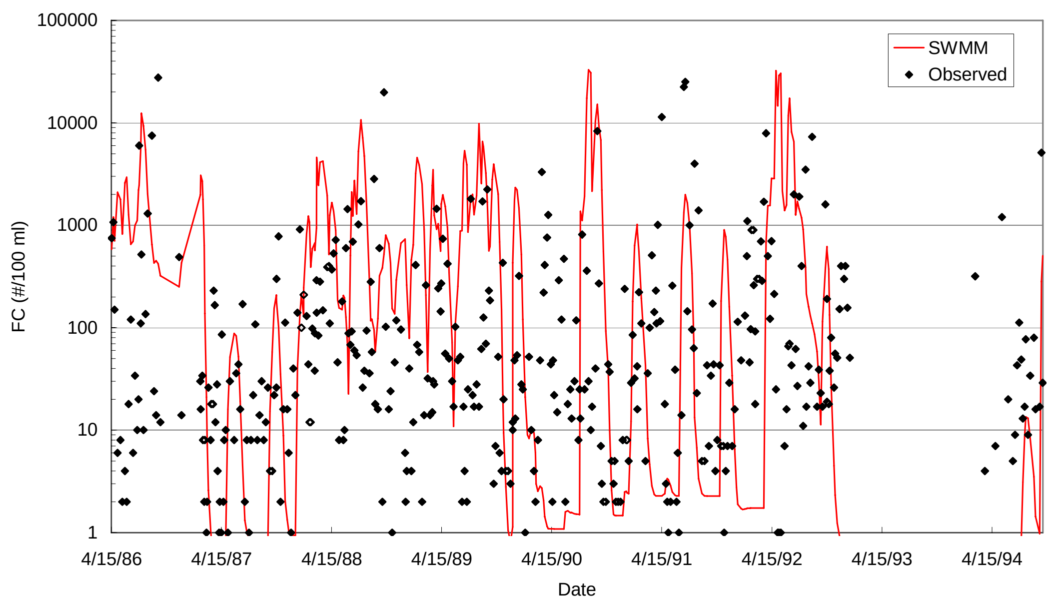


Figure A-6. Observed versus simulated fecal coliform at monitoring station CH9.

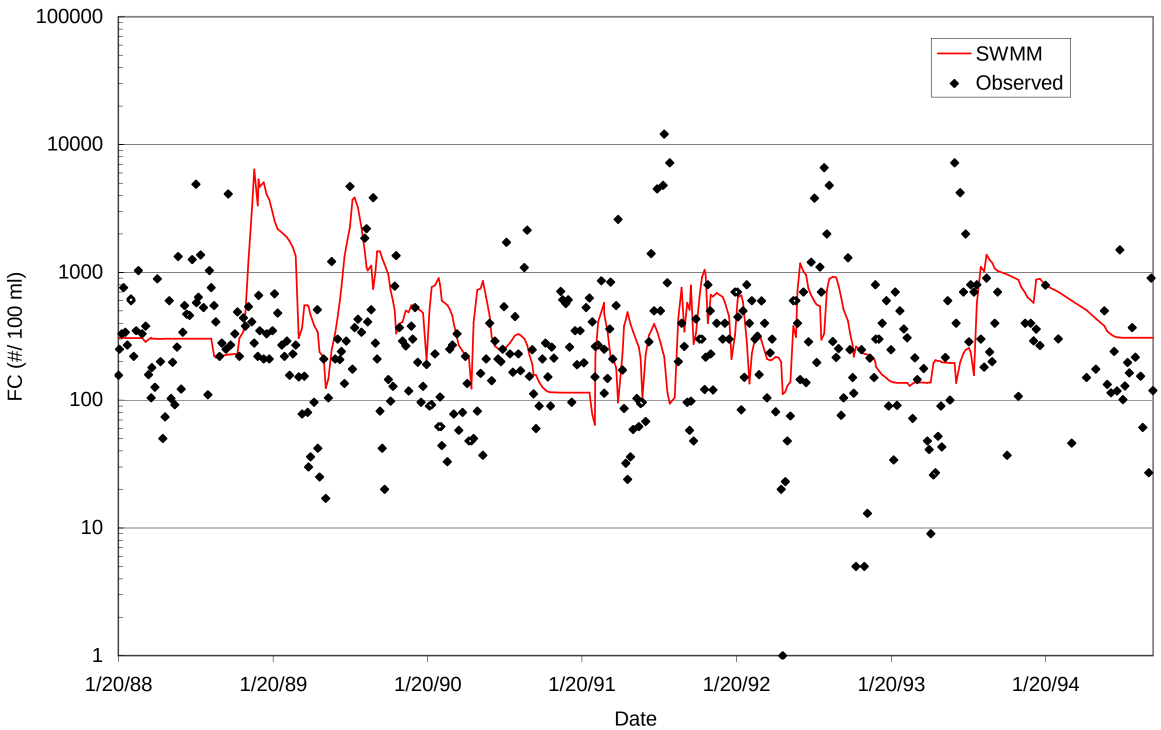


Figure A-7. Observed versus simulated fecal coliform at monitoring station ULI.

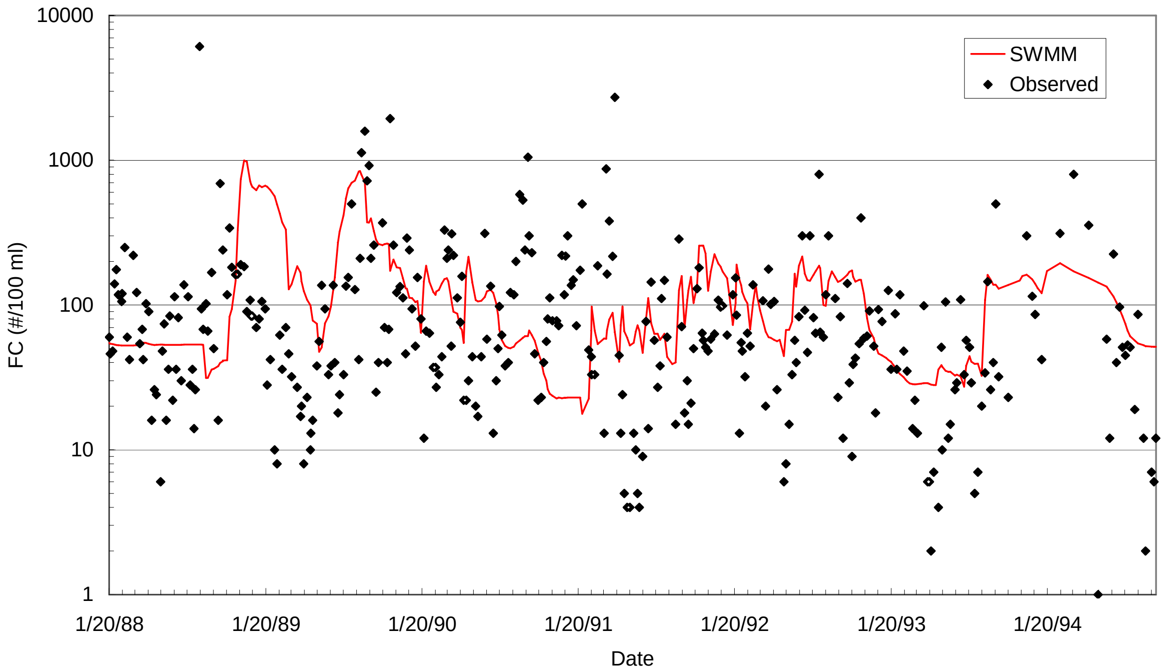


Figure A-8. Observed versus simulated fecal coliform at monitoring station ULO.

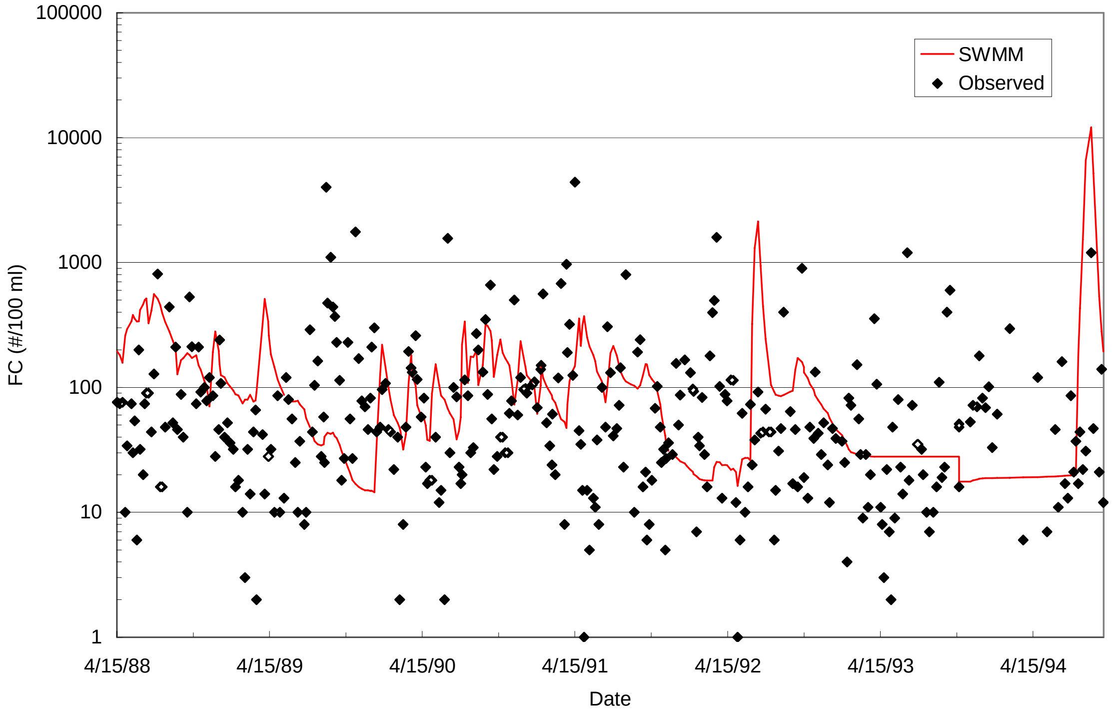


Figure A-9. Observed versus simulated fecal coliform at monitoring station CH6.

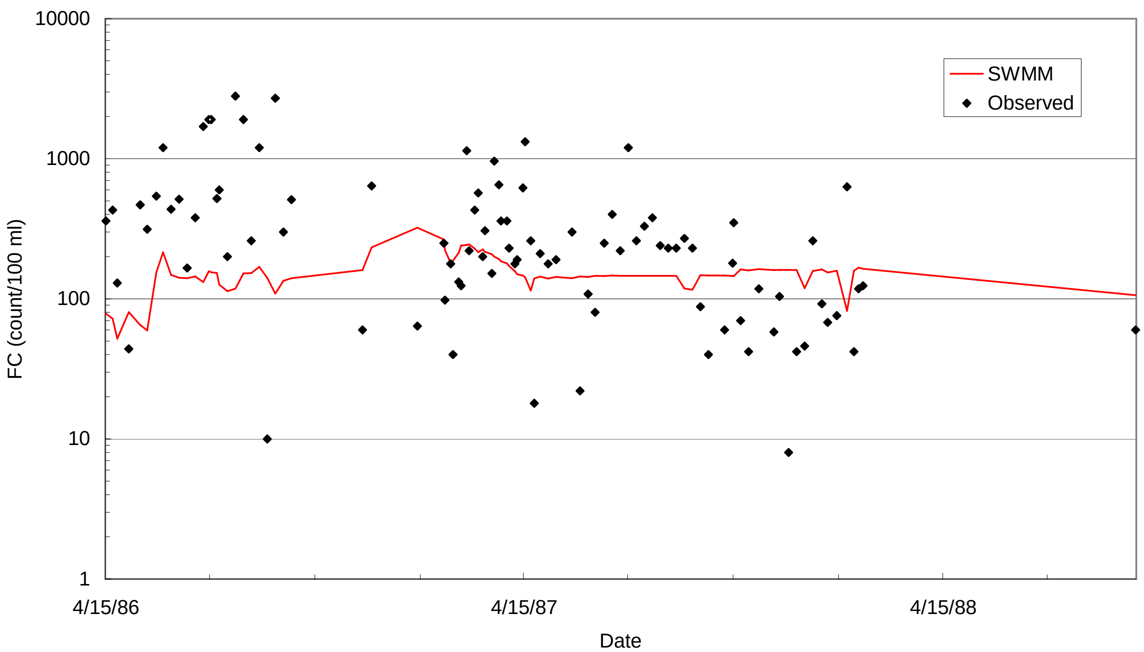


Figure A-10. Observed versus simulated fecal coliform at monitoring station CH2.

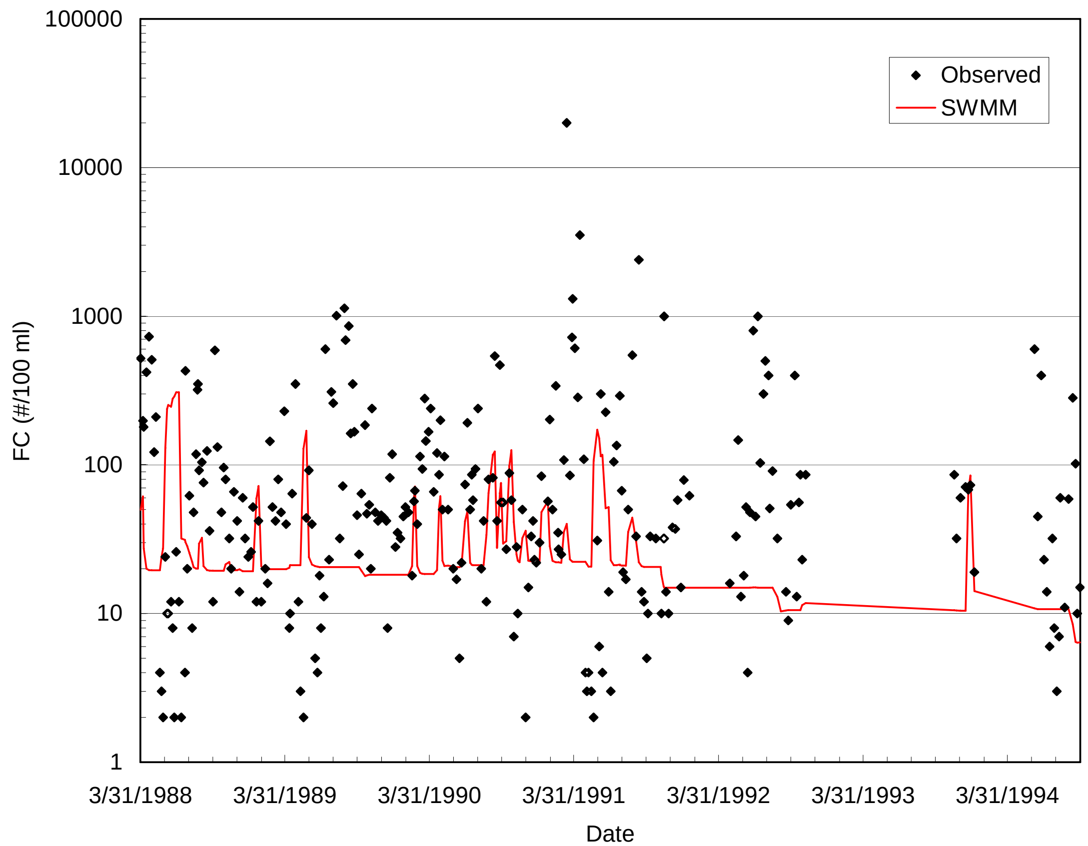


Figure A-11. Observed versus simulated fecal coliform at monitoring station CL3.

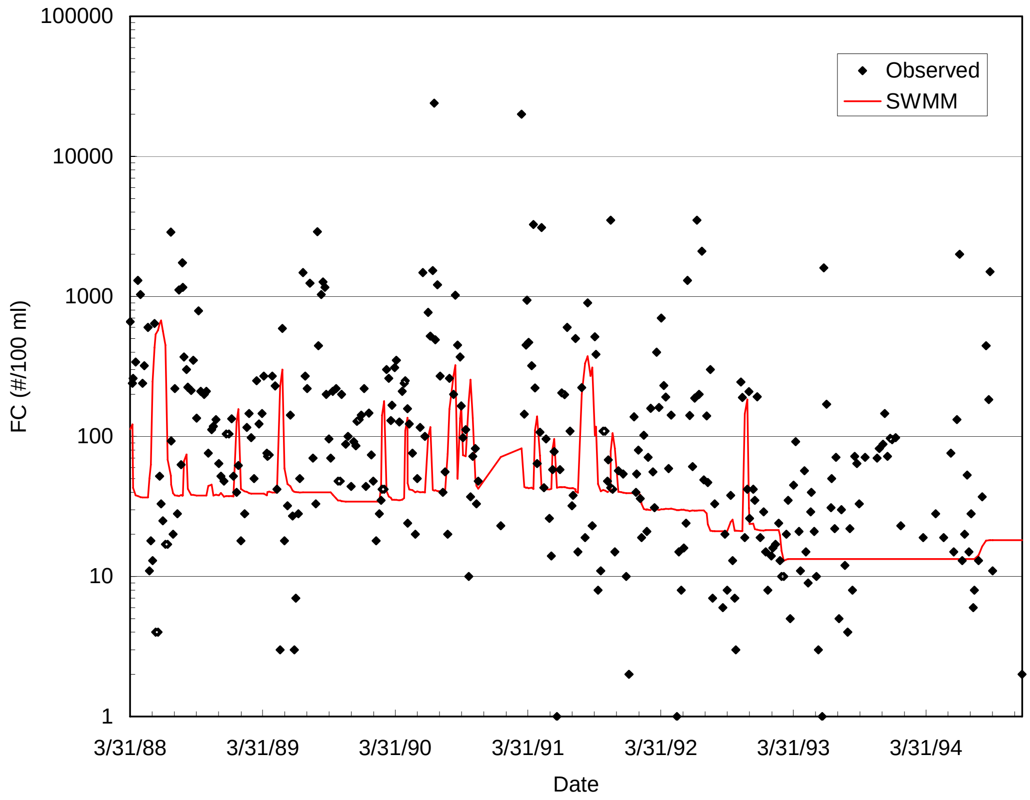


Figure A-12. Observed versus simulated fecal coliform at monitoring station CL2.

APPENDIX B: ANNUAL AVERAGE SUBBASIN FECAL COLIFORM LOADS

Table B-1. Annual Average Subbasin Fecal Coliform Loads.

SUBBASIN	ACRES	AVERAGE LOAD (#FC/YEAR)	AVG #FC/AC	RANK
77	42.0	1.425E+16	3.393E+14	1
133	23.0	6.950E+15	3.022E+14	2
81	56.8	1.461E+16	2.572E+14	3
144	9.2	2.000E+15	2.179E+14	4
118	8.8	1.892E+15	2.140E+14	5
126	188.2	3.842E+16	2.041E+14	6
119	19.6	3.902E+15	1.993E+14	7
154	31.8	6.289E+15	1.978E+14	8
180	37.0	7.070E+15	1.913E+14	9
51	0.0	1.077E+16	1.889E+14	10
45	18.5	3.414E+15	1.849E+14	11
152	71.4	1.293E+16	1.811E+14	12
135	26.2	4.707E+15	1.799E+14	13
149	18.7	3.323E+15	1.776E+14	14
91	0.0	7.300E+15	1.768E+14	15
2	1055.9	1.805E+17	1.710E+14	16
27	0.0	1.066E+16	1.686E+14	17
48	0.0	3.065E+15	1.655E+14	18
12	192.4	3.158E+16	1.641E+14	19
171	87.9	1.415E+16	1.611E+14	20
18	251.6	3.962E+16	1.575E+14	21
3	252.3	3.955E+16	1.568E+14	22
109	0.0	1.175E+16	1.546E+14	23
57	22.1	3.378E+15	1.528E+14	24
31	8.3	1.260E+15	1.518E+14	25
52	17.0	2.450E+15	1.442E+14	26
16	151.3	2.084E+16	1.377E+14	27
172	146.1	1.975E+16	1.352E+14	28
70	8.0	1.080E+15	1.343E+14	29
26	263.2	3.533E+16	1.343E+14	30
104	117.3	1.503E+16	1.281E+14	31
32	5.8	7.360E+14	1.278E+14	32
174	15.7	2.006E+15	1.275E+14	33
13	62.1	7.830E+15	1.260E+14	34
75	6.0	7.530E+14	1.259E+14	35
1	826.8	1.025E+17	1.240E+14	36
166	8.3	9.950E+14	1.199E+14	37
69	26.2	3.116E+15	1.188E+14	38
108	3.0	3.229E+14	1.095E+14	39
5	767.5	8.180E+16	1.066E+14	40
89	31.9	3.377E+15	1.058E+14	41
22	49.4	5.183E+15	1.049E+14	42
72	13.2	1.343E+15	1.021E+14	43
36	10.8	1.102E+15	1.018E+14	44

SUBBASIN	ACRES	AVERAGE LOAD (#FC/YEAR)	AVG #FC/AC	RANK
150	0.0	1.086E+15	9.936E+13	45
177	6.6	6.560E+14	9.880E+13	46
106	25.8	2.536E+15	9.822E+13	47
17	35.0	3.418E+15	9.760E+13	48
176	25.8	2.514E+15	9.752E+13	49
90	5.4	5.263E+14	9.746E+13	50
34	9.3	9.000E+14	9.709E+13	51
96	2.7	2.611E+14	9.670E+13	52
6	270.8	2.586E+16	9.549E+13	53
99	47.2	4.445E+15	9.417E+13	54
84	38.0	3.472E+15	9.130E+13	55
15	19.0	1.728E+15	9.090E+13	56
148	27.3	2.453E+15	8.982E+13	57
54	20.0	1.791E+15	8.942E+13	58
100	354.5	3.166E+16	8.932E+13	59
30	447.3	3.877E+16	8.667E+13	60
68	107.5	9.270E+15	8.620E+13	61
127	13.5	1.164E+15	8.597E+13	62
103	7.4	6.320E+14	8.541E+13	63
178	18.4	1.570E+15	8.523E+13	64
175	14.8	1.237E+15	8.352E+13	65
73	16.2	1.345E+15	8.302E+13	66
170	103.0	8.390E+15	8.142E+13	67
7	296.8	2.329E+16	7.848E+13	68
300	166.7	1.284E+16	7.705E+13	69
114	0.0	2.551E+16	7.637E+13	70
132	20.0	1.505E+15	7.540E+13	71
162	23.3	1.701E+15	7.297E+13	72
35	21.9	1.540E+15	7.038E+13	73
20	80.0	5.527E+15	6.907E+13	74
146	17.5	1.194E+15	6.819E+13	75
10	14.9	1.008E+15	6.770E+13	76
110	31.4	2.115E+15	6.731E+13	77
74	31.5	2.116E+15	6.722E+13	78
50	111.2	7.440E+15	6.694E+13	79
169	2.7	1.748E+14	6.596E+13	80
88	134.8	8.800E+15	6.528E+13	81
161	10.8	6.720E+14	6.228E+13	82
113	16.1	9.830E+14	6.090E+13	83
11	13.8	7.795E+14	5.649E+13	84
145	6.4	3.555E+14	5.546E+13	85
94	129.8	7.136E+15	5.498E+13	86
123	0.0	8.120E+14	5.486E+13	87
8	26.3	1.404E+15	5.332E+13	88
82	98.6	5.224E+15	5.297E+13	89
42	7.6	3.877E+14	5.115E+13	90
157	48.5	2.424E+15	4.997E+13	91

SUBBASIN	ACRES	AVERAGE LOAD (#FC/YEAR)	AVG #FC/AC	RANK
46	24.6	1.178E+15	4.781E+13	92
165	4.3	2.061E+14	4.771E+13	93
147	7.2	3.227E+14	4.470E+13	94
173	3.3	1.466E+14	4.470E+13	95
95	12.8	5.631E+14	4.399E+13	96
128	27.3	1.174E+15	4.308E+13	97
19	41.4	1.770E+15	4.277E+13	98
156	8.9	3.230E+14	3.621E+13	99
163	6.8	2.275E+14	3.336E+13	100
160	33.4	1.051E+15	3.150E+13	101
117	26.4	8.075E+14	3.065E+13	102
168	9.4	2.215E+14	2.364E+13	103
179	63.7	1.404E+15	2.205E+13	104
159	27.9	5.771E+14	2.068E+13	105
83	6.6	1.365E+14	2.068E+13	106
142	26.6	5.288E+14	1.992E+13	107
66	6.7	1.258E+14	1.878E+13	108
105	5.2	4.418E+13	8.496E+12	109
85	30.5	2.276E+14	7.453E+12	110
41	7.4	5.086E+13	6.854E+12	111
21	20.4	1.139E+14	5.578E+12	112
124	16.9	6.260E+13	3.704E+12	113
102	321.0	1.166E+15	3.632E+12	114
53	22.6	7.440E+13	3.296E+12	115
24	61.6	1.659E+14	2.693E+12	116
181	137.8	3.276E+14	2.378E+12	117
61	0.0	7.700E+13	8.499E+11	118
80	3.8	3.181E+12	8.371E+11	119
138	73.1	5.697E+13	7.797E+11	120
71	9.9	6.349E+12	6.420E+11	121
40	88.5	2.297E+13	2.595E+11	122
140	13.3	1.007E+12	7.571E+10	123
63	18.5	7.700E+11	4.162E+10	124
111	2.7	5.285E+10	1.957E+10	125
101	10.3	1.276E+11	1.235E+10	126
97	30.6	1.156E+11	3.778E+09	127
92	13.2	1.840E+10	1.394E+09	128
93	7.5	4.827E+09	6.462E+08	129
25	46.3	5.646E+09	1.219E+08	130
64	6.9	0.000E+00	0.000E+00	131
98	55.7	0.000E+00	0.000E+00	132
112	15.2	0.000E+00	0.000E+00	133
115	0.0	0.000E+00	0.000E+00	134

IPaC **U.S. Fish & Wildlife Service**

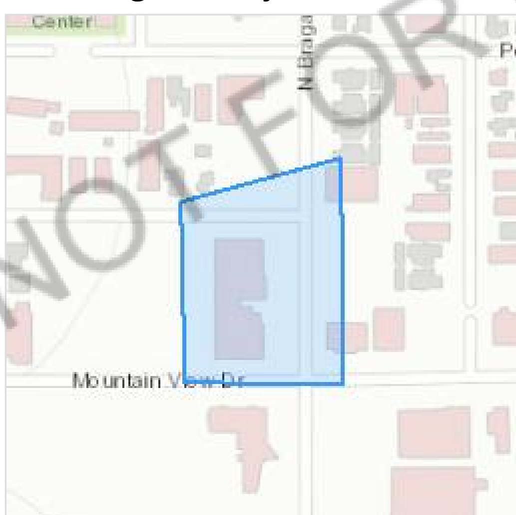
IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

Location

Anchorage County, Alaska



Local office

Anchorage Fish & Wildlife Field Office

(907) 271-2888
(907) 271-2786

4700 Blm Road

Anchorage, AK 99507

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species[1] and their critical habitats are managed by the Ecological Services Program of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries[2]).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact NOAA Fisheries for species under their jurisdiction.

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1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information. IPaC only shows species that are regulated by USFWS (see FAQ).

2. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

There are no listed species or critical habitats expected to occur at this location.

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

There are migratory birds in your project area. Please refer to Alaska's Bird Nesting Season for recommendations to minimize impacts to migratory birds, including eagles.

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.

Additional information can be found using the following links:

- Birds of Conservation Concern https://www.fws.gov/program/migratory-birds/species
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide conservation measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
American Golden-plover *Pluvialis dominica* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 20 to Aug 15
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds Feb 1 to Sep 30
Hudsonian Godwit *Limosa haemastica* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 15 to Jul 31
Lesser Yellowlegs *Tringa flavipes* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9679	Breeds May 1 to Aug 15
Olive-sided Flycatcher *Contopus cooperi* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/3914	Breeds May 20 to Aug 31
Short-billed Dowitcher *Limnodromus griseus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9480	Breeds Jun 1 to Aug 10

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

Breeding Season (■)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

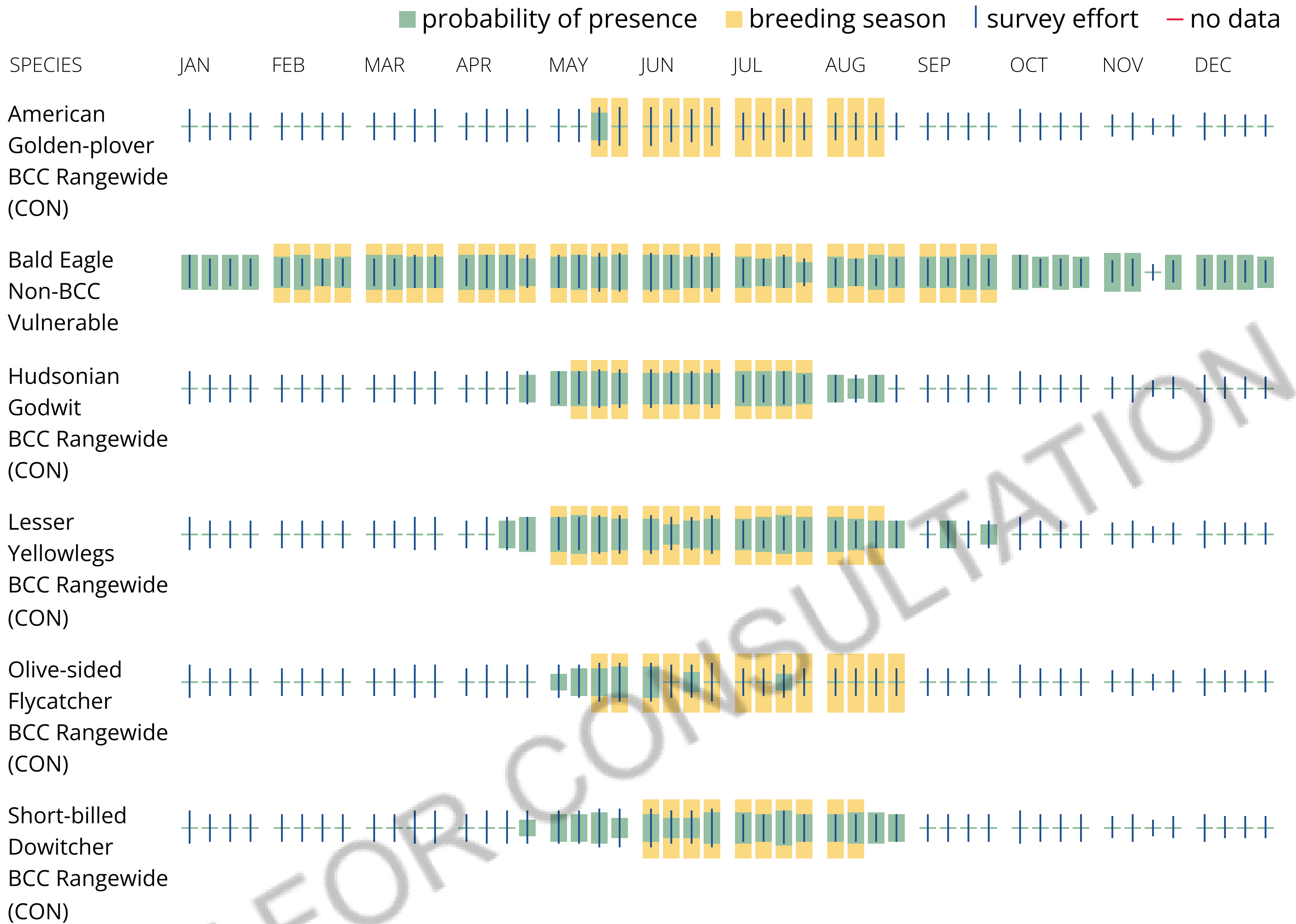
Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

To see a bar's survey effort range, simply hover your mouse cursor over the bar.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe

Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.



Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the list of migratory birds that potentially occur in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the Rapid Avian Information Locator (RAIL) Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets.

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering or migrating in my area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may query your location using the RAIL Tool and look at the range maps provided for birds in your area at the bottom of the profiles provided for each bird in your results. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Facilities

National Wildlife Refuge lands

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

There are no refuge lands at this location.

Fish hatcheries

There are no fish hatcheries at this location.

Wetlands in the National Wetlands Inventory (NWI)

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Wetland information is not available at this time

This can happen when the National Wetlands Inventory (NWI) map service is unavailable, or for very large projects that intersect many wetland areas. Try again, or visit the NWI map to view wetlands at this location.

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate Federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

Alaska DEC Drinking Water Protection Areas

Open in Map Viewer Classic

Sign In

Legend

Non-Community Water System (NC)

Alaska DEC Public Water System Source Minimum Required Separation Distances

PWS Separation Distance 100 ft

PWS Separation Distance 200 ft

Alaska DEC Drinking Water Protection Areas

Zone A (GW-Several Months Time of Travel or SW 1000 ft buffer)

Zone B (GW-2 Yr Time of Travel or SW-1 mile buffer)

Zone C Surface Water (Watershed Boundary)

Zone E Ground Water Surface Water Influence (1000 ft buffer)

Zone F Ground Water Surface Water Influence (1 mile buffer)

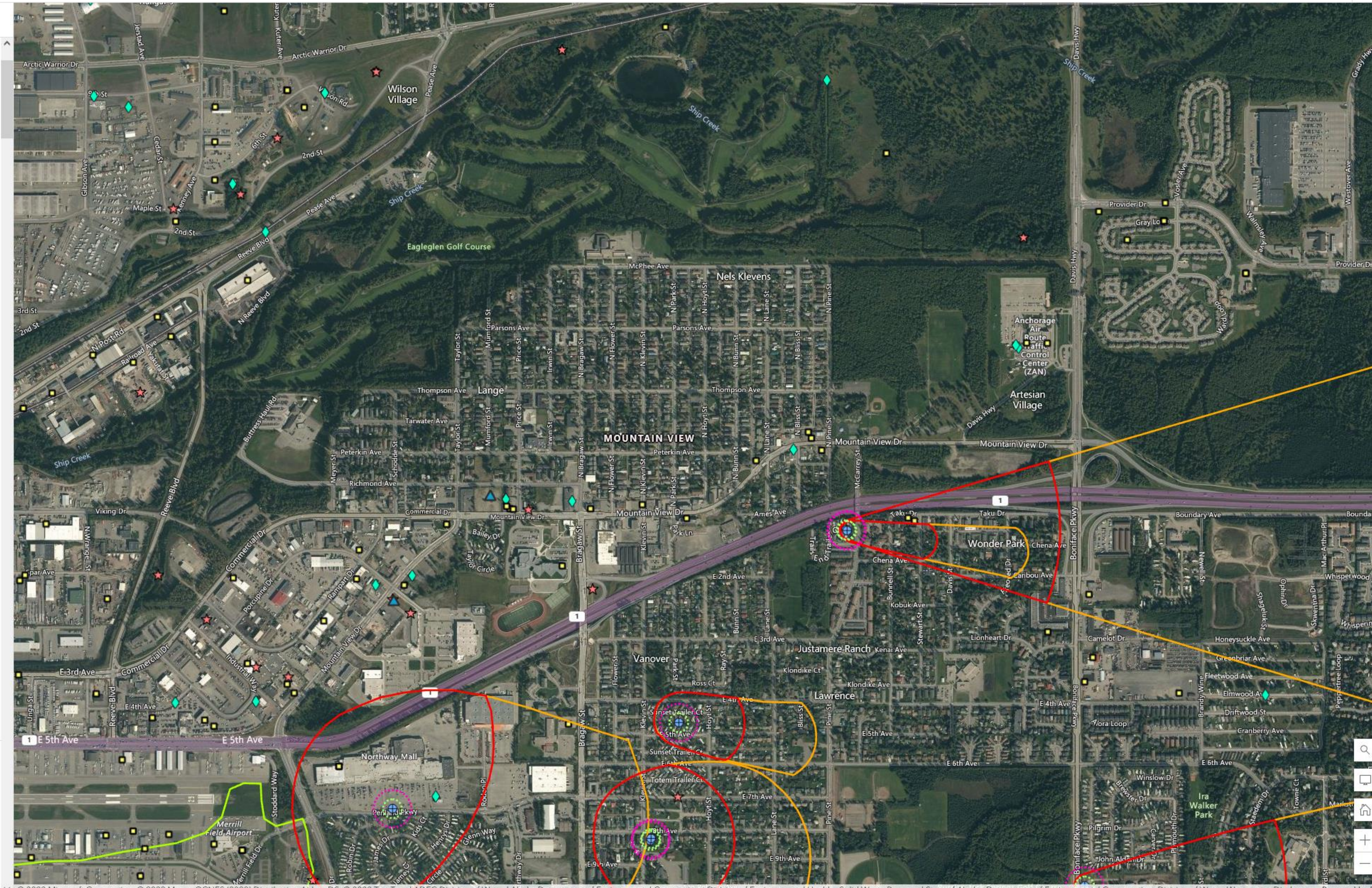
Zone G Ground Water Surface Water Influence (Watershed Boundary)

Provisional Protection Areas

Alaska DEC Contaminated Sites

Contaminated Sites

- Active
- Cleanup Complete
- Cleanup Complete - Institutional Controls
- Informational



APPENDIX E
DELEGATION OF AUTHORITY, SUBCONTRACTOR CERTIFICATION

A..E-01

B..E-02

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APPENDIX F
PERMIT CONDITIONS

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ALASKA POLLUTANT DISCHARGE ELIMINATION SYSTEM

GENERAL PERMIT FOR DISCHARGES FROM LARGE AND SMALL CONSTRUCTION ACTIVITIES
(Construction General Permit) – Final

Permit Number: **AKR100000**

DEPARTMENT OF ENVIRONMENTAL CONSERVATION
Wastewater Discharge Authorization Program
555 Cordova Street
Anchorage, AK 99501

In compliance with the provisions of the Clean Water Act (CWA), 33 U.S.C. §1251 et. seq., as amended by the Water Quality Act of 1987, P.L. 100-4, this permit is issued under provisions of Alaska Statutes 46.03, the Alaska Administrative Code (AAC) as amended, and other applicable State laws and regulations.

Operators of large and small construction activities described in Part 1.4 of this Alaska Pollutant Discharge Elimination System (APDES) general permit, except for those activities excluded from authorization to discharge in Part 1.4.4 of this permit, are authorized to discharge storm water associated with construction activity to waters of the U.S., in accordance with the conditions and requirements set forth herein. Permit authorization is required from the "commencement of construction activities" until "final stabilization" as defined in Appendix C.

This permit shall become effective on <u>2/1/2021</u>.

This permit and the authorization to discharge shall expire at midnight, <u>1/31/2026</u>.

Signature	Date
	December 17, 2020
Gene McCabe	Program Manager

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SCHEDULE OF SUBMISSIONS

The Schedule of Submissions (Table 1) summarizes the required submissions and activities the permittee must complete and/or submit to the Alaska Department of Environmental Conservation (DEC or the Department) during the terms of this permit. The operator is responsible for all submissions and activities even if they are not summarized below.

Table 1: Schedule of Submissions

Permit Part	Type of Project	Submittal Requirement	Frequency	Due Date	Submit to [1]
Prior to Construction					
1.4.4.7, 2.1.1, 2.1.2, and 4.11	Projects that will construct Permanent Storm Water Management Controls	Engineering Plans	Once	At least 30 calendar days before the start of construction or as required by the MS4 Operator	Permitting Program or MS4 Operator
1.5	Small construction activities that use a waiver in lieu of CGP authorization	Waiver Certification	Once	At least five business days before proposed start of construction	Permitting Program
2.1.3	Projects that disturb greater than or equal to 5 acres of land and are outside an MS4 area	SWPPP [2]	Once	With NOI	Permitting Program
2.1.4	Projects inside an MS4 area	SWPPP	Once	Depends on requirements of MS4 operator	MS4 Operator
2.1.5 and 4.6.7	Project that use Cationic Treatment Chemicals	Engineering Plans and Project Details	Once	At least 14 calendar days before use of the system	Permitting Program
2.1.6	Projects that discharge to an Outstanding Natural Resource Water	Site-Specific Antidegradation Analysis	Once	At least 14 calendar days before filing NOI	Permitting Program
2.3	Projects that disturb greater than or equal to 1 acre of land	Notice of Intent	Once	At least five business days before the start of construction	Permitting Program

Table 1: Schedule of Submissions

Permit Part	Type of Project	Submittal Requirement	Frequency	Due Date	Submit to [1]
During Construction					
2.4.2 2.6	For an authorized permittee if the permittee intends to continue operations and discharges beyond the term of this permit	Submit a complete and accurate new NOI according to Part 2.3	Once	Within 90 calendar days of the effective date of this permit	Permitting Program
2.7	To update or correct information on the original NOI	NOI Modification	As needed	As needed	Permitting Program
3.2, 8.4, and 9.2	If the difference between upstream and downstream samples exceed WQS for turbidity	Corrective Action Report	As necessary	At least 14 calendar days after receiving monitoring results	Compliance Program
9.1	Projects that disturb greater than or equal to 20 acres of land	Annual Report	As needed for sites meeting Part 3.2	By December 31st or with NOT	Compliance Program
9.5	All projects with an active NOI	Request for Submittal of Records	As requested by DEC	At least 30 calendar days after receipt of request	As requested by DEC
Post Construction					
10.2	All projects with an active NOI	Notice of Termination (NOT)	Once	Within 30 calendar days of completion of the project	Permitting Program

Note:
1. See Appendix A, Part 1.1 for Permitting and Compliance Program contact information and addresses
2. All projects that require an NOI must prepare a SWPPP. However, only operators who are developing projects that disturb greater than or equal to five (5) acres of land and are outside an MS4 area are required to submit a SWPPP to DEC.

REQUIRED ON-SITE DOCUMENTATION

The Summary of Required On-Site Documentation (Table 2) lists the documents the permittee must have available at the project site or the project management office. The permittee is responsible for all documentation even if they are not summarized below.

Table 2: Summary of Permit Required On-Site Documentation

Permit Part	Document	Frequency	Purpose of Document
2.3	NOI	Once at start of project	Applicant request for authorization to discharge under permit coverage
2.5	DEC NOI Reply Letter	Once at start of project	To provide permittee with DEC project tracking number indicating project is covered by CGP
2.7	NOI Modification	As needed	To modify the original NOI if project conditions, personnel, or SWPPP location change
5.0	SWPPP	Developed prior to submitting the NOI. Updated as necessary.	To describe the project and the control measures to minimize the discharge of pollutants into waters of the U.S.
5.4; 6.7	Inspection Reports	Conducted at frequency specified in SWPPP	To monitor compliance with SWPPP and CGP
5.5; 7.0	Monitoring Plan (if required)	As needed	To describe monitoring of storm water discharge for those projects that disturb more than threshold requirement
5.6	Permit Eligibility related to Total Maximum Daily Load (TMDL)	Once at start of project	To document compliance with TMDL requirements
5.7	Permit Eligibility related to Endangered Species Act (ESA)	Once at start of project	To document compliance with ESA requirements
5.8.1	Copy of this permit	Once at start of project	To include in SWPPP
5.8.2	Additional Documentation in the SWPPP	Updated as necessary	To maintain summaries of various specific activities at the site to document they were accomplished.
8.3	Corrective Action Log (if necessary)	Updated as necessary	To list the corrective actions taken at a site
8.4; 9.2	Corrective Action Report (if necessary)	As needed	To report exceeding the turbidity requirement and describe
9.1	Annual Report (if required)	Annually or at NOT	To report result of discharge monitoring
9.4	Records	As needed	To maintain project records
10.2	NOT	Once at completion of project	To notify DEC that the permittee is terminating permit coverage

1.0 COVERAGE UNDER THIS PERMIT

1.1 Introduction

The Alaska Construction General Permit (CGP) authorizes storm water discharges from large and small construction-related activities that result in a total land disturbance of equal to or greater than one acre and where those discharges enter waters of the U.S. (directly or through a storm water conveyance system) or a municipal separate storm sewer system (MS4) leading to waters of the U.S. subject to the conditions set forth in this permit. This permit also authorizes storm water discharges from certain construction support activities and some non-storm water discharges commonly associated with construction sites.

The goal of this permit is to minimize erosion and reduce or eliminate the discharge of pollutants, such as sediment carried in storm water runoff from construction sites through implementation of appropriate control measures. Polluted storm water runoff can adversely affect fish, animals, plants, and humans. In order to ensure protection of water quality and human health, this permit describes control measures that must be used to manage storm water runoff during construction activities. This permit replaces the CGP that became effective February 1, 2016 and expired on January 31, 2021.

1.2 Person(s) Responsible for Obtaining Authorization under this Permit

1.2.1 All operators of large or small construction activities that meet the conditions in Part 1.4 must obtain authorization under this permit. For the purposes of this permit, an “operator” is any party associated with a construction project that meets either of the following two criteria:

1.2.1.1 The party has operational control over construction plans and specifications, including the ability to make modifications to those plans and specifications, or

1.2.1.2 The party has day-to-day operational control of those activities at a project that are necessary to ensure compliance with the permit conditions (e.g., they are authorized to direct workers at a site to carry out activities required by the permit)

Note: Subcontractors generally are not considered operators for the purposes of this permit.

Note: Where there are multiple operators associated with the same project, all operators are required to obtain permit authorization. The following applies in these situations:

- *If one operator has control over plans and specifications and a different operator has control over activities at the project site, they may divide responsibility for compliance with the terms of this permit as long as they develop a group storm water pollution prevention plan (SWPPP) (see Part 5.1), which documents which operator has responsibility for each requirement of the permit.*
- *If an operator only has operational control over a portion of a larger project (e.g., one of four homebuilders in a subdivision), the operator is responsible for compliance with all applicable effluent limits, terms, and conditions of this permit as it relates to the activities on their portion of the construction site, including protection of endangered species, critical habitat, and historic properties, and implementation of control measures described in the SWPPP in the areas under their control.*
- *An operator must ensure either directly or through coordination with other permittees, that their activities do not render another permittee’s pollutant discharge controls ineffective.*

1.3 Permit Area

This general permit covers the State of Alaska, except lands within the Metlakatla Indian Reservation and the Denali National Park and Preserve.

1.4 Eligibility

1.4.1 **Eligibility Requirements**. To be authorized under this permit, the project must meet the following conditions or be notified by DEC that the site is eligible for permit coverage.

1.4.1.1 The project will disturb one or more acres of land, or will disturb less than one acre of land but is part of a common plan of development or sale that will ultimately disturb one or more acres of land;

1.4.1.2 The site will discharge storm water to waters of the U.S. (directly or through a storm water conveyance system) or a MS4 leading to a waters of the U.S.;

1.4.1.3 The project area is located in an area where DEC is the permitting authority;

1.4.1.4 The project is not already covered under a different APDES permit;

1.4.1.5 The project does not discharge to an impaired waterway with an EPA-approved or established Total Maximum Daily Load (TMDL) that specifically precludes such discharges; and

1.4.1.6 The project is not likely to jeopardize the continued existence or cause a take of any threatened or endangered species protected under the Endangered Species Act (ESA) or their designated critical habitat.

1.4.2 Authorized Storm Water Discharges. Subject to compliance with the terms and conditions of this permit, the following discharges are authorized under this permit:

1.4.2.1 Storm water discharges associated with large and small construction activities, including those that are part of a common plan of development or sale that will ultimately disturb one or more acres of land.

1.4.2.2 Storm water discharges designated by DEC as needing a storm water permit under 40 CFR §122.26(a)(1)(v) or §122.26(b)(15)(ii).

1.4.2.3 Storm water discharges from support activities (such as concrete or asphalt batch plants, equipment staging yards, material storage areas, excavated material disposal areas, borrow areas) (as defined in Appendix C), whether on-site, adjacent to, or off-site, provided:

1.4.2.3.1 The support activity is directly related to the construction site required to have permit authorization for discharges of storm water associated with construction activity under this permit:

1.4.2.3.2 The support activity is not a commercial operation serving multiple unrelated construction projects by different permittees;

1.4.2.3.3 The support activity does not operate beyond the completion of the construction activity at the project it supports; and

1.4.2.3.4 Appropriate control measures are identified in the Storm Water Pollution Prevention Plan (SWPPP) and pollutant discharges are minimized in compliance with Parts 3.0 and 4.0 of the permit.

1.4.2.4 Discharges composed of allowable discharges listed in Parts 1.4.2 and 1.4.3 commingled with a discharge authorized by a different APDES permit and/or a discharge that does not require APDES permit authorization.

1.4.3 Authorized Non-Storm Water Discharges. Subject to compliance with the terms and conditions of this permit, the following non-storm water discharges are authorized under this general permit, provided the non-storm water component of that the discharge is in compliance with the SWPPP requirements in Part 5.3.9:

1.4.3.1 Discharges from fire-fighting activities;

1.4.3.2 Fire hydrant flushings;

1.4.3.3 Waters used to wash vehicles where detergents are not used;

1.4.3.4 Water used to control dust;

1.4.3.5 Potable water including uncontaminated water line flushings;

1.4.3.6 Routine external building wash down where detergents are not used;

1.4.3.7 Pavement wash waters where spills or leaks of toxic or hazardous materials have not occurred (unless all spilled material has been removed) and where detergents are not used;

1.4.3.8 Uncontaminated air conditioning or compressor condensate;

1.4.3.9 Uncontaminated, non-turbid discharges of ground water or spring water;

1.4.3.10 Foundation or footing drains where flows are not contaminated with process materials such as solvents or contaminated groundwater;

1.4.3.11 Uncontaminated construction dewatering waters that are treated by an appropriate control measure in compliance with Part 4.4.2, or have been treated with treatment chemicals in compliance with Part 4.6; and

1.4.3.12 Landscape irrigation.

1.4.4 Limitations on Coverage. The following discharges are <u>not authorized</u> under this permit:

1.4.4.1 **Post-Construction Discharges**. Discharges that originate from the project after construction activities have ceased and a Notice of Termination (NOT) has been submitted in accordance to Part 10.0, including any temporary support activity.

1.4.4.2 **Discharges that May Exceed Water Quality Standards.** Discharges that DEC, prior to authorization under this permit, determines will cause, have the reasonable potential to cause, or contribute to an excursion above any applicable water quality standard (WQS). Where such a determination is made prior to authorization, DEC may notify the applicant that an individual permit application is necessary in accordance with Part 2.8. However, DEC may provide permit authorization after the applicant has included appropriate controls and implementation procedures designed to bring the discharge into compliance with WQS's in accordance with Part 3.1.

1.4.4.3 **Discharges to Water Quality Impaired Waters.** Discharges into receiving waters that are listed as impaired waters in the report *Alaska's Final 2018 Integrated Water Quality Monitoring and Assessment Report*, dated March 26, 2020 (or the most current EPA-approved version), or with an approved or established TMDL analysis, unless the discharges are in accordance with Part 3.2.

1.4.4.4 **Comingled Discharges.** Discharges that are mixed with non-storm water, unless they are listed as allowable non-storm water discharges in Part 1.4.3.

1.4.4.5 **Discharges Currently or Previously Covered by another Permit.** Unless the permittee received written notification from DEC specifically allowing these discharges to be authorized under this permit, the permittee is not eligible for coverage under this permit for any of the following:

1.4.4.5.1 Storm water discharges associated with construction activity that have been covered under an individual permit, an alternative APDES general permit, or are required to obtain authorization under an alternative general permit in accordance with Part 2.8.

1.4.4.5.2 Discharges from sites where any APDES permit has been or is in the process of being denied, terminated, or revoked by DEC (*this does not apply to the routine reissuance of permits every five years*).

1.4.4.6 **Discharges of Dredged or Fill Material.** Discharges of dredged or fill material into waters of the U.S. requiring federal authorization through the U.S Army Corps of Engineers CWA Section 404 Regulatory Program.

1.4.4.7 **Discharges from Nondomestic Treatment Works.** Discharges of storm water to the land or groundwater from a nondomestic wastewater treatment works (as defined in 18 AAC 72) using permanent storm water management controls unless they are in compliance with 18 AAC 72.600 and EPA Underground Injection Control regulations[1].

1.4.5 Emergency Repairs or Reconstruction of a Facility

1.4.5.1 Discharges from construction activities conducted in response to a disaster (as defined in Alaska Statute 26.23.900) are conditionally authorized, provided that the operator does the following:

1.4.5.1.1 Submits a Notice of Intent (NOI) and SWPPP (if project disturbs five or more acres in accordance with Part 2.1) to the Department in accordance with Part 2.3 and 2.4 within 30 calendar days of initiating construction activities.

1.4.5.1.2 Implements appropriate control measures as soon as possible after initiating construction activities. For discharges occurring during the initial 30 day period, the permittee must demonstrate compliance with the terms and conditions of this permit to the extent practicable depending on the disaster.

1.5 Waivers for Certain Small Construction Activities

1.5.1 **Waiver Criteria.** An operator of a small construction activity may qualify for a waiver in lieu of obtaining authorization under this permit if one of the following three criteria are met. Details of the three waiver options and procedures for requesting a waiver are provided in Appendix D:

1.5.1.1 The project has a low rainfall erosivity factor;

1.5.1.2 DEC or EPA has established or approved a TMDL that addresses the pollutant(s) of concern and has determined storm water control measures are not needed to protect water quality;

1.5.1.3 The operator develops an equivalent analysis that determined allocations for pollutant(s) of concern are not needed to protect water quality. This waiver is only available for non-impaired waters.

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[1] For additional information refer to DEC's Engineered Wastewater Disposal System web page at http://dec.alaska.gov/water/wastewater/engineering/engineered-systems and EPA's Underground Injection Control web page at http://www.epa.gov/uic/underground-injection-control-region-10-ak-id-or-and-wa

2.0 AUTHORIZATION UNDER THIS GENERAL PERMIT

2.1 Submittal Requirements Prior to Construction Depending on the type and location of the project, the operator may be required to submit information to the DEC and/or an MS4 operator for review prior to filing the NOI and commencement of construction activities. The following is a summary of the information to be submitted to each agency by project type and area of jurisdiction.

2.1.1 **Permanent Storm Water Management Controls** (Outside MS4)**.** An operator installing permanent storm water management controls in accordance with Part 4.11 and where the project is located outside of an APDES permitted MS4, must submit information required by the DEC in Part 4.11 at least thirty (30) calendar days prior to filing the NOI for the project. The operator must receive the DEC's written reply prior to the commencement of construction activities.

2.1.2 **Permanent Storm Water Management Controls** (Inside MS4)**.** An operator installing permanent storm water management controls in accordance with Part 4.11 and where the project is located inside the area of an APDES permitted MS4 must submit information required by the MS4 operator for the project and must receive the MS4 operator's approval prior to the commencement of construction activities. Check with the respective MS4 operator for their particular submittal requirements. *(See http://dec.alaska.gov/water/wastewater/stormwater/swppp-submittal-rqmts for further MS4 operator contact information.)*

2.1.2.1 Operators of construction activity within the Municipality of Anchorage (with the exception of ADOT&PF, see 2.1.2.2) shall submit information to:

Municipality of Anchorage
Public Works Department
4700 South Elmore Rd.
P.O. Box 196650
Anchorage, AK 99519-6650

2.1.2.2 Operators of construction activities for Alaska Department of Transportation & Public Facilities (ADOT&PF) construction projects within the Municipality of Anchorage shall submit information to:

ADOT&PF
Construction and Operations, Central Region
4111 Aviation Ave.
P.O. Box 196900
Anchorage, AK 99519

2.1.2.3 Operators of construction activity within the Fairbanks North Star Borough shall submit information to:

Fairbanks North Star Borough
Department of Public Works
P.O. Box 71267
Fairbanks, AK 99707

2.1.2.4 Operators of construction activity within the City of Fairbanks shall submit information to:

City of Fairbanks
Engineering Division
800 Cushman St.
Fairbanks, AK 99701

2.1.2.5 Operators of construction activity within the City of North Pole shall submit information to:

City of North Pole
Department of Public Works
125 Snowman Lane
North Pole, AK 99705

2.1.2.6 Operators of construction activity within the Joint Base Elmendorf-Richardson shall submit information to:

Storm Water Lead
673rd CES/CEIEC
724 Quartermaster Drive
Joint Base Elmendorf-Richardson

2.1.2.7 Operators of construction activity within the Port of Anchorage shall submit information to:

Port of Anchorage
Operations and Maintenance
2000 Anchorage Port Road
Anchorage, AK 99501

2.1.2.8 Operators of construction activity within Fort Wainwright shall submit information to:

Water Quality Program
US Army Garrison, Alaska DPW, Environmental Division
3023 Engineer Place
Fort Wainwright, AK 99703

2.1.3 **SWPPP Submittal to DEC**. An operator developing a project that disturbs five or more acres of land must submit a copy of the SWPPP to the DEC (Appendix A, Part 1.1.1) at the time the NOI is filed (electronic attachments to the eNOI are preferred).

2.1.4 **SWPPP Submittal to MS4**. An operator developing a project that is located inside the area of an APDES permitted MS4 must submit a copy of the SWPPP to the respective MS4 operator. Check with the respective MS4 operator for their particular submittal requirements. *(http://dec.alaska.gov/water/wastewater/stormwater/swppp-submittal-rqmts for further MS4 operator contact information.)*

2.1.4.1 Within the Municipality of Anchorage

2.1.4.1.1 An operator of construction projects disturbing one or more acres of land shall submit a copy of the SWPPP to either DEC or the Municipality based on the project type and operator as shown in the following table.

Table 3: SWPPP Submittal within Municipality of Anchorage MS4 area.

Project Type	Submit SWPPP to
Government (Federal, state, or Port of Anchorage) road projects and other government sponsored transportation projects such as ports, railroads, or airports	DEC
Government (municipal) road projects and other government transportation projects	Municipality
Public or private utility projects when the utility is initiating the work	Municipality
Work that requires a building permit	Municipality
Non-publicly funded transportation projects	Municipality

2.1.4.1.2 Submittal of the SWPPP to the Municipality shall be made according to the most recent Municipality requirements and be submitted to the address given in Part 2.1.2.1

2.1.4.1.3 Submittal of the SWPPP to the DEC shall be to the address in Appendix A, Part 1.1.1.

2.1.4.2 Within the road service areas of the Fairbanks North Star Borough, check with the Borough for the latest SWPPP submittal requirements at the address given in Part 2.1.2.3. An operator of a publicly-funded project disturbing one or more acres of land shall submit a copy of the SWPPP to the DEC for review at the address in Appendix A, Part 1.1.1.

2.1.4.3 Within the City of Fairbanks, check with the City for the latest SWPPP submittal requirements at the address given in Part 2.1.2.4. An operator of a public-funded project disturbing one or more acres of land shall submit a copy of the SWPPP to the DEC for review at the address in Appendix A, Part 1.1.1.

2.1.4.4 Within the City of North Pole**,** check with the City for the latest SWPPP submittal requirements at the address given in Part 2.1.2.5. An operator of a public-funded project disturbing one or more acres of land shall submit a copy of the SWPPP to the DEC for review at the address in Appendix A, Part 1.1.1.

2.1.4.5 Within the Joint Base Elmendorf-Richardson, check with the latest SWPPP submittal requirements at the address given in Part 2.1.2.6.

2.1.4.6 Within the Port of Anchorage, check with the latest SWPPP submittal requirements at the address given in Part 2.1.2.7.

2.1.4.7 Within the Fort Wainwright installation boundary, check with the latest SWPPP submittal requirements at the address given in Part 2.1.2.8.

2.1.5 **Projects Using Cationic Treatment Chemicals or an Active Treatment System**. Submit engineering plans and projects details listed in Part 4.6.7 to DEC (Appendix A, Part 1.1.1) at least 14 calendar days prior to use at the construction site.

2.1.6 **Projects that Discharge to an Outstanding Natural Resource Water**. Contact DEC at least 30 calendar days prior to commencement of construction activities that may discharge to a high quality water that constitutes an outstanding national resource, such as a water of a national or state park or wildlife refuge or a water of “exceptional recreational or ecological significance” (as described in Appendix C), to discuss the need to conduct a site-specific antidegradation analysis. If an antidegradation analysis is required, it must be submitted at least 14 calendar days prior to filing the NOI. Before beginning construction activities, operators must receive a written approval of the analysis from the DEC.

Note: No Outstanding Natural Resource Waters are designated in Alaska as of the date of this permit issuance.

2.2 How to Obtain Authorization

2.2.1 To obtain authorization under this permit, an operator must:

2.2.1.1 Be responsible for a project located in the area where DEC is the permitting authority;

2.2.1.2 Meet the eligibility requirements of Part 1.4;

2.2.1.3 Develop a SWPPP according to the requirements in Part 5.0 prior to filing for an NOI and submit a copy of the SWPPP as specified in Part 2.1;

2.2.1.4 Select, design, install, and implement control measures in accordance with Part 4.0 to meet non-numeric effluent limits;

2.2.1.5 Submit a complete and accurate NOI either using DEC's electronic system or using a paper form in accordance with Part 2.3 prior to commencing construction activities;

2.2.1.6 Pay the general permit authorization fees in accordance with 18 AAC 72.956;

2.2.1.7 Submit any additional information requested by the DEC or MS4 Operator (if applicable); and

2.2.1.8 Be granted authorization to discharge by the DEC.

2.2.2 Submission of the NOI demonstrates the operator's intent to be covered by this permit; it is not a determination by DEC that the operator meets the eligibility requirements for the permit. A discharge is **<u>not authorized</u>** if:

2.2.2.1 The operator's NOI is incomplete or inaccurate;

2.2.2.2 DEC requires the operator to obtain authorization under an individual permit or an alternative general permit; or

2.2.2.3 The discharge does not meet the eligibility requirements under Part 1.4.

2.2.3 If the information on the NOI is incorrect or is missing, the NOI will be deemed incomplete and permit authorization will not be granted. A complete NOI shall include the following information:

2.2.3.1 **Operator**: organization name, contact person and title, complete mailing address, telephone number, fax number (optional), and email address;

2.2.3.2 **Billing Contact**: organization name, contact person and title, complete mailing address, telephone number and fax number and email address. If the billing contact information is the same as the operator information, check the box on the NOI indicating that it is the same;

2.2.3.3 **Project/site**: project/site name, a physical location, the nearest city and zip code, the borough, latitude and longitude, how the latitude and longitude were determined, and estimated project start date and completion date, and an estimate of the area to be disturbed;

2.2.3.4 **SWPPP**: acknowledgement of whether a SWPPP has been prepared in advance of filing the NOI, the location of the SWPPP – either with the operator, the project/site, or other location, SWPPP contact if different than the operator contact;

2.2.3.5 **Discharge**: the name(s) of the waterbody to which the project discharges, identification if the project/site discharges to a waterbody that is impaired or has a TMDL, if so, confirmation that the discharge is consistent with the assumptions and requirements of the TMDL;

2.2.3.6 Signatory information in compliance with Appendix A, Part 1.12.

2.3 How to Submit an Notice of Intent (NOI)

2.3.1 **Submittal Options.** Each operator must submit an NOI to be authorized to discharge under this permit at least five business days prior to commencement of construction activities. DEC may need additional time for manual processing of NOIs. The complete and accurate NOI can be submitted either:

2.3.1.1 Electronically (*strongly encouraged*): Go to DEC's Water Online Application System (OPA) web page at http://dec.alaska.gov/water/oasys/index.html to prepare and submit electronic NOI (eNOI). *Note the eNOI will likely be processed more quickly and result in faster receipt of an authorization to discharge*.

2.3.1.2 Paper NOI Form: Complete the CGP NOI form on DEC's APDES Storm Water Forms web page at http://dec.alaska.gov/water/wnpspc/stormwater/2016CGPForms.htm. Once the form is complete, scan and email the entire form (5 pages) to the permitting email address in Appendix A, Section 1.1.1 or submit a paper copy to DEC at the address listed in Appendix A, Section 1.1.1.

2.3.1.3 Applicants must pay the general permit authorization fee (in accordance with 18 AAC 72.956) before their NOI is considered complete.

2.4 Submission Deadlines

2.4.1 **New Projects.** The operator must submit a complete and accurate NOI and SWPPP (if project disturbs five or more acres in accordance with Part 2.1) prior to commencement of construction activities consistent with Parts 2.2.1 and 2.3 to obtain authorization under this permit.

2.4.2 **Permitted Ongoing Projects.**

2.4.2.1 An ongoing permitted project is one that commenced construction activities prior to the effective date of this permit and where the discharges from that project were authorized under the 2016 CGP (AKR100000). To continue coverage, a permittee must:

2.4.2.1.1 Continue to comply with the terms and conditions of the 2016 CGP until the permittee has been granted authorization under this permit or an alternative APDES permit, or submits a NOT;

2.4.2.1.2 Update the existing SWPPP as necessary to comply with the requirements of Part 3.0, Part 4.0 and Part 5.0 before submitting a new NOI, as described in Part 2.4.2.1.3; and

2.4.2.1.3 Submit a complete and accurate new NOI within 90 calendar days of the effective date of this permit according to Part 2.3. A copy of the updated SWPPP and permit fee is not required to be submitted with the NOI to DEC for permitted ongoing projects.

2.4.2.2 If the permittee is eligible to submit a NOT (e.g., construction is finished and final stabilization has been achieved) before the 90th day, a new NOI is not required to be submitted provided a NOT is submitted within 90 calendar days after the effective date of this permit.

2.4.3 **Change of Permittee for an Authorized Ongoing Project.**

2.4.3.1 A permittee of an ongoing project who transfers ownership of the project, or a portion thereof, to a different operator, the new operator will be required to submit a complete and accurate new NOI for a new project in accordance with Part 2.3.1 and the original permittee must file a NOT in accordance with Part 2.7.5.

2.4.4 **Unpermitted Ongoing Project/Late Notification.**

An operator who commences construction activities without authorization to discharge for a project that requires submission of a NOI consistent with Part 2.2 must develop and/or update a project-specific SWPPP and submit a complete and accurate NOI consistent with Part 2.3 as soon as practicable. The applicant is authorized to discharge in accordance with Part 2.5. The DEC reserves the right to take enforcement action for any unpermitted discharges or permit non-compliance that occurs between the commencement of construction and discharge authorization.

2.5 Date of Authorization to Begin Discharge

Authorization to discharge under this general permit requires the operator seeking authorization to submit to DEC a complete and accurate NOI and payment of fee. If the project disturbs five or more acres, a copy of the SWPPP must be submitted in accordance with Part 2.1 prior to commencement of construction activities consistent with Parts 2.2.1 and 2.3.. The operator must receive written notification of authorization from DEC that coverage has been granted, and that a specific authorization number has been assigned prior to construction activities.

A permittee is authorized to discharge storm water from construction activities under the terms and conditions of this general permit upon the date specified in the issuance of the DEC authorization letter, which is posted on DEC's water permit search website (http://dec.alaska.gov/Applications/Water/WaterPermitSearch/Search.aspx).

2.6 Continuation of Expired General Permit

If this permit is not reissued prior to the expiration date, it will be administratively continued in accordance with 18 AAC 83.155(c) and remain in force and effect for discharges that were covered prior to expiration.

2.6.1 The permittee is required to abide by all limitations, monitoring, and reporting included herein if the permit enters administrative extension until such time a permit is reissued authorizing the discharge or an NOT is submitted by the permittee.

2.6.2 A permittee who is authorized to discharge under this permit prior to the expiration date, any discharges authorized will automatically remain covered by this permit until the earliest of:

2.6.2.1 Authorization for coverage under a reissued permit or replacement of this permit following a permittee's timely and appropriate submittal of a complete NOI requesting authorization to discharge under the new permit and compliance with the requirements of the new permit;

2.6.2.1.1 If a permittee fails to submit a timely NOI for coverage under the reissued or replacement permit, the permittee's coverage will expire at midnight on the date that the NOI is due.

2.6.2.2 Submittal of a NOT;

2.6.2.3 Issuance of an individual permit for the project's discharges; or

2.6.2.4 A formal permit decision by DEC to not reissue this general permit or not cover a particular discharger previously covered by the general permit, at which time DEC will identify a reasonable time period for covered dischargers to seek coverage under an alternative general permit or an individual permit. Coverage under this permit will cease at the end of this time period.

2.7 Submittal of a Modification to Original NOI

2.7.1 **Modification.** A permittee must file an NOI modification form to DEC (see Part 2.3) to update or correct the following information on the original NOI within 30 calendar days of the change:

2.7.1.1 Owner/Operator address and contact information;

2.7.1.2 Site information;

2.7.1.3 Estimated start or end dates;

2.7.1.4 Number of acres to be disturbed; or

2.7.1.5 SWPPP location and contact information.

2.7.2 Continuation of expired permit in accordance with Part 2.6.

2.7.3 If the original project disturbance was between one and less than five acres, and will now disturb five acres or more, a SWPPP must be submitted with the NOI modification.

2.7.4 No general permit authorization fee is required when submitting an NOI modification.

2.7.5 **NOT Instead of Modification.** The permittee must submit a NOT instead of an NOI modification form to DEC within 30 calendar days when the operator has changed. A change of operator in this case means when an organization changes control of the project. It does not mean when a corporate officer of the organization changes while the organization continues with the project. The new owner/operator must file a new NOI to obtain coverage under the CGP. Coverage is not transferrable.

2.8 Alternative Permits

2.8.1 **DEC Requiring Authorization under an Alternative Permit**

DEC may terminate or revoke a permittee's authorization under this permit and may require a permittee to apply for and/or obtain authorization to discharge under an alternative permit (i.e., an APDES individual permit or an alternative APDES general permit in accordance with 40 CFR §122.64 and §124.5). If DEC requires a permittee to apply for an alternative permit, DEC will notify the permittee in writing that a permit application is required. This notification will include a brief statement of the reasons for this decision, alternative permit application requirements, and an application form. In addition, the notice will set a deadline to file the application, and will include a statement that on the effective date of issuance or denial of the APDES individual permit, or the effective date of authorization or denial of authorization under the alternative general permit as it applies to the permittee, authorization under this general permit will automatically terminate. An application must be submitted to DEC at the address in Appendix A, Section 1.1.1. DEC may grant additional time to submit the application upon a written request by the permittee provided the request is received prior to expiration of the deadline. If the permittee is covered under this permit and fails to submit an alternative permit application in a timely manner as required by DEC, then the authorization under this permit will automatically terminate at the end of the day specified by DEC as the deadline for application submittal. The DEC may take appropriate enforcement action for any unpermitted discharge.

2.8.2 **Operator Requesting Authorization under an Alternative Permit**

An operator may request to be excluded from coverage under this general permit by applying for an individual permit. The operator must submit an individual permit application in accordance with 18 AAC 83.305 – 83.385 to DEC no later than ninety (90) days after publication of the general permit to the address in Appendix A, Part 1.1.1. DEC may grant the request by issuing an individual permit or authorization under an alternative general permit if DEC deems that the reasons cited are adequate to support the request.

2.8.3 When a permittee is issued an APDES individual permit or is authorized to discharge under an alternative APDES general permit, the authorization under this permit is automatically terminated on the effective date of the individual permit or the date of authorization under the alternative general permit, whichever the case may be. If the permittee is denied an APDES individual permit or an alternative APDES general permit, the authorization under this permit is automatically terminated on the date of such denial, unless otherwise specified by DEC.

3.0 COMPLIANCE WITH STANDARDS AND LIMITS

3.1 Requirements for all Projects

3.1.1 A permittee must select, install, implement, and maintain control measures (described in Part 4.0) at the construction site to minimize the discharge of pollutants as necessary to meet WQS's (18 AAC 70). A permittee must comply with all permit conditions with respect to installation and maintenance of control measures, inspections, monitoring (if necessary), corrective actions, reporting and recordkeeping.

3.1.2 In general, except in situations explained in Part 3.1.3, the storm water controls planned, developed, implemented, maintained, and updated by the permittee that are consistent with the provisions of Parts 3.0 through 9.0 are considered to meet the stringent requirements of this permit to ensure that the discharges do not cause or contribute to an excursion above any WQS (18 AAC 70).

3.1.3 At any time after authorization, DEC may determine that the permittee's storm water discharges will cause, have reasonable potential to cause, or contribute to an excursion above any applicable WQS. If such a determination is made, DEC may require the permittee to:

3.1.3.1 Take corrective actions and modify storm water controls in accordance with Part 8.0 to adequately address the identified water quality concerns;

3.1.3.2 Submit valid and verifiable data and information that are representative of ambient conditions and indicate that the receiving water is attaining WQSs; or

3.1.3.3 Minimize discharges of storm water from the construction project and submit an individual permit application in accordance with Part 2.8.

3.1.4 All written responses required under this part must include a signed certification consistent with Appendix A, Part 1.12.

3.2 Discharge to Impaired Water Body

If the permittee is discharging into a water body with an EPA-established or approved TMDL, the permittee must implement measures to ensure that the discharge of pollutants from the site is consistent with the assumptions and requirements of the EPA-established or approved TMDL, including ensuring that the discharge does not exceed specific wasteload or load allocation that has been established that would apply to the discharge. The permittee must also evaluate the recommendation in the Implementation Section of the TMDL and incorporate applicable measures into the operation.

3.2.1 Discharging to an Impaired Water Body for Turbidity or Sediment (Category 5)

3.2.1.1 Permittees who (1) discharge into a water body that is listed on Alaska's 303(d) List of Impaired Waters (Category 5) for turbidity or sediment (http://dec.alaska.gov/water/water-quality/impaired-waters) and (2) disturbs 20 or more acres of land at one time (including non-contiguous land disturbances that take place at the same time and are part of a larger common plan of development or sale) that drains to an impaired water must:

3.2.1.1.1 Develop, implement, and modify as necessary a written site-specific monitoring plan consistent with Part 7.0 that specifies the sampling frequency and location.

3.2.1.1.2 Conduct turbidity sampling at the following locations to evaluate compliance with the WQS for turbidity;

3.2.1.1.2.1 Upstream turbidity in the impaired water at a representative location (upgradient) from the point of storm water discharge into the impaired water or outside the area of influence of the storm water discharge; and

3.2.1.1.2.2 Downstream turbidity at a representative location downstream from the point of discharge into the impaired water, inside the area of influence of the storm water discharge. Alternatively, the discharge turbidity may be measured at the point where the storm water discharge leaves the construction site, rather than when it is in the receiving water body.

3.2.1.1.3 Based on the sampling (as described in Part 3.2.1.1.2), the resulting water quality must meet the state WQS for turbidity, as follows:

3.2.1.1.3.1 The downstream sample may not exceed 5 nephelometric turbidity units (NTU) above the upstream sample when the upstream turbidity is 50 NTU or less; and

3.2.1.1.3.2 The downstream sample may not have more than 10% increase in turbidity when the upstream turbidity is more than 50 NTU, not to exceed a maximum increase of 25 NTU.

3.2.1.1.4 If the difference between the upstream and downstream sample exceeds the WQS for turbidity, the permittee must:

3.2.1.1.4.1 Review the SWPPP and the control measures selected for the project and make appropriate improvements and corrections to the control measures within seven calendar days of the date the discharge exceeds the WQS;

3.2.1.1.4.2 Update the SWPPP with the improvements and changes to the control measures;

3.2.1.1.4.3 Submit a corrective action report consistent with Part 9.2; and

3.2.1.1.4.4 Continue to sample daily until the discharged storm water is less than the WQS for turbidity for the receiving water.

3.2.2 Discharging to an Impaired Water Body with an Approved or Established TMDL for Turbidity or Sediment (Category 4a or 4b)

3.2.2.1 Operators are not eligible for authorization under this permit if:

3.2.2.1.1 An EPA-approved or established TMDL specifically precludes such discharges; or

3.2.2.1.2 The project involves a discharge of pollutants of concern (e.g. turbidity, sediment, debris, etc.) to waters with an EPA-approved or established TMDL for turbidity or sediment, unless control measures are implemented as necessary for consistency with the assumptions and requirements of the TMDL.

3.2.2.2 If a specific wasteload or load allocation has been established for turbidity or sediment that would apply to the discharge of storm water from the construction site, the permittee must implement necessary steps to meet that allocation. The permittee must also evaluate the implementation measures recommended in the TMDL and incorporate them as appropriate.

3.2.2.3 In a situation where an EPA-approved or established TMDL for turbidity or sediment has specified a general wasteload or load allocation for a pollutant of concern (e.g. turbidity, sediment, debris, etc.) that is applicable to construction storm water discharges, but no specific requirements for construction sites have been identified in the TMDL, the permittee should consult with DEC to confirm that meeting the standards in Parts 3.0 and 4.0 will be consistent with the approved TMDL.

3.2.2.4 Where an EPA-approved or established TMDL has not specified a wasteload or load allocation applicable to construction storm water discharges, but has not specifically excluded these discharges, compliance with the requirements in Parts 3.0 and 4.0 of this permit will generally be assumed to be consistent with the approved TMDL.

3.3 Protection of Endangered Species

A permittee must protect federally-listed endangered or threatened species, or federally-designated critical habitat.

3.3.1 An applicant is not eligible to discharge if the storm water discharges, allowable non-storm water discharges, and storm water discharge-related activities (as defined in Appendix C) are likely to jeopardize the continued existence of any species that are federally-listed as endangered or threatened (listed) under the ESA or result in the adverse modification or destruction of federally-designated critical habitat under the ESA.

3.3.2 An applicant is not eligible to discharge if the storm water discharges, allowable non-storm water discharges, and storm water discharge-related activities (as defined in Appendix C) would cause a prohibited take of federally-listed endangered or threatened species (as defined under Section 3 of the ESA and 50 CFR §17.3), unless such takes are authorized under Sections 7 or 10 of the ESA.

4.0 CONTROL MEASURES

4.1 Control Measure Selection and Design Considerations

4.1.1 Permittees must select, design, install, and implement the control measures in this Part to the extent practicable. The specific control measures are based on the requirements of the national effluent limitation guidelines (ELG) that apply to the construction and development industry (40 CFR §450).

4.1.2 The selection, design, installation, maintenance, and removal of control measures must be in accordance with good engineering practices manufacturer specifications and address site-specific conditions such as precipitation, site topography, soil characteristics, and growing season. Permittees may deviate from such manufacturer's specifications where the permittee provides justification for such deviation and includes documentation of their rationale in the SWPPP. If a permittee finds that their control measures are not achieving their intended effect of minimizing pollutant discharges, the permittee must modify these control measures in accordance with the corrective action requirements set forth in Part 8.0.

4.1.3 Erosion and Sediment Controls. A permittee must design, install, and maintain effective erosion and sediment controls to minimize the discharge of pollutants. At a minimum, such controls must be designed, installed, and maintained to:

4.1.3.1 Control storm water volume and velocity to minimize soil erosion and pollutant discharges;

4.1.3.2 Control storm water discharges, including both peak flowrates and total storm water volume, to minimize channel and streambank erosion and scour in the immediate vicinity of discharge points;

4.1.3.3 Minimize the amount of soil exposed during construction activity;

4.1.3.4 Minimize the disturbance of steep slopes;

4.1.3.5 Minimize sediment discharges from the site. The design, installation, and maintenance of erosion and sediment controls must address factors such as the amount, frequency, intensity, duration of precipitation; the nature of resulting storm water runoff; and soil characteristics, including the range of soil particle sizes expected to be present on the site;

4.1.3.6 Provide and maintain natural buffers around waters of the U.S., direct storm water to vegetated areas and maximize storm water infiltration to reduce pollutant discharges, unless infeasible;

4.1.3.7 Minimize soil compaction. Minimizing soil compaction is not required where the intended function of a specific area of the site dictates it be compacted.

4.1.3.8 Unless infeasible, preserve topsoil. Preserving topsoil is not required where the intended function of a specific area of the site dictates that the topsoil be disturbed or removed.

4.1.4 Additional Erosion and Sediment Controls Selection and Design Considerations:

4.1.4.1 Preventing storm water from coming into contact with polluting materials is generally more effective, and less costly, than removing pollutants from storm water;

4.1.4.2 Using a combination of control measures is more effective than using control measures in isolation for minimizing pollutants in the storm water discharge;

4.1.4.3 Using technologically available, economically practicable, and achievable methods in light of best industry practices;

4.1.4.4 Assessing the type and quantity of pollutants, including their potential to impact receiving water quality, is critical to designing effective control measures that will achieve the limits in this permit;

4.1.4.5 Minimizing impervious areas at the permittees facility and infiltrating runoff onsite (including bioretention cells, green roofs, and pervious pavement, among other approaches) can reduce runoff and improve groundwater recharge and stream base flows in local streams, although care must be taken to avoid ground water contamination;

4.1.4.6 Dissipate storm water runoff into open vegetated swales and natural depressions to reduce in stream impacts of erosive flows;

4.1.4.7 Conserving and/or restoring of riparian buffers will help protect streams from storm water runoff and improve water quality; and

4.1.4.8 Using treatment interceptors (e.g., sand filters) may be appropriate in some instances to minimize the discharge of pollutants.

4.2 Erosion Control Measures

A permittee must comply with the erosion control measures in this Part to minimize soil exposure on the site during construction.

4.2.1 Delineation of Site

A permittee must generally delineate (e.g., with flags, stakes, signs, silt fence, etc.) the location of any of the following that apply to the site:

4.2.1.1 All areas where soil disturbing construction activities will occur; and

4.2.1.2 Specific areas that will be left undisturbed such as trees, boundaries of sensitive areas, or buffers established under Part 4.2.3.

4.2.2 Minimize the Amount of Soil Exposed during Construction Activity

A permittee must include the following in the selection of control measures and the sequence of project construction as they apply to the project site:

4.2.2.1 Preserve native topsoil for later use with on-site stockpiles, unless deemed infeasible by space constraints or site design creates impervious surfaces; and

4.2.2.2 Sequence or phase construction activities to minimize the extent and duration of exposed soils.

4.2.3 Maintain Natural Buffer Areas

A permittee must maintain natural buffer areas at stream crossings and around the edge of any waters of the U.S. that are located within or immediately adjacent to the construction activity in accordance with the following:

4.2.3.1 The buffer must be a minimum of 25 feet wide, or the width as required by local ordinance, unless infeasible based on site dimensions;

4.2.3.2 Exceptions are allowed for water dependent activities, specific water access activities, or necessary water crossings;

4.2.3.3 A permittee should, to the extent practicable, use perimeter controls adjacent to buffers and direct storm water sheet flow to buffer areas to increase sediment removal and maximize storm water infiltration.

4.2.4 Clearing Vegetation

4.2.4.1 Clearing of vegetation that disturbs the vegetative mat and exposes soil is **prohibited** prior to obtaining authorization under this permit.

4.2.4.2 Cutting of trees and brush while the ground is frozen without disturbing the vegetative mat early in the springtime to avoid adversely affecting migratory birds or their nests in accordance with the U.S. Fish & Wildlife Service's "Nesting Birds: Timing Recommendations to Avoid Land Disturbance & Vegetation Clearing"[2] is allowed prior to the submittal of a project NOI. If vegetation clearing that disturbs the vegetative mat and occurs after the onset of spring thaw (as defined in Appendix C) or conditions that consist of above freezing temperatures that cause melting of snow, the permittee must develop a SWPPP and file an NOI. Operators must receive authorization under this permit and otherwise comply with the terms of this permit prior to such clearing.

4.2.5 Control Storm Water Discharges and Flow Rates

A permittee must include the following control measures to handle storm water and total storm water volume discharges as they apply to the site:

4.2.5.1 Divert storm water around the site so that it does not flow onto the project site and cause erosion of exposed soils (diverting storm water around the site can be effective measure as long as it does not cause flooding and/or erosion offsite);

4.2.5.2 Slow down or contain storm water that may collect and concentrate within a site and cause erosion of exposed soils;

4.2.5.3 Avoid placement of structural control measures in active floodplains to the degree technologically and economically practicable and achievable;

4.2.5.4 Place velocity dissipation devices (e.g., check dams, sediment traps, or riprap) along the length of any conveyance channel (of erodible materials) to provide a non-erosive flow velocity. Also place velocity dissipation devices where discharges from the conveyance channel or structure join a water course to prevent erosion and to protect the channel embankment, outlet, adjacent stream bank slopes, and downstream waters; and

4.2.5.5 Install permanent storm water management controls, where practical, so that they are functional prior to construction of site improvements (e.g., impervious surfaces).

4.2.6 Protect Steep Slopes

A permittee must consider the following in the selection of control measures as they apply to the project site:

4.2.6.1 Design and construct cut-and-fill slopes in a manner that will minimize erosion. Applicable practices include, but are not limited to, reducing continuous length of slope with terracing and diversions, reducing slope steepness, and roughening slope surfaces (e.g., track walking);

4.2.6.2 Divert concentrated flows of storm water away from and around the disturbed portion of the slope. Applicable practices include, but are not limited to interceptor dikes and swales, grass-lined channels, pipe slope drains, subsurface drains, check dams; and

4.2.6.3 Stabilize exposed areas of the slope in accordance with Part 4.5.

4.3 Sediment Control Measures

Sediment control measures (e.g. sediment ponds, traps, filters, etc.) must be constructed as one of the first steps in grading. These control measures must be functional before other land

[2] https://www.fws.gov/alaska/pages/nesting-birds-timing-recommendations-avoid-land-disturbance-vegetation-clearing

disturbing activities take place. A permittee must install, establish, and use any of the following control measures that apply to the project site.

4.3.1 **Storm Water Inlet Protection**

A permittee must install appropriate protection measures (e.g. filter berms, perimeter controls, temporary diversion dikes, etc.) to minimize the discharge of sediment prior to entry into storm water inlets located on site or immediately downstream of the site.

4.3.2 **Water Body Protection**

A permittee must install appropriate protection measures (e.g. velocity dissipation devices in accordance with Part 4.2.5.4) to minimize the discharge of sediment prior to entry into the water body for water bodies located on site or immediately downstream of the site.

4.3.3 **Down-Slope Sediment Controls**

A permittee must establish and use down-slope sediment controls (e.g., silt fence or temporary diversion dike) for any portion of the down-slope and side-slope perimeter where storm water will be discharged from disturbed areas of the site.

4.3.4 **Stabilized Construction Vehicle Access and Exit Points**

A permittee must establish construction vehicle access and exit points. Access and exit points should be limited to one route, if possible. If sediment escapes the construction site, off-site accumulations of sediment must be removed at a frequency sufficient to minimize off-site impacts.

4.3.5 **Vehicle Track-Out**

A permittee must provide an effective way of minimizing off-site vehicle tracking of sediment from wheels to prevent track-out onto paved surfaces. Where sediment has been tracked-out from a site onto paved roads, sidewalks, or other paved areas outside of the site, remove the deposited sediment by the end of the same business day in which the track-out occurs or by the end of the next business day if track-out occurs on a non-business day. Remove the track-out by sweeping, shoveling, or vacuuming these surfaces, or by using other similarly effective means of sediment removal.

4.3.6 **Dust Generation**

A permittee must minimize the generation of dust through the application of water or other dust suppression techniques and prior to vehicle exit.

4.3.7 **Stockpile Management**

In accordance with Part 4.5.1, a permittee must stabilize or cover stockpiles, protect with sediment control measures. Locate soil stockpiles away from storm water inlets, water bodies, and conveyance channels, if possible. Install a sediment control measure along all downgradient perimeter areas.

4.3.8 **Authorized Non-Storm Water Discharges**

A permittee must minimize any non-storm water authorized by this permit.

4.3.9 **Sediment Basins**, where applicable:

4.3.9.1 For common drainage locations that serve an area with 10 or more acres disturbed at one time, a temporary (or permanent) sediment basin that provides storage for a calculated volume of runoff from the drainage area from a 2-year, 24-hour storm, or equivalent sediment control measures, must be installed, maintained, and used where practicable until final stabilization of the site.

4.3.9.1.1 Where no such calculation has been performed, a temporary (or permanent) sediment basin providing 3,600 cubic feet of storage per acre drained, or equivalent sediment control measures, must be installed and used where practicable until final stabilization of the site. When computing the number of acres draining into a common location, it is not necessary to include flows from offsite areas and flows from on-site areas that are either undisturbed or have undergone final stabilization where such flows are diverted around both the disturbed area and the sediment basin.

4.3.9.1.2 In determining whether installing a sediment basin is practicable, the permittee may consider factors such as site soils, slope, available area on-site, etc. In any event, the permittee must consider public safety, especially as it relates to children, as a design factor for the sediment basin, and alternative sediment control measures must be used where site limitations would preclude a safe design.

4.3.9.2 For drainage locations which serve 10 or more disturbed acres at one time and where a temporary sediment basin or equivalent controls is not practicable, smaller sediment basins and/or sediment traps should be used. Silt fences, vegetative buffer strips, or equivalent sediment control measures are required for all down slope boundaries (and for those side slope boundaries deemed appropriate as dictated by individual site conditions).

4.3.9.3 For drainage locations serving less than 10 acres, sediment traps should be used. Silt fences, vegetative buffer strips, or equivalent sediment control measures are required for all down slope boundaries (and for those side slope boundaries deemed appropriate as dictated by individual site conditions) of the construction area unless a sediment trap providing storage for a calculated volume of runoff from a 2-year, 24-hour storm event or 3,600 cubic feet of storage per acre drained is provided.

4.3.9.4 Surface outlets. When discharging from basins and impoundments, utilize outlet structures that withdraw water from the surface, unless infeasible.

Note: No installation of sediment basins should be installed in permafrost areas. Installing sediment basins in the presence of permafrost is challenging and might not be practicable in some instances because permafrost creates poor surface drainage that hinders the infiltration of runoff. Also, the excavation of permafrost in summer can trigger thawing and instability.

4.4 Dewatering

4.4.1 If a construction activity includes excavation dewatering that may adversely impact a local drinking water well, a DEC-identified contaminated site or groundwater plume, or waters of the U.S., the permittee may be required to obtain authorization under the DEC General Permit for Excavation Dewatering (AKG002000 or most current version) in addition to this permit.

4.4.2 A discharge from eligible dewatering activities, including discharges from dewatering of trenches and excavations, are prohibited unless treated by appropriate control measures. Appropriate control measures include, but are not limited to, sediment basins or traps, dewatering tanks, weir tanks, or filtration systems designed to remove sediment. To the extent feasible, use vegetated, upland areas of the site to infiltrate dewatering water before discharge.

4.5 Soil Stabilization

A permittee must stabilize all disturbed areas of the site to minimize erosion and sedimentation and the resulting discharge of pollutants according to the requirements of this Part. A permittee must ensure that existing vegetation is preserved and a natural buffer is maintained wherever possible, and disturbed portions of the site are stabilized (Part 4.2.3). A permittee should avoid using impervious surfaces for stabilization. Applicable stabilization control measures include, but are not limited to:

- Temporary and permanent seeding;
- Sodding;
- Mulching;
- Rolled erosion control product;
- Compost blanket;
- Soil application of Polyacrylamide (PAM);
- Early application of gravel base on areas to be paved; and
- Dust control.

4.5.1 **Minimum Requirements for Soil Stabilization**. A permittee must consider the selection and implementation of control measures and the sequence of project construction as they apply to the project site.

4.5.1.1 **Deadline to Initiate Stabilization**. Stabilization of disturbed areas must, at a minimum, be initiated immediately whenever any clearing, grading, excavating, or other earth disturbing activities have permanently ceased on any portion of the site or temporarily ceased on any portion of the site and will not resume for a period exceeding:

4.5.1.1.1 Seven (7) calendar days for those areas of the state with a mean annual precipitation of forty (40) inches or greater; or

4.5.1.1.2 Fourteen (14) calendar days for those areas of the state with a mean annual precipitation less than forty (40) inches.

Note: In the context of this provision, "immediately" means no later than the end of the next work day, following the day when the earth-disturbing activities have temporarily or permanently ceased.

Note: Earth-disturbing activities have temporarily ceased when clearing, grading, and excavation within any area of the site that will not include permanent structures will not resume (i.e., the land will be idle) for a period of seven or 14 or more calendar days (dependent on mean annual precipitation from above), but such activities will resume in the future.

The timeframe above begins counting as soon as you know that construction work on a portion of your site will be temporarily ceased. In circumstances where you experience unplanned or unanticipated delays in construction due to circumstances beyond your control (e.g., sudden work stoppage due to unanticipated problems associated with construction labor, transportation difficulties delays due to weather and site or soil conditions, funding, or other issues related to the ability to work on the site; weather conditions rendering the site unsuitable for the continuation of construction work) and you do not know at first how long the work stoppage will continue, your requirement to immediately initiate stabilization is triggered as soon as you know with reasonable certainty that work will be stopped for the time period above. At that point, you must comply with Parts 4.5.1.1 and 4.5.1.2.

4.5.1.1.3 Types of activities considered to constitute initiation of stabilization, but is not limited to:

4.5.1.1.3.1 Prepping the soil for vegetative stabilization by performing all activities necessary to initially seed or plant the area to be stabilized or for non-vegetative stabilization by installing or application of physical, structural, or mechanical measures;

4.5.1.1.3.2 Applying mulch or other non-vegetative product to the exposed area;

4.5.1.1.3.3 Seeding or planting the exposed area;

4.5.1.1.3.4 Starting any of the activities in Part 4.5.1.1.3.1 - 4.5.1.1.3.3 on a portion of the area to be stabilized, but not on the entire area; or

4.5.1.1.3.5 Finalizing arrangements (e.g., delivery of stabilization products, scheduling the installation of the products) to have stabilization product fully installed in compliance with the applicable deadline for completing stabilization in Parts 4.5.1.1 and 4.5.1.2.

4.5.1.2 **Deadline to Complete Temporary Stabilization Activities**. As soon as practicable, but no later than 14 calendar days after the initiation of soil stabilization measures consistent with Part 4.5.1.1, the following are required to be completed:

4.5.1.2.1 For vegetative stabilization, all activities necessary to initially seed or plant the area to be stabilized; and/or

4.5.1.2.2 For non-vegetative stabilization, the installation or application of all such non-vegetative measures.

Note: DEC may determine, based on an inspection carried out under Part 6.6 and corrective actions required under Part 8.1.1.4 Corrective Action Required by DEC, that the level of sediment discharge on the site makes it necessary to require a faster schedule for completing stabilization. For instance, if sediment discharges from an area of exposed soil that is required to be stabilized are compromising the performance of existing storm water controls, DEC may require stabilization to correct this problem and may take appropriate enforcement action.

4.5.1.3 **Exceptions to the Deadlines for Initiating and Completing Stabilization**.

4.5.1.3.1 *Projects in Arid or Semi-Arid, or Drought-Stricken Areas*. For those areas of the state with a mean annual precipitation is less than or equal to 20 inches and where initiating perennial vegetative stabilization measures is infeasible within 14 calendar days after construction activity has temporarily ceased, vegetative or non-vegetative stabilization measures must be initiated immediately.

Note: In the context of this provision, "immediately" means no later than the end of the next work day, following the day when the earth-disturbing activities have temporarily or permanently ceased.

4.5.1.3.1.1 Immediately initiate, and within 14 calendar days complete, the installation of non-vegetative stabilization measures to prevent erosion.

4.5.1.3.1.2 If construction is occurring during a drought-stricken period, indicate in the SWPPP the beginning and ending dates of the drought-stricken period and your site conditions. Include the schedule for initiating and completing vegetative stabilization.

4.5.1.3.2 *Deadlines for projects that are affected by circumstances beyond the control of the permittee that delay the initiation and/or completion of vegetative stabilization as required in Parts 4.5.1.1 and/or 4.5.1.2*. If the permittee is unable to meet the deadlines in Parts 4.5.1.1 and/or 4.5.1.2 due to circumstances beyond the permittee's control[3], and is using vegetative cover for temporary stabilization, the permittee may comply with the following stabilization deadlines instead:

4.5.1.3.2.1 Immediately initiate, and within 14 calendar days complete, the installation of temporary non-vegetative stabilization measures to prevent erosion;

4.5.1.3.2.2 Complete all soil conditioning, seeding, watering or irrigation installation, mulching, and other required activities related to the planting and initial establishment of vegetation as soon as conditions or circumstances allow it on the site; and

4.5.1.3.2.3 Document the circumstances in the SWPPP that prevent meeting the deadlines required in Parts 4.5.1.1 and/or 4.5.1.2 and the proposed schedule for initiating and completing stabilization.

4.5.1.3.3 Winter Considerations, see Part 4.12.

4.5.1.3.4 In limited circumstances, stabilization may not be required if the intended function of a specific area of the site necessitates that it remain disturbed.

4.5.1.4 **Deadline to Complete Final Stabilization Activities**. A permittee must consider the selection and implementation of control measures and the sequence of project construction as they apply to the project site.

4.5.1.5 The permittee must within seven (7) calendar days of initiating final stabilization complete or continue maintenance for the following on any portion of the site that has reached final grading and for areas where clearing, grading, excavating, or other earth disturbing activities have permanently ceased:

4.5.1.5.1 All soil conditioning, seeding, watering, mulching, and any other required activities for the establishment of vegetative cover;

4.5.1.5.2 The installation or application of all such measures for vegetative cover; and/or

4.5.1.5.3 The placement of non-vegetative final stabilization measures.

4.5.2 **Stabilization Requirements for Terminating Permit Authorization**

To terminate authorization under this permit, final stabilization (as defined in Appendix C), must be achieved on all portions of the site for which a permittee is responsible and all ground disturbing construction activity or use of related support activities must be completed, in accordance with Part 10.2.1.1.

4.6 Treatment Chemicals

4.6.1 The use of treatment chemicals to reduce sediment in a storm water discharge is allowed provided that all the requirements of this Part are met. Use conventional sediment controls before and after the application of treatment chemicals. Chemicals may only be applied where storm water is treated upstream and is directed to a sediment control (e.g., sediment trap, sediment basin) before discharge.

[3] Examples include problems with the supply of seed stock or with the availability of specialized equipment, unsuitability of soil conditions due to excessive precipitation and/or flooding.

4.6.2 Select appropriate treatment chemicals. Chemicals must be appropriately suited to the types of soils likely to be exposed during construction and present in the discharges being treated (i.e., the expected turbidity, pH, and flow rate of storm water flowing into the chemical treatment system or area, etc.)

4.6.3 Minimize discharge risk from stored chemicals. Store all treatment chemicals in leak-proof containers that are kept under storm-resistant cover and surrounded by secondary containment structures (e.g., spill berms, decks, spill containment pallets), with adequate spill kits available on-site to respond in the event of a discharge of treatment chemicals.

4.6.4 Use chemicals in accordance with good engineering practices and specifications of the chemical provider/supplier, and with dosing specifications and sediment removal design specifications provided by the provider/supplier of the applicable chemicals, or document in your SWPPP specific departures from these specifications and how they reflect good engineering practice.

4.6.5 Application of treatment chemicals through the use of manufactured products (e.g., gel bars, gel logs, floc blocks, etc.) must be used in combination with adequate ditch check dams, sediment traps, sediment basins, or physical control measure designed to settle out chemically treated storm water and minimize the presence of treatment chemicals before discharges reach waters of the U.S. At a minimum there must be adequate ditch length downstream of the last manufactured product prior to reaching the discharge point into a water of the U.S. to provide a place for sedimentation to occur.

4.6.6 Ensure proper training. Ensure that all persons who handle and use treatment chemicals at the construction site are provided with appropriate product-specific training, including but not limited to proper dosing requirements, handling, storage, and disposal.

4.6.6.1 Document the following in the SWPPP:

4.6.6.1.1 Specific chemicals and chemical treatment systems used;

4.6.6.1.2 Names and titles of person(s) who handle and apply treatment chemicals;

4.6.6.1.3 Title of training conducted, date, instructor name, and attendees.

4.6.7 If the permittee plans to use cationic treatment chemicals or an active treatment system (as defined in Appendix C) they must submit a request to the Department (Permitting Program, Appendix A part 1.1.1) fourteen (14) calendar days in advance of proposed usage. The request must include the following:

4.6.7.1 Operator Name, mailing address, phone number, and email address;

4.6.7.2 Project/Site name, physical address, contact name, phone number, email address and permit authorization number;

4.6.7.3 Site Map with all receiving waterbodies, proposed location of chemical treatment system, and proposed point of discharge into receiving waterbodies;

4.6.7.4 Schematic drawing of the proposed treatment system; and

4.6.7.5 Description of the proposed treatment system including; type of system being used, chemicals being used, estimated start and finish date, sampling and recordkeeping schedule and reporting, and name of treatment system operator or company.

4.6.8 The permittee must perform all additional measures as conditioned by the Department authorization to ensure that the use of such chemicals will not cause an exceedance of water quality standards.

4.7 Prohibited Discharge

4.7.1 **A permittee is prohibited from discharging the following from the site**:

4.7.1.1 Wastewater from concrete washout, unless managed by an appropriate control measure;

4.7.1.2 Wastewater from washout and cleanout of stucco, paint, form release oils, curing compounds and other hazardous construction materials;

4.7.1.3 Fuels, oils, or other pollutants used in vehicle and equipment operation and maintenance; and

4.7.1.4 Soaps or solvents used in vehicle and equipment washing.

4.8 Good Housekeeping Measures

A permittee must design, install, implement, and maintain effective good housekeeping measures to prevent and/or minimize the discharge of pollutants. At a minimum, such measures must be designed, installed, implemented, and maintained to:

- Minimize the discharge of pollutants from equipment and vehicle washing, wheel wash water, and other waters. Wash waters must be treated in a sediment basin or alternative control that provides equivalent or better treatment prior to discharge;
- Minimize the exposure of building materials, building products, construction wastes, trash, landscape materials, fertilizers, pesticides, herbicides, detergents, sanitary waste and other materials present on the site to precipitation and to storm water. Minimization of exposure is not required in cases where the exposure to precipitation and to storm water will not result in a discharge of pollutants, or where exposure of a specific material or product poses little risk of storm water contamination (such as final products and materials intended for outdoor use); and
- Minimize the discharge of pollutants from spills and leaks and implement chemical spill and leak prevention and response procedures.

A permittee must include appropriate measures for any of the following activities that are used at the site.

4.8.1 **Washing of Equipment and Vehicles and Wheel Wash-Down**. If a permittee conducts washing of equipment or vehicles and/or wheel wash-down at the site the permittee must comply with the following requirements:

4.8.1.1 Designate areas to be used for washing of equipment and vehicles and/or wheel wash-down and conduct such activities only in these areas;

4.8.1.2 Locate such activities, to the extent practicable, away from storm water conveyance channels, storm water inlets, and waters of the U.S.;

4.8.1.3 Treat all wash water in a sediment basin or use alternative control measures that provide equivalent or better treatment prior to discharge; and

4.8.1.4 To comply with the prohibition in Part 4.7.1.4, the discharge of soaps and solvents used in equipment and vehicle washing and/or wheel wash-down is strictly prohibited.

4.8.2 **Fueling and Maintenance Areas**. If a permittee conducts fueling and/or maintenance activities for equipment and vehicles at the site the permittee must comply with the following requirements:

4.8.2.1 Designate areas to be used for fueling and/or maintenance of equipment and vehicles and conduct such activities only in these areas (the designated area may move from one location to another on linear projects);

4.8.2.2 Locate such activities, to the extent practicable, away from storm water conveyance channels, storm water inlets, and waters of the U.S.;

4.8.2.3 Minimize the exposure to precipitation and storm water or use secondary containment structures designed to eliminate the potential for spills or leaked chemicals; and

4.8.2.4 To comply with the prohibition in Part 4.7.1.3, a permittee must:

4.8.2.4.1 Clean up spills or contaminated surfaces immediately;

4.8.2.4.2 Ensure adequate clean up supplies are available at all times to handle spills, leaks, and disposal of used liquids;

4.8.2.4.3 Use drip pans or absorbents under or around leaky equipment and vehicles; and

4.8.2.4.4 Dispose of liquid wastes or materials used for fueling and maintenance in accordance with Part 4.8.6.

4.8.3 **Staging and Material Storage Areas**. If a permittee maintains staging and material storage areas at the site the permittee must comply with the following requirements:

4.8.3.1 Designate areas to be used for staging and material storage areas;

4.8.3.2 Locate such activities, to the extent practicable, away from storm water conveyance channels, storm water inlets, and waters of the U.S.; and

4.8.3.3 Minimize the exposure to precipitation and storm water and vandalism for all chemicals, treatment chemicals, liquid products, petroleum products, and other materials that have the potential to pose a threat to human health or the environment.

4.8.4 **Washout of Applicators/Containers used for Paint, Concrete, and Other Materials**. If a permittee conducts washing of applicators and/or containers used for paint, concrete, and other materials at the site, the permittee must comply with the following requirements:

4.8.4.1 Designate areas to be used for washout;

4.8.4.2 Locate such activities, to the extent practicable, away from storm water conveyance channels, storm water inlets, and waters of the U.S.;

4.8.4.3 Direct all concrete, paint, and other material washout activities into a lined, water-tight container or pit to ensure there is no discharge into the underlying soil and onto the surrounding areas;

4.8.4.4 Dispose of liquid wastes in accordance with Part 4.8.6; and

4.8.4.5 For concrete washout areas, remove hardened concrete waste when it has reached one-half (½) the height of the container or pit and dispose of in accordance with Part 4.8.6.

4.8.5 **Fertilizer or Pesticide Use**. If a permittee uses fertilizers or pesticides the permittee must comply with the following requirements:

4.8.5.1 Application of fertilizers and pesticides in a manner and at application rates that will minimize the loss of chemical to storm water runoff. Manufacturers' label requirements for application rates and disposal requirements must be followed; and

4.8.5.2 Use pesticides in compliance with federal, state, and local requirements.

4.8.6 **Storage, Handling, and Disposal of Construction Waste**. If a permittee stores, handles and/or disposes of construction waste at the site, the permittee must comply with the following requirements:

4.8.6.1 Locate areas dedicated for management of construction waste, to the extent practicable, away from storm water conveyance channels, storm water inlets, and waters of the U.S.;

4.8.6.2 Dispose of all collected sediment, asphalt and concrete millings, floating debris, paper, plastic, fabric, construction and demolition debris and other domestic wastes according to federal, state and local requirements;

4.8.6.3 Store hazardous or toxic waste in appropriate sealed containers and dispose of these wastes in accordance with manufacture's recommended method of disposal or federal, state or local requirements; and

4.8.6.4 Provide containment of sanitation facilities (e.g., use of portable toilets) to prevent discharges of pollutants to the storm water drainage system or receiving water. Clean or replace sanitation facilities and inspect them regularly for leaks and spills.

4.9 Spill Notification

4.9.1 A permittee is prohibited from discharging hazardous substance or oil from a spill or other release. Upon discovery of a spill of a reportable quantity, a permittee must report the spill in accordance with Part 9.3.

4.10 Projects near a Public Water System (PWS)

4.10.1 Where the project intersects a PWS drinking water protection area (DWPA) (see Part 5.3.5.15), notify the PWS contact. PWS contact information can be obtained using the online application, Drinking Water Watch, http://dec.alaska.gov:8080/DWW by entering the appropriate 6-digit PWS ID (e.g., 225025).

4.10.2 Within the identified DWPA, restrict project activities that could significantly change the natural surface water drainage or groundwater gradient.

4.10.3 Immediately notify the nearby PWS of any identified potential contamination, such as spills or excess erosion.

4.11 Permanent Storm Water Management Control

A permittee must comply with applicable APDES MS4 permit requirements, local requirements, and the applicable requirements under 18 AAC 72.600 (i.e., Nondomestic Wastewater System Plan Review) regarding the design and installation of permanent storm water management controls. Structural measures should be placed on upland soils to the degree practicable and achievable.

4.11.1 A permittee who constructs, alters, installs, modifies, or operates any part of a permanent storm water management control at a site and is located outside a municipality operating under an APDES MS4 permit must submit a copy of the engineering plans in accordance with 18 AAC 72.600 to DEC for review to the Permitting Program in Appendix A Part 1.1.1 at least 30 calendar days before the commencement of construction.

4.11.2 A permittee who constructs, alters, installs, modifies, or operates any part of a permanent storm water management control measure at a site and is located inside a municipality operating under an APDES MS4 permit must submit a copy of the required submittal information to the respective MS4 operator for review. Permittees must contact the MS4 Operator for submittal deadlines. See http://dec.alaska.gov/water/wastewater/stormwater/sw-municipal for a list of MS4 Operators and their contact information

4.12 Winter Considerations

4.12.1 **Winter Shutdown**. A permittee who plans to cease construction during the winter and resume construction the next summer must plan for winter shutdown and prepare their site to manage storm water flows until construction activities resume. The permittee must identify the anticipated dates of fall freeze-up and spring thaw (see Appendix C) for their site and use these dates to plan for winter shutdown. **Frozen ground by itself is not considered an acceptable control measure for stabilization**.

4.12.1.1 A permittee must ensure the following measures are complete prior to fall freeze-up until construction activities resume:

4.12.1.1.1 Temporary or final stabilization for conveyance channels;

4.12.1.1.2 Temporary or final stabilization for disturbed slopes, disturbed soils, and soil stockpiles; and

4.12.1.1.3 Proper installation of erosion and sediment control measures in anticipation of spring thaw.

4.12.1.2 Where temporary stabilization is precluded by snow cover or frozen ground conditions prior to the anticipated date of Fall Freeze-up, stabilization measures must be initiated as soon as practicable following the actual spring thaw.

4.12.2 **Winter Construction**. A permittee conducting winter construction activities that may extend beyond spring thaw must install appropriate control measures to minimize erosion and sediment runoff during spring thaw and summer rainfall[4].

Permit authorization is not required for the construction of ice roads or the placement of sand or gravel on frozen tundra with no excavation or potential to pollute waters of the U.S.

4.13 Maintenance of Control Measures

4.13.1 A permittee must maintain all control measures, good housekeeping measures, and other protective measures in effective operating condition. If site inspections required by Part 6.0 identify control measures, good housekeeping measures, or other protective measures that are not operating effectively, the permittee must implement corrective actions in accordance with Part 8.0.

4.13.2 If existing control measures need to be modified or if additional control measures are necessary for any reason, the permittee must complete any corrective action in accordance with the deadlines stated in Part 8.2.

4.13.3 A permittee must remove sediment from silt fences, check dams, berms or other controls before the accumulated sediment reaches:

4.13.3.1 One-third (⅓) the distance up the above-ground height (or it reaches a lower height based on manufacturer's specifications) for silt fences;

4.13.3.2 One-half (½) the distance up the above-ground height (or it reaches a lower height based on manufacturer's specifications or BMP guidance manuals) for storm water inlets, check dams, berms, or other control measure; or

4.13.3.3 For sediment traps or sediment ponds, the permittee must remove accumulated sediment when the design capacity has been reduced by fifty (50%) percent.

[4] The Alaska Storm Water Guide, Chapters 3 and 4, provide guidance on the selection, design, and installation of winter construction practices and controls.

4.14 Storm Water Lead and Training of Employees

A permittee must identify one "qualified person" (as defined in Appendix C) as the storm water lead/SWPPP Manager to ensure the control measures described in the SWPPP are implemented as written, or modified as necessary, during construction. The qualifications and training for the storm water lead/SWPPP Manager, SWPPP preparer, storm water inspector, and monitoring person for a site varies with the size of the project. A permittee must ensure that employees and subcontractors receive adequate training to ensure proper installation, maintenance, and removal of the control measures described in the SWPPP for the project.

4.15 Applicable Federal, State, Tribal, or Local Requirements

A permittee must ensure that the storm water control measures implemented at the site are consistent with all applicable federal, state, tribal, or local requirements for soil and erosion control and storm water management.

5.0 STORM WATER POLLUTION PREVENTION PLAN

5.1 Storm Water Pollution Prevention Plan (SWPPP)

5.1.1 A permittee must prepare a SWPPP for each site before submitting their NOI for permit coverage and document the control measures implemented at the site. The SWPPP is intended to document the selection, design, installation, and implementation of control measures that are being used to comply with the requirements set forth in Parts 3.0 and 4.0.

5.1.2 The SWPPP must, at a minimum:

5.1.2.1 Include the information described in Part 5.3.

5.1.2.2 Be implemented as written, including any modifications for changes in design or field conditions, until the submittal of the NOT.

5.1.2.3 Be developed by a "qualified person" (as defined in Appendix C).

5.1.2.4 Be signed, dated, and certified in accordance with Appendix A, Part 1.12.

5.2 Deadlines for SWPPP Preparation

5.2.1 An operator must prepare a SWPPP before submitting the NOI for authorization under this permit.

5.2.2 A permittee with an ongoing project with authorization under a previous construction general permit and a SWPPP that was developed based on that permit must review and update the SWPPP prior to submitting the NOI for authorization under this permit (see Part 2.4.2.1.2).

5.2.3 A permittee must provide a copy of the applicable portions of the SWPPP, or site–specific training to each subcontractor who engages in soil disturbing activities prior to the subcontractor conducting any soil disturbing activity. Revisions to the SWPPP that affect the subcontractor's soil disturbing activities must be provided to the subcontractor in a timely manner.

5.3 SWPPP Contents

At a minimum, the SWPPP must include the following:

5.3.1 **Permittee(s)**

Identify the permittee(s) for the site and any subcontractors that may work on the site, including the areas where the subcontractors may be or are expected to conduct activities covered by this permit.

5.3.2 **Storm Water Contact(s)**

Identify the following qualified person(s) responsible for the following (Note: A small project may have all these responsibilities carried out by one person):

5.3.2.1 Storm Water Lead;

5.3.2.2 Updating the SWPPP according to Part 5.9;

5.3.2.3 Conducting inspections according to Part 6.0;

5.3.2.4 Conducting monitoring (if applicable) according to Part 7.0; and

5.3.2.5 Operating an Active Treatment System (if applicable) according to 4.6.7.

5.3.3 **Project Site-Specific Conditions**. Briefly describe the existing site-specific conditions, including:

5.3.3.1 The mean annual precipitation based on the nearest weather station;

5.3.3.2 Site conditions such as soils, topography, drainage patterns, approximate growing season, and vegetation; and

5.3.3.3 Receiving waters such as impaired waters or waters listed in the Alaska Department of Fish &Game (ADF&G) Anadromous Waters Catalog.

5.3.4 **Nature of Construction Activity**. Briefly describe the nature of the construction activity, including:

5.3.4.1 The function of the project (e.g., low density residential, shopping mall, subdivision, airport, highway, etc.);

5.3.4.2 The intended sequence and timing of activities that disturb soils at the site;

5.3.4.3 Size of the property including support activities described in Part 1.4.2.3 (in acres) and the total area expected to be disturbed by excavation, grading, or other construction activities (in acres);

5.3.4.4 A general location map (e.g., USGS quadrangle map, a portion of a city or county map, or other map) with enough detail to identify the location of the construction site and waters of the U.S. within one mile of the site; and

5.3.4.5 Identification of all potential sources of pollutants that may reasonably be expected to affect the quality of the storm water discharges from the site.

5.3.5 **Site Map(s)**. The SWPPP must contain a legible site map (or set of maps for large projects) showing the entire site and identifying the following site-specific information:

5.3.5.1 North Arrow and bar scale;

5.3.5.2 Boundaries of the property where construction activities will occur;

5.3.5.3 Locations where earth-disturbing activities will occur, noting any phasing of construction activities;

5.3.5.4 Location of areas that will not be disturbed and natural features to be preserved;

5.3.5.5 Location of all storm water conveyances including ditches, pipes, and swales;

5.3.5.6 Locations of storm water inlets and outfalls, with a unique identification code for each outfall;

5.3.5.7 Municipal separate storm sewer systems, if present;

5.3.5.8 Direction(s) of storm water flow and approximate slopes anticipated after grading activities;

5.3.5.9 Locations where control measures will be or have been installed;

5.3.5.10 Locations where exposed soils will be stabilized or have been stabilized;

5.3.5.11 Locations where post-construction storm water controls will be or have been installed;

5.3.5.12 Locations of support activities described in Part 1.4.2.3;

5.3.5.13 Locations where authorized non-storm water will be used, including the types that will be used on-site;

5.3.5.14 Locations of all waters of the U.S. (including significant wetland areas 10,000 square feet or greater) on the site and those located within 2,500 feet of the site boundary that may be affected by storm water discharges from the site;

5.3.5.15 Location of existing public water system (PWS) drinking water protection areas (DWPA) for PWS sources (e.g. springs, wells, or surface water intakes) that intersect the boundary of the proposed project/permit area. The DWPAs can be found using the interactive web map application, "*Alaska DEC Drinking Water Protection Areas*", located at http://dec.alaska.gov/das/GIS/apps.htm.

5.3.5.16 Locations where storm water and/or authorized non-storm water discharges to waters of the U.S. (including wetlands) or an MS4;

5.3.5.17 Sampling Point(s) (if applicable): A permittee subject to the requirements of Parts 3.2 must include the location(s) of the storm water discharge sampling point(s). For a linear project, indicate which sampling points are considered substantially identical, in accordance with Part 7.3.5; and

5.3.5.18 Areas where final stabilization has been accomplished and no further construction-phase permit requirements apply.

5.3.6 **Control Measures**. The SWPPP must describe and document the location of all control measures that will be installed and maintained to meet the requirements in Parts 3.0 and 4.0. For each major activity identified in the project description, the SWPPP must clearly document the following.

5.3.6.1 The type of control measure to be installed and maintained and the location on the site for installation.

5.3.6.2 The general sequence during the construction process in which the control measures will be installed and made operational, as well as the manufacturer's or BMP manual specifications for installation.

5.3.6.3 The general sequence of the stabilization practices that will be used to achieve temporary or final stabilization on exposed portions of the site as required in Part 4.5.

5.3.6.4 The type of treatment chemicals used on the site and a description of the general location of their use at the site, in accordance with in Part 4.6.

5.3.6.5 The information submitted to DEC for an active treatment system, in accordance with Part 4.6.7.

5.3.6.6 The good housekeeping measures that will be used at the site, if any, in accordance with Part 4.8.

5.3.6.7 A description of spill prevention and response measures that will be used at the site, in accordance with Part 4.9. The permittee may reference the existence of other plans for Spill Prevention and Control and Countermeasure (SPCC) for the project, provided that a copy of the other plan(s) is kept with the SWPPP.

5.3.6.8 A description of all permanent storm water management controls that will be installed at the site, including their location, in accordance with Part 4.11.

5.3.6.9 For projects that expect a winter shutdown, the SWPPP must provide a description of the following:

5.3.6.9.1 Anticipated dates of fall freeze-up and spring thaw (as defined in Appendix C); and

5.3.6.9.2 The methods the permittee will use to address winter considerations in accordance with Part 4.12.

5.3.6.10 A description of maintenance procedures for the control measures in accordance with Part 4.13.

5.3.6.11 A description of the training relevant to the construction activity and control measures used at the site in accordance with Part 4.14.

5.3.7 **Construction and Waste Materials**. The SWPPP must describe in general terms the type of construction and waste materials expected to be stored at the site with updates as appropriate and describe the measures for the handling and disposal of all wastes generated at the site, including clearing and demolition debris or other waste soils removed from the site, construction and domestic waste, hazardous or toxic waste, and sanitary waste.

5.3.8 **Locations of Other Industrial Storm Water Discharges**. The SWPPP must describe and identify the location of any storm water discharge associated with support activities described in Part 1.4.2.3. This includes storm water discharges from dedicated asphalt plants and dedicated concrete plants that are covered by this permit.

5.3.9 **Non-Storm Water Discharges**. The SWPPP must identify all authorized sources of non-storm water discharges listed in Part 1.4.3 of this permit, except for flows from fire-fighting activities that are combined with storm water discharges associated with construction activity at the site. The SWPPP must also describe the good housekeeping measures used to control or reduce non-storm water discharges.

5.4 Inspections

5.4.1 The SWPPP must document the procedures for performing site inspections specified by Part 6.0 of this permit, and where necessary, procedures for taking corrective actions in accordance with Part 8.0. At a minimum, the SWPPP must document the following:

5.4.1.1 Person(s) or positions of person(s) responsible for conducting site inspections;

5.4.1.2 Schedules to be followed for conducting inspections;

5.4.1.3 Any inspection checklist or form that will be used to collect and summarize data and observations; and

5.4.1.4 How conditions found that require corrective action will be addressed.

5.4.2 A record of each inspection and of any corrective actions taken in accordance with Part 8.0 must be retained with the SWPPP for at least three years from the date that permit authorization expires or is terminated.

5.5 Monitoring Plan (if applicable)

5.5.1 A permittee subject to the monitoring requirements in Part 3.2 must include a copy of the monitoring plan that complies with Part 7.0. At a minimum the SWPPP must document the following:

5.5.1.1 Person(s) or positions of person(s) responsible for conducting monitoring;

5.5.1.2 Schedules to be followed for conducting the monitoring;

5.5.1.3 Any monitoring checklist or form that will be used to record monitoring results; and

5.5.1.4 How conditions found that require corrective action will be addressed.

5.5.1.5 A record of each monitoring event,

5.5.1.6 The annual report submitted to DEC in accordance with Part 9.1, and

5.5.1.7 Any corrective actions taken in accordance with Part 8.0.

5.5.2 A record of each monitoring event and of any corrective actions taken in accordance with Part 7.0 and 8.0 must be retained with the SWPPP for at least three years from the date permit authorization expires or is terminated.

5.6 Documentation of Permit Eligibility Related to a Total Maximum Daily Load

The SWPPP must include documentation supporting a determination of permit eligibility with regards to waters that have an EPA-established or approved TMDL. See Part 3.2 for additional information to determine eligibility related to a TMDL. The SWPPP must include the following:

5.6.1 Identification of whether the discharge is identified, either specifically or generally, in an EPA-established or approved TMDL and any associated allocations, requirements, and assumptions identified for the discharge;

5.6.2 Summaries of consultation with state or federal TMDL authorities on consistency of SWPPP conditions with the approved TMDL; and

5.6.3 Measures taken by the permittee to ensure that the discharge of pollutants from the site is consistent with the assumptions and requirements of the EPA-established or approved TMDL, including any specific wasteload or load allocation that has been established that would apply to the discharge.

5.7 Documentation of Permit Eligibility Related to Endangered Species

The SWPPP must include documentation supporting a determination of permit compliance with regard to the Endangered Species Act (ESA), including:

5.7.1 Information on whether federally-listed endangered or threatened species or designated critical habitat may be in the project area;

5.7.2 Whether such species or critical habitat may be adversely affected by storm water discharges or storm water discharge-related activities from the project;

5.7.3 Results of the listed species and critical habitat screening determinations;

5.7.4 Any correspondence between the U.S. Fish and Wildlife Service (USFWS), EPA, National Marine Fisheries Service (NMFS), or others and the permittee regarding listed species and critical habitat, including any notification that delays the permittee’s authorization to discharge under this permit; and

5.7.5 A summary description of measures necessary to protect federally-listed endangered or threatened species or federally-designated critical habitat.

5.8 Post-Authorization Records

5.8.1 **Copy of Permit Requirements**. The SWPPP must contain the following documents:

5.8.1.1 A copy of this permit;

5.8.1.2 A copy of the signed and certified NOI form submitted to DEC; and

5.8.1.3 Upon receipt, a copy of the letter from DEC authorizing permit coverage and providing the permit tracking number.

5.8.2 **Additional Documentation Requirements**. Summaries of the following information, or copies of the reports, must be maintained with the SWPPP by the permittee following authorization under this permit:

5.8.2.1 **Grading and Stabilization Activities Log**

5.8.2.1.1 Date(s) when grading activities occur;

5.8.2.1.2 Description of Grading Activity and Location

5.8.2.1.3 Date(s) when construction activities temporarily or permanently cease on a portion of the site;

5.8.2.1.4 Date(s) when stabilization measures are initiated;

5.8.2.1.5 Description of Stabilization Measure.

5.8.2.2 Date of beginning and ending period for winter shutdown;

5.8.2.3 Copies of inspection reports as required in Part 5.4.2;

5.8.2.4 Copies of rainfall monitoring as required in Part 7.3.9.2;

5.8.2.5 Copies of monitoring reports or annual reports (if applicable) as required in Part 5.5.2 and 9.1.

5.8.2.6 Log of SWPPP modifications;

5.8.2.7 Documentation required in Part 4.6 (i.e. Material Safety Data Sheet, manufacturer and/or supplier test results, or employee training information)

5.8.2.8 Records of employee training, including the date(s) training was received;

5.8.2.9 Documentation of maintenance and repairs of control measures, including date(s) of regular maintenance, date(s) of discovery of areas in need of repair/maintenance, and date(s) that the control measure(s) returned to full function; and

5.8.2.10 Description of any corrective action taken at the site, including the Corrective Action Log (Required in Permit Part 8.3) that records event(s) that caused the need for corrective action and dates when problems were discovered and modifications occurred, in accordance with Part 8.0.

5.9 Maintaining an Updated SWPPP

5.9.1 **SWPPP Modifications**. A permittee must modify the SWPPP, including site map(s) in response to any of the following:

5.9.1.1 Whenever changes are made to construction plans, control measures, good housekeeping measures, monitoring plan (if applicable), or other activities at the site that are no longer accurately reflected in the SWPPP. This includes changes made in response to corrective actions triggered under Part 8.0 and notifications by the permittee(s);

5.9.1.2 If inspections or investigations by site staff or by local, state, tribal or federal officials determine that SWPPP modifications are necessary for compliance with this permit; or

5.9.1.3 To reflect any revisions to applicable federal, state, tribal, or local law that affect the control measure implemented at the construction site.

5.9.2 **SWPPP Amendment Log**. A permittee must keep a log showing dates, name of person authorizing the change, and a brief summary of changes for all SWPPP modifications (e.g., adding new control measures, changes in project design, or storm events that cause for the replacement of control measures).

5.9.3 **Deadlines for SWPPP Modifications**. Revisions to the SWPPP must be completed within seven days of the inspection that identified the need for a SWPPP modification or within seven days of substantial modifications to the construction plans or changes in site conditions.

5.10 Additional SWPPP Requirements

5.10.1 **Retention of the SWPPP**

5.10.1.1 A copy of the SWPPP (including a copy of the permit), NOI, and acknowledgement letter from DEC must be retained at the construction site or other location easily accessible during normal business hours. If the permittee has day-to-day operational control over SWPPP implementation, the permittee must have a copy of the SWPPP available at a central location at the site for the use of all those identified as having responsibilities under the SWPPP whenever they are on the construction site. If an on-site location is unavailable to store the SWPPP when no personnel are present, notice of the plan's location must be posted near the main entrance at the site.

5.10.2 **Main Entrance Signage**

A sign or other notice must be posted conspicuously near the main entrance of the site. If there is insufficient space near the main entrance to post a sign or notice, the notice can be posted in a local public building such as the town hall or public library. For linear projects (e.g. highways or utilities) the sign or other notice must be posted at a location near the main entrance of the construction project (such as where a pipeline project crosses a public road) where the public may read it during non-business hours. At a minimum, the sign or other notice must contain the following information:

5.10.2.1 Permit authorization number assigned to the NOI,

5.10.2.2 Operator contact name and phone number for obtaining additional construction site information, and

5.10.2.3 The location of the SWPPP or the name and telephone number of the contact person for scheduling SWPPP viewing times. If the location of the SWPPP or the name and telephone number of the contact person for scheduling SWPPP viewing times has changed (i.e., is different than that submitted to DEC in the NOI), the current location of the SWPPP or name and telephone number of a contact person for scheduling viewing times.

5.10.3 **Availability of SWPPP**

5.10.3.1 A permittee is required to keep a current copy of the SWPPP at the site or other location easily accessible during normal business hours.

5.10.3.2 A permittee may move the location where the SWPPP is available during the winter shut down for a site that is expected to have a winter shutdown provided that the winter SWPPP location conforms to the requirements of Part 5.10.2.

5.10.3.3 A permittee must ensure that each subcontractor who engages in soil disturbing activities is provided access to a copy of the SWPPP and is familiar with relevant portion(s) thereof that relate to the subcontractor's activities at the project.

5.10.3.4 The SWPPP must be made available upon request by: DEC; EPA; a state, tribal or local agency approving sediment and erosion plans, grading plans, or storm water management plans; local government officials; the operator of a MS4 receiving discharges from the site; and representatives of the ADF&G, USFWS or the NMFS. An electronic or hard copy of the SWPPP must be made available in its entirety to DEC staff for review and copying upon request.

5.10.3.5 DEC may provide access to portions of the SWPPP to a member of the public upon request. Confidential Business Information (CBI) may be withheld from the public per Appendix A, Part 1.13, but may not be withheld from those staff cleared for CBI review within DEC, EPA, USFWS, or NMFS.

5.10.4 **Signature and Certification**

The SWPPP must be dated, signed, and certified in accordance with the requirements of Appendix A, Part 1.12.

5.11 Requirements for Different Types of Operators

The permittee may meet one or both of the operational control components in the definition of operator found in Appendix C. Part 5.11.3 applies to all permittees having control over only a portion of a construction site.

5.11.1 If the permittee has operational control over construction plans and specifications, the permittee must ensure that:

5.11.1.1 The project specifications meet the minimum requirements of this Part and all other applicable permit conditions;

5.11.1.2 The SWPPP indicates the areas of the project where the permittee has operational control over project specifications, including the ability to make modifications in specifications;

5.11.1.3 All other permittees implementing portions of the SWPPP (or their own SWPPP) who may be impacted by a change to the construction plan are notified of such changes in a timely manner; and

5.11.1.4 The SWPPP indicates the name of the party(ies) with day-to-day operational control of those activities necessary to ensure compliance with the SWPPP or other permit conditions.

5.11.2 If the permittee has operational control over day-to-day activities, the permittee must ensure that:

5.11.2.1 The SWPPP meets the minimum requirements of this Part and identifies the parties responsible for implementation of control measures identified in the plan;

5.11.2.2 The SWPPP indicates areas of the project where the permittee has operational control over day-to-day activities; and

5.11.2.3 The SWPPP indicates the name of the parties with operational control over project specifications (including the ability to make modifications in specifications).

5.11.3 If the permittee has operational control over only a portion of a larger common plan of development (e.g., one of four homebuilders in a subdivision), the permittee must ensure that:

5.11.3.1 They comply with all applicable control measures, terms, and conditions of this permit as it relates to the activities on the permittee's portion of the construction site, including, but not limited to: monitoring (if applicable), inspections, and protection of endangered species, and critical habitat..

5.11.3.2 They implement a portion of a comprehensive SWPPP or develop and implement a separate SWPPP that covers only their portion of the project in compliance with Part 5.1.

5.11.3.3 Activities on their portion of the site do not render another party's control measures ineffective.

6.0 INSPECTIONS

6.1 Inspection Frequency

6.1.1 A permittee must conduct inspections at one of the following schedules:

6.1.1.1 Once every seven calendar days; or

6.1.1.2 Once every 14 calendar days and within 24 hours of the end of a storm event that resulted in a discharge from the site; or

6.1.1.3 For areas of the state where the mean annual precipitation is forty (40) inches or greater, or relatively continuous precipitation or sequential storm events, inspect at least once every seven (7) calendar days.

6.1.2 A permittee must specify in the SWPPP which schedule will be followed.

6.2 Case-by-Case Reductions in Inspection Frequency

A permittee may reduce inspection frequency in the following situations:

6.2.1 If the entire site is stabilized in accordance with Part 4.5, a permittee may reduce the frequency of inspections to at least once every calendar month (minimum of 7 days separation between inspections) and within two business days of the end of a storm event at actively staffed sites that resulted in a discharge from the site;

6.2.2 If portions of the site have achieved final stabilization in accordance with Part 4.5 but construction activity remains on other portions of the site, a permittee may suspend inspections for those portions that have achieved final stabilization; however, the permittee must conduct subsequent inspections within two business days of the end of a storm event that results in a discharge from that portion of the site previously considered finally stabilized;

6.2.3 If the project is undergoing winter shutdown (as defined in Appendix C), implemented control measures with Part 4.12 Winter Considerations, and is documented in accordance with Part 5.3.6.9, a permittee may stop inspections 14 calendar days after the anticipated fall freeze-up and must resume inspections in accordance with Part 6.1 at least 21 calendar days prior to the anticipated spring thaw;

6.2.4 If the project is undergoing winter construction the inspection frequency can be reduced to once per month if runoff is unlikely due to continuous frozen conditions that are likely to continue at the site for at least three (3) months based on historic seasonal averages. If unexpected weather conditions (such as above freezing temperatures or rain events) make discharges likely, the permittee must immediately resume a regular inspection frequency; or

6.2.5 If the entire site has achieved final stabilization (as defined in Appendix C) and a NOT has been submitted, no further inspection requirements apply to the site.

6.3 Qualified Person

An inspection must be conducted by a qualified person (as defined in the Appendix C) provided by a permittee.

6.4 Site Inspection

6.4.1 **Location of Inspections**. During a site inspection, a permittee must at a minimum inspect the following areas of the site:

6.4.1.1 Areas of the site disturbed by construction activity (e.g., areas cleared, graded, or excavated);

6.4.1.2 Areas used for storage of materials that are exposed to precipitation;

6.4.1.3 Areas where control measures are installed and maintained at the site;

6.4.1.4 Areas where sediment and other pollutants have accumulated or been deposited and may have the potential for or are entering the storm water conveyance system;

6.4.1.5 Locations where vehicles enter or exit the site;

6.4.1.6 Areas where storm water typically flows, including the storm water conveyance system;

6.4.1.7 Points of discharge from the site. Where such discharge locations are inaccessible, the nearest downstream location must be inspected to the extent that such inspections are practicable; and

6.4.1.8 Portions of the site where temporary or final stabilization measures have been initiated.

6.4.2 **Scope of Inspection**. At a minimum, the scope of the site inspection must include the following:

6.4.2.1 Check whether all control measures are installed and operating as intended and determine if any control measures need to be replaced, repaired, or maintained;

6.4.2.2 Check for the presence of accumulated sediment near the project area boundary that has a potential for being washed outside of the project boundary on locations such as roadways or parking lots, storm water conveyance systems, storm water inlets, and discharge points;

6.4.2.3 Check for the evidence of, or the potential for spills, leaks, or other accumulations of pollutants on the site entering the storm water conveyance system or waters of the U.S.;

6.4.2.4 Describe visible areas where erosion has occurred near the project area boundary that has a potential for being washed outside of the project boundary;

6.4.2.5 Identify any locations where new or modified control measures are necessary to meet the requirements in Part 4.0;

6.4.2.6 Identify all points where there is a discharge from the site and describe the conditions that are contributing to that discharge (e.g., recent storm event with failure of a control measure); and

6.4.2.7 Any incidents of noncompliance observed and corrective actions taken pursuant to Part 8.0.

6.5 Linear Project Inspections

6.5.1 Representative inspections may be performed at linear projects if the areas described in Part 6.4 are inaccessible, unsafe for personnel, would compromise stabilized areas, or would cause additional disturbance of soils.

6.5.2 Representative inspections must be performed by a qualified person (as defined in Appendix C).

6.5.3 To conduct representative inspections, a qualified person must inspect control measures along the site 0.25 mile above and below each access point where a roadway, undisturbed right-of-way, or other similar feature intersects the site and allows access to the areas described in Part 6.4. The conditions of the control measures along each inspected 0.25 mile segment may be considered as representative of the condition of control measures along that reach extending from the end of the 0.25 mile segment to either the end of the next 0.25 mile inspected segment, or to the end of the project, whichever occurs first.

6.5.4 If treatment chemicals are used then inspections must be conducted of all areas using the treatment chemicals.

6.6 Inspections by DEC or Applicable Government Authority

6.6.1 A permittee must allow an authorized representative of DEC, EPA, or the MS4 operator at any reasonable time to:

6.6.1.1 Enter onto the site where a regulated construction activity is conducted or where records are kept under the conditions of this permit;

6.6.1.2 Access and copy any records that must be kept under the conditions of this permit;

6.6.1.3 Inspect any portion of the site, including any off-site staging areas or material storage areas and the erosion and/or sediment control measures; and

6.6.1.4 Sample or monitor for the purpose of ensuring compliance.

6.7 Inspection Report

For each inspection required by this Part, the permittee must complete an inspection report.

6.7.1 At a minimum, the inspection report must include:

6.7.1.1 The inspection date;

6.7.1.2 Names, titles, and qualifications of personnel conducting the inspection;

6.7.1.3 Weather information for the period since the last inspection (or since commencement of construction activity if the first inspection) including a general estimate of the beginning day of each storm event, duration of each storm event, and whether any discharges occurred (information from the nearest National Weather Service Station within 20 miles may be adequate provided it is representative of the actual site location if the permittee does not maintain a rain gauge on site);

6.7.1.4 Weather information and a description of any discharges occurring at the time of the inspection;

6.7.1.5 Location(s) of discharges of sediment or other pollutants from the site;

6.7.1.6 Location(s) of control measures that need to be maintained;

6.7.1.7 Location(s) of control measures that failed to operate as designed or proved inadequate for a particular location;

6.7.1.8 Location(s) where additional control measures are needed that did not exist at the time of inspection; and

6.7.1.9 Corrective action required, if any, including complete-by dates.

6.7.2 The inspection report must be signed in accordance with Appendix A, Part 1.12.

7.0 MONITORING

7.1 General Requirements

7.1.1 A permittee whose project is subject to Part 3.2 Discharge to Impaired Water Body is required to develop, implement, and modify a written site-specific plan for analytical monitoring that includes all the requirements of this Part and follows the applicable DEC Quality Assurance Guidance for a Water Quality Monitoring Plan[5].

7.1.2 The DEC may notify the permittee of additional discharge monitoring requirements. Any such notice will briefly state the reasons for the monitoring, locations, and parameters to be monitored, frequency and period of monitoring, sample types, and reporting requirements.

7.2 Qualified Person

Monitoring must be conducted by a qualified person (as defined in Appendix C) provided by a permittee.

7.3 Discharge Monitoring Requirements

7.3.1 **Sampling Parameter**

A permittee must sample for turbidity if the construction activity meets the requirements of Part 7.1.

7.3.2 **Sampling Frequency**

7.3.2.1 Sampling must be conducted during or immediately following any storm event (as defined in Appendix C) or snowmelt event that results in a discharge from the site. For areas of the state described in Part 6.1.1.3, sample once per week following any storm event that results in a discharge from the site.

7.3.2.2 A permittee must collect at least two representative samples of the discharge. In the monitoring plan the permittee must characterize the number and frequency of samples to be measured/collected per discharge so as to represent the water quality conditions in the discharge (at minimum two samples per day per storm event).

7.3.2.3 A permittee is only required to collect samples during normal business hours and when conditions are safe for sampling personnel. When unsafe conditions (i.e., those that are dangerous or create inaccessibility for personnel) prevent the collection of samples, the permittee must conduct sampling of the discharge from the site as soon as the conditions are safe for sampling.

7.3.2.4 If a permittee is unable to collect a sample of the discharge due to unsafe conditions, the reason must be documented and attached to all required reports and records of the sampling activity.

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[5] Detailed requirements can be accessed at the following web page: http://dec.alaska.gov/water/water-quality/quality-assurance/

7.3.3 **Sampling Locations**

7.3.3.1 The permittee is required to conduct sampling at all discharge points where storm water or authorized non-storm water is discharged to an impaired water body or as per Part 7.1.2.

7.3.3.2 Linear Projects are also subject to the visual monitoring requirements in Part 7.4.

7.3.3.3 All sampling locations must be identified on the SWPPP site map and be clearly marked in the field with a flag, tape, stake, or other visible marker.

7.3.4 **Discharging to an Impaired Water body**. If the project is subject to Part 3.2, the permittee is required to conduct sampling at the following locations:

7.3.4.1 At a representative location upstream from the point of discharge into receiving water body or outside the area of influence of the discharge; and

7.3.4.2 At a representative location downstream from the point of discharge into the receiving water body, inside the area of influence of the discharge. Alternatively, the sample may be taken at the point it leaves the construction site, rather than when it is in the receiving water body.

7.3.5 **Representative Discharge Point for a Linear Project.** If a linear project has two or more outfalls that discharge substantially identical effluents, based on similarities of the soil disturbance and construction activity occurring within the drainage areas of the discharge point, the permittee may collect a representative sample of the storm water discharge at one of the discharge points and report that the quantitative data also apply to the substantially identical discharge point(s). For this to be permissible, the permittee must describe the following in the monitoring plan:

7.3.5.1 Locations of the discharge points;

7.3.5.2 Why the discharge points are expected to discharge substantially identical pollutants; and

7.3.5.3 Estimates of the size of the drainage area (in square feet) for each of the discharge points.

7.3.6 **Commingled Discharges**. If, prior to discharging, storm water flow commingles with sources of storm water that originate outside of the construction site or on property that is not owned or operated by the permittee, the following applies:

7.3.6.1 A permittee is required to collect samples of discharges from the construction site that consist in part of storm water that originates outside of the construction site and discharges from the site; or

7.3.6.2 If storm water originates outside of the construction site then discharges from the permittee’s property but does not come into contact with the site construction activities, the permittee is not required to sample this discharge.

7.3.7 **Sample Type**. All sampling performed by the permittee must be representative of the flow and characteristics of the discharge.

7.3.8 **Sampling and Analysis Methods**

7.3.8.1 Turbidity analysis must be performed with an EPA-approved field-calibrated nephelometer or turbidity meter (turbidimeter) for water quality measurements.

7.3.8.2 Samples required by this permit should be analyzed immediately.

7.3.8.3 Automatic sampling may be used; however, samples from automatic samplers must be collected no later than the next business day after their accumulation, unless flow through automated analysis is used and analyzed consistent with Part 7.3.8.2.

7.3.8.4 If the permittee cannot conduct field turbidity measurements, then all laboratory analysis must be conducted according to test procedures specified in 40 CFR §136, unless other test procedures have been specified in this permit. Samples must be preserved as required by the appropriate EPA-approved method of analysis and analyzed within specified holding times.

7.3.9 **Rainfall Monitoring**

7.3.9.1 A permittee must use a rain gauge on site or utilize the nearest National Weather Service (NWS) precipitation gauge station to determine the amount of rainfall during a storm event if the NWS gauge used is located within 20 miles of the site.

7.3.9.2 A permittee must maintain daily records of the rainfall amounts and dates of rainfall events as part of the SWPPP, in accordance with Part 9.4.

7.3.10 **Recording Monitoring Data**. A permittee must retain records of all sampling information and reports as part of the SWPPP, in accordance with Part 9.4. For each sample collected, the permittee must record the following:

7.3.10.1 The date, monitoring location, method, and time of sampling;

7.3.10.2 The name and title of the individual(s) who performed the sampling and analyses;

7.3.10.3 The date(s) analyses were performed;

7.3.10.4 The analytical techniques or methods used; and

7.3.10.5 The results of such analyses in nephelometric turbidity units (NTU) and all calibration and quality control information used to validate the measurement(s).

7.3.11 **Reporting Monitoring Results**

7.3.11.1 All monitoring data collected pursuant to Part 7.0 must be submitted to DEC, in accordance with Part 9.1, Annual Reports. (Note: The monitoring data collected under this Part does not need to conform to Appendix A Part 3.2.)

7.3.11.2 For each discharge point, a permittee must submit the following information:

7.3.11.2.1 Name of discharge point. If the discharge point is on a linear project and is representative of one or more substantially similar discharge points, include the names of the other discharge points;

7.3.11.2.2 Date sample(s) collected;

7.3.11.2.3 Result of each individual sample collected in NTUs, or, if no discharge occurred during the sampling period for that discharge point indicate no discharge;

7.3.11.2.4 The arithmetic mean of all samples collected for each day; and

7.3.11.2.5 If the sample result(s) are from a representative discharge point, indicate representative sample.

7.3.11.3 A permittee is required to report all sampling results, including those that reflect samples collected beyond the minimum frequency required in Part 7.3.2.

7.4 Visual Monitoring for a Linear Project

A permittee for a linear project subject to the monitoring requirements in Part 3.2 or Part 7.1 are also required to visually monitor drainage areas and discharge locations in portions of the site where temporary or final stabilization has been initiated and document monitoring activities with the procedures described in this Part.

7.4.1 **Visual Monitoring Frequency**. Visual monitoring must be conducted at least once every seven calendar days, and the permittee may choose to do it more frequently.

7.4.2 **Visual Monitoring Locations**. The inspector must visually observe discharge points in portions of the site where temporary or final stabilization has been initiated and each drainage area associated with the linear project for the presence of current (and indications of prior) discharges and their sources.

7.4.3 **Visual Monitoring Requirements**. During conditions at the project in which a discharge is occurring, the permittee must:

7.4.3.1 Observe and document the visual quality and characteristics of the discharge, including color, odor, floating, settled, or suspended solids, foam, oil sheen, and other obvious indicators of storm water pollutants; and

7.4.3.2 Document whether control measures are operating effectively or are in need of maintenance.

7.4.4 **Recording Visual Monitoring Data**. A permittee must document the results of the visual monitoring and maintain this documentation with the SWPPP as required in Part 9.4. A permittee is not required to submit the visual monitoring findings to DEC, unless specifically requested to do so. At a minimum, the documentation of the visual monitoring must include:

7.4.4.1 The visual monitoring date;

7.4.4.2 Name and title of personnel conducting the visual monitoring;

7.4.4.3 Observations and documentation of the visual monitoring; and

7.4.4.4 Any conditions requiring corrective action and a description of the corrective action.

8.0 CORRECTIVE ACTIONS

A permittee must take corrective actions as identified through the inspections conducted under Part 6.0 or as indicated by monitoring conducted under Part 7.0. This includes addressing the performance of control measures, including modifications to the selection, design, installation, and/or implementation of those control measures or to address permit violations.

8.1 Corrective Action Conditions

8.1.1 A permittee must review and revise the selection, design, installation, and implementation of their control measures whenever any of the following conditions are identified, discovered, or made aware of at the site:

8.1.1.1 An unauthorized release or prohibited discharge (e.g., spill, leak, or discharge of non-storm water not authorized by this or another APDES permit);

8.1.1.2 Control measures are not designed, installed, and/or maintained as required in Part 4.0;

8.1.1.3 The permittee becomes aware, or DEC determines that the control measures are not operating as intended or are not effective enough to meet the requirements of Part 3.1.2;

8.1.1.4 An inspection by DEC or EPA official determines that modification to the control measures are necessary to meet the requirements of this permit;

8.1.1.5 The accumulation or tracking of sediment in or near any storm water conveyance channels, storm water inlet, on roadways or parking lots outside the project area and adjacent to the site, in the immediate vicinity of control measures, at discharge points or entry points into the storm sewer system, or in other areas of the site; or

8.1.1.6 Pollutants (other than sediment such as trash or litter) have accumulated in or near any storm water conveyance channels, on roadways or parking lots within and adjacent to the site, in the immediate vicinity of control measures, at discharge points or entry points into the storm sewer system, or in other areas of the site.

8.2 Deadlines for Corrective Actions

8.2.1 A permittee must review the design, installation, and maintenance of control measures upon detecting any condition in Part 8.1.1 and document any corrective action(s) to be taken to eliminate or further investigate the deficiency and comply with the following:

8.2.1.1 For conditions that are easily remedied (i.e., removal of tracked sediment, maintenance of control measures, or spill clean-up), the permittee must initiate appropriate steps to correct the problem within 24 hours from the time of discovery and correct the problem as soon as practicable; or

8.2.1.2 If installation of a new control measure is needed or an existing control measure requires redesign and reconstruction or replacement, the permittee must install the new or modified measure and make it operational within seven calendar days from the time of discovery of the need for the corrective action, unless infeasible;

8.2.1.3 If a discharge occurs during a local 2-year, 24-hour storm event, a corrective action as described in Part 8.1.1 must be initiated within 24 hours from the time of discovery of a discharge from the storm event;

8.2.1.4 Monitoring, if required, must continue while corrective actions are being carried out.

8.2.2 Where a permittee takes corrective actions that could affect a subcontractor, the permittee must provide notification to the subcontractor within three calendar days of taking the corrective action.

8.2.3 Subcontractors must notify the permittee within 24 hours of becoming aware of any of conditions listed in Part 8.1.1.

8.3 Corrective Action Log

8.3.1 A permittee must document the following information in the corrective action log, within 24 hours of discovery of any condition listed in Part 8.1 or upon notification from a subcontractor:

8.3.1.1 Date the problem was identified;

8.3.1.2 Summary of corrective action taken or to be taken (or, for conditions triggering corrective actions identified in Part 8.1, where the determination is made that action is not necessary, the basis for this determination);

8.3.1.3 Notice of whether SWPPP modifications were required as a result of this discovery or corrective action; and

8.3.1.4 Date corrective action completed.

8.3.2 A permittee must retain a copy of the corrective action log on-site with the SWPPP as required in Part 9.4.

8.4 Corrective Action Report

If monitoring pursuant to Part 3.2 Discharge to Impaired Water Body exceeds a WQS, the permittee must submit a corrective action report consistent with Part 9.2; except when there is a discharge that results from a storm event in that same day that is larger than the local 2-year, 24-hour storm.

8.5 Substantially Identical Outfalls

8.5.1 If the event triggering correction action is linked to an outfall that represents other substantially identical outfalls, the permittees review must assess the need for corrective action for each outfall represented by the outfall that triggered the review. Any necessary changes to control measures that affect these other outfalls must also be made before the next storm event if possible, or as soon as practicable following that storm event.

9.0 REPORTING AND RECORDKEEPING

9.1 Annual Report

9.1.1 All water quality monitoring data collected by the permittee pursuant to Part 3.2 Discharge to Impaired Water Body or Part 7.0 Monitoring must be submitted to DEC in an annual report. The annual report form must be submitted to the appropriate address in Appendix A, Part 1.1.2 by December 31 of each year during construction and upon submittal of the NOT (see Part 10.0). (Note: The monitoring data reported under this part does not need to conform to Appendix A Part 3.2.)

9.1.2 Monitoring results must be presented in a clearly legible format in tabular form. Upon written notification, DEC may require the permittee to submit the monitoring results on a more frequent basis. Monitoring and analysis of any storm water discharge(s) or the receiving water(s) beyond the minimum frequency stated in this permit must be reported in a similar manner to DEC.

9.1.3 A permittee must sign and certify all annual reports in accordance with the requirements of Appendix A, Part 1.1.12, Signature Requirement and Penalties. All signed and certified legible original annual reports and all other reports and documents must be submitted to DEC Compliance and Enforcement Program address in Appendix A, Part 1.1.2.

9.2 Corrective Action Report

If a corrective action report is required by Part 8.4 or Appendix A, Part 3.5, a permittee must submit a corrective action report to DEC Compliance and Enforcement Program address in Appendix A, Part 1.1.2 no later than 14 calendar days after receiving the monitoring results. The report must include the following:

9.2.1 APDES Permit Tracking Number;

9.2.2 Project name, physical address and location;

9.2.3 Name of receiving water;

9.2.4 Monitoring data from the event that exceeded a WQS;

9.2.5 An explanation of the conditions that caused the excursion;

9.2.6 Steps taken or planned (should corrective actions not yet be complete) to correct the violation; and

9.2.7 An appropriate contact name, telephone number and e-mail address.

9.3 Spill of Hazardous Substances Report

9.3.1 A permittee is prohibited from discharging hazardous substances or oil from a spill or other release. Alaska state law (18 AAC 75.300) and Part 4.9 requires all oil and hazardous substance release be reported to DEC Spill Prevention and Response program. Spill reporting placards can be found at the following webpage: http://dec.alaska.gov/spar/ppr/spill-information/reporting.

9.3.2 To report a spill, call the nearest DEC Area Response Team Office and follow their reporting requirements:

- Southeast (Juneau) – 465-5340
- Central (Anchorage) – 269-3063
- Northern (Fairbanks) – 451-2121

9.3.3 Outside of normal business hours, the permittee must call (800) 478-9300 to report the spill as soon as the permittee has knowledge of the discharge.

9.4 Retention of Records

A permittee must retain the following records at the site or the records must be readily available at a designated alternate location during the life of the construction activity and for a minimum of three years from the date that authorization under this permit expires or is terminated. This period may be extended by request of DEC at any time.

9.4.1 Records of all data used to complete the NOI to be covered by this permit;

9.4.2 A copy of the SWPPP (including any modifications made during the term of this permit);

9.4.3 A copy of all monitoring information (if applicable) and reports required by this permit;

9.4.4 A copy of all inspection reports generated in accordance with Part 6.0;

9.4.5 Documentation related to noncompliance and corrective actions taken pursuant to Part 8.0; and

9.4.6 Any other reports and certifications required by this permit.

9.5 Request for Submittal of Records

The DEC may request copies of all or a portion of the information collected and maintained in the SWPPP. A permittee must provide a response to written requests for records to the Department within 30 calendar days of receipt of a written request.

10.0 TERMINATION OF PERMIT AUTHORIZATION

10.1 Submitting a Notice of Termination (NOT)

10.1.1 To terminate permit coverage, a permittee must submit a complete and accurate NOT to DEC that certifies that one or more of the conditions in Part 10.2 have been met to terminate permit coverage. A permittee must comply with this permit until an NOT is submitted.

10.2 When to Submit a Notice of Termination

10.2.1 A permittee must submit an NOT within 30 calendar days after one or more of the following conditions have been met:

10.2.1.1 Final stabilization has been achieved on all portions of the site, in accordance with Part 4.5.2, for which a permittee is responsible, all ground disturbing construction activity or use of support activities has been completed, and all temporary BMP’s have been removed;

10.2.1.2 A new permittee has assumed control according to Appendix A, Part 2.3, over all areas of the site that have not been finally stabilized;

10.2.1.3 Authorization under an individual permit or alternative APDES general permit has been obtained, unless DEC has required that a permittee obtain such coverage under authority of Part 2.8, in which case authorization under this permit will automatically terminate;

10.2.1.4 For residential construction only, temporary stabilization has been completed and the residence has been transferred to the homeowner; or

10.2.1.5 The planned construction activity identified on the original NOI was never initiated (e.g., no grading or earthwork was ever started) and plans for the construction have been permanently abandoned or indefinitely postponed.

10.2.2 A permittee subject to pending state or federal enforcement actions, including citizen suits brought under state or federal law, may not submit a NOT. The permittee must certify that it is not subject to any pending state or federal enforcement actions, including citizen suites brought under state or federal law[6].

10.3 Submitting a Notice of Termination

10.3.1 A permittee must submit a NOT to terminate authorization under this permit. The complete and accurate NOT can be submitted either:

10.3.1.1 Electronically (strongly encouraged): Go to DEC's Water Online Application System (OASys) web page at http://dec.alaska.gov/water/wastewater/stormwater/apdesenoi/ to prepare and submit electronic NOT (eNOT). Note: the eNOT will likely be processed more quickly.

10.3.1.2 Paper NOT Form**:** Complete the form in Appendix E or access the form on DEC's APDES Storm Water Forms web page at http://dec.alaska.gov/water/wastewater/stormwater/forms#CGP. Once the form is complete, scan and email the entire form to DEC OPA. Submit a paper copy to DEC Permitting Program at the address listed in Appendix A, Section 1.1.1.

10.3.2 A permittee's authorization to discharge terminates at 11:59 pm of the day the NOT is signed.

10.3.3 If a permittee submits a NOT without meeting one or more of the conditions identified in Part 10.2, then the NOT is invalid and a permittee remains responsible for meeting the requirements of this permit until authorization is terminated pursuant to Part 10.3.2.

11.0 PERMIT REOPENER CLAUSE

11.1 Procedures for Modification or Revocation

Permit modification or revocation will be conducted according 18 AAC 83.130, 18 AAC 83.135, 18 AAC 83.140, or 18 AAC 83.145.

11.2 Water Quality Protection

If there is evidence indicating that the storm water discharges authorized by this permit cause, have the reasonable potential to cause or contribute to an excursion above any applicable WQS, the permittee may be required to obtain an individual permit in accordance with Part 2.8 of this permit, or the permit may be modified to include different limitations and/or requirements.

[6] 18 AAC 83.130(k).

11.3 Timing of Permit Modification

DEC may elect to modify the permit prior to its expiration (rather than waiting for the new permit cycle) to comply with any new statutory or regulatory requirements.

12.0 Electronic Reporting (E-Reporting) Rule (Phase II)

Phase II of the E-Reporting rule will integrate electronic reporting for all reports required by the Permit (e.g., Annual Reports and Certifications) and implementation is expected to begin December 2023. Permittees should monitor DEC's E-Reporting Information website (http://dec.alaska.gov/water/compliance/electronic-reporting-rule/) for updates on Phase II of the E-Reporting Rule and will be notified when they must begin submitting all other reports electronically. Until such time, other reports by the Permit may be submitted in accordance with Appendix A – Standard Conditions.

13.0 Standard Conditions Applicable to Recording and Reporting

The permittee must comply with the following recording and reporting requirements, as described in Appendix A, Standard Conditions unless specified in the body of the permit:

- Retention of Records, Part 1.11.2;
- Records Contents, Part 1.11.3
- Special Reporting Obligations, Part 2.0; and
- Monitoring, Recording, and Reporting Requirements, Part 3.0.

Appendix A Standard Permit Conditions

APDES PERMIT

NONDOMESTIC DISCHARGES

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Appendix A of the permit contains standard regulatory language that must be included in all APDES permits. These requirements are based on the regulations and cannot be challenged in the context of an individual APDES permit action. The standard regulatory language covers requirements such as monitoring, recording, reporting requirements, compliance responsibilities, and other general requirements. Appendix A, Standard Conditions is an integral and enforceable part of the permit. Failure to comply with a Standard Condition in this Appendix constitutes a violation of the permit and is subject to enforcement.

1.0 Standard Conditions Applicable to All Permits

1.1 Contact Information and Addresses

1.1.1 Permitting Program

Documents, reports, and plans required under the permit and Appendix A are to be sent to the following address:

State of Alaska Department of Environmental Conservation Division of Water Wastewater Discharge Authorization Program 555 Cordova Street Anchorage, Alaska 99501 Telephone (907) 269-6285 Fax (907) 269-3487 Email: DEC.Water.WQPermit@alaska.gov

1.1.2 Compliance and Enforcement Program

Documents and reports required under the permit and Appendix A relating to compliance are to be sent to the following address:

State of Alaska Department of Environmental Conservation Division of Water Compliance and Enforcement Program 555 Cordova Street Anchorage, Alaska 99501 Telephone Nationwide (877) 569-4114 Anchorage Area / International (907) 269-4114 Fax (907) 269-4604 Email: dec-wqreporting@alaska.gov

1.2 Duty to Comply

A permittee shall comply with all conditions of the permittee's APDES permit. Any permit noncompliance constitutes a violation of 33 U.S.C 1251-1387 (Clean Water Act) and state law and is grounds for enforcement action including termination, revocation and reissuance, or modification of a permit, or denial of a permit renewal application. A permittee shall comply with effluent standards or prohibitions established under 33 U.S.C. 1317(a) for toxic pollutants within the time provided in the regulations that establish those effluent standards or prohibitions even if the permit has not yet been modified to incorporate the requirement.

1.3 Duty to Reapply

If a permittee wishes to continue an activity regulated by this permit after its expiration date, the permittee must apply for and obtain a new permit. In accordance with 18 AAC 83.105(b), a permittee with a currently effective permit shall reapply by submitting a new application at least 180 days before the existing permit expires, unless the Department has granted the permittee permission to submit an application on a later date. However, the Department will not grant permission for an application to be submitted after the expiration date of the existing permit.

1.4 Need to Halt or Reduce Activity Not a Defense

In an enforcement action, a permittee may not assert as a defense that compliance with the conditions of the permit would have made it necessary for the permittee to halt or reduce the permitted activity.

1.5 Duty to Mitigate

A permittee shall take all reasonable steps to minimize or prevent any discharge in violation of this permit that has a reasonable likelihood of adversely affecting human health or the environment.

1.6 Proper Operation and Maintenance

1.6.1 A permittee shall at all times properly operate and maintain all facilities and systems of treatment and control and related appurtenances that the permittee installs or uses to achieve compliance with the conditions of the permit. The permittee’s duty to operate and maintain properly includes using adequate laboratory controls and appropriate quality assurance procedures. However, a permittee is not required to operate back-up or auxiliary facilities or similar systems that a permittee installs unless operation of those facilities is necessary to achieve compliance with the conditions of the permit.

1.6.2 Operation and maintenance records shall be retained and made available at the site.

1.7 Permit Actions

A permit may be modified, revoked and reissued, or terminated for cause as provided in 18 AAC 83.130. If a permittee files a request to modify, revoke and reissue, or terminate a permit, or gives notice of planned changes or anticipated noncompliance, the filing or notice does not stay any permit condition.

1.8 Property Rights

A permit does not convey any property rights or exclusive privilege.

1.9 Duty to Provide Information

A permittee shall, within a reasonable time, provide to the Department any information that the Department requests to determine whether a permittee is in compliance with the permit, or whether cause exists to modify, revoke and reissue, or terminate the permit. A permittee shall also provide to the Department, upon request, copies of any records the permittee is required to keep under the permit.

1.10 Inspection and Entry

A permittee shall allow the Department, or an authorized representative, including a contractor acting as a representative of the Department, at reasonable times and on presentation of credentials establishing authority and any other documents required by law, to:

1.10.1 Enter the premises where a permittee's regulated facility or activity is located or conducted, or where permit conditions require records to be kept;

1.10.2 Have access to and copy any records that permit conditions require the permittee to keep;

1.10.3 Inspect any facilities, equipment, including monitoring and control equipment, practices, or operations regulated or required under a permit; and

1.10.4 Sample or monitor any substances or parameters at any location for the purpose of assuring permit compliance or as otherwise authorized by 33 U.S.C. 1251-1387 (Clean Water Act).

1.11 Monitoring and Records

A permittee must comply with the following monitoring and recordkeeping conditions:

1.11.1 Samples and measurements taken for the purpose of monitoring must be representative of the monitored activity.

1.11.2 The permittee shall retain records in Alaska of all monitoring information for at least three years, or longer at the Department's request at any time, from the date of the sample, measurement, report, or application. Monitoring records required to be kept include:

1.11.2.1 All calibration and maintenance records,

1.11.2.2 All original strip chart recordings or other forms of data approved by the Department for continuous monitoring instrumentation,

1.11.2.3 All reports required by a permit,

1.11.2.4 Records of all data used to complete the application for a permit,

1.11.2.5 Field logbooks or visual monitoring logbooks,

1.11.2.6 Quality assurance chain of custody forms,

1.11.2.7 Copies of discharge monitoring reports, and

1.11.2.8 A copy of this APDES permit.

1.11.3 Records of monitoring information must include:

1.11.3.1 The date, exact place, and time of any sampling or measurement;

1.11.3.2 The name(s) of any individual(s) who performed the sampling or measurement(s);

1.11.3.3 The date(s) and time any analysis was performed;

1.11.3.4 The name(s) of any individual(s) who performed any analysis;

1.11.3.5 Any analytical technique or method used; and

1.11.3.6 The results of the analysis.

1.11.4 Monitoring Procedures

Analyses of pollutants must be conducted using test procedures approved under 40 CFR Part 136, adopted by reference at 18 AAC 83.010, for pollutants with approved test procedures, and using test procedures specified in the permit for pollutants without approved methods.

1.12 Signature Requirement and Penalties

1.12.1 Any application, report, or information submitted to the Department in compliance with a permit requirement must be signed and certified in accordance with 18 AAC 83.385. Any person who knowingly makes any false material statement, representation, or certification in any application, record, report, or other document filed or required to be maintained under a permit, or who knowingly falsifies, tampers with, or renders inaccurate any monitoring device or method required to be maintained under this permit shall, upon conviction, be subject to penalties under 33 U.S.C. 1319(c)(4), AS 12.55.035(c)(1)(B), (c)(2) and (c)(3), and AS 46.03.790(g).

1.12.2 In accordance with 18 AAC 83.385, an APDES permit application must be signed as follows:

1.12.2.1 For a corporation, a responsible corporate officer shall sign the application; in this subsection, a responsible corporate officer means:

1.12.2.1.1 A president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy- or decision-making functions for the corporation; or

1.12.2.1.2 The manager of one of more manufacturing, production, or operating facilities, if

1.12.2.1.2.1 The manager is authorized to make management decisions that govern the operation of the regulated facility, including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long term environmental compliance with environmental statutes and regulations;

1.12.2.1.2.2 The manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and

1.12.2.1.2.3 Authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.

1.12.2.2 For a partnership or sole proprietorship, by the general partner or the proprietor, respectively, shall sign the application.

1.12.2.3 For a municipality, state, federal, or other public agency, either a principal executive officer or ranking elected official shall sign the application; in this subsection, a principal executive officer of an agency means:

1.12.2.3.1 The chief executive officer of the agency; or

1.12.2.3.2 A senior executive officer having responsibility for the overall operations of a principal geographic unit or division of the agency.

1.12.3 Any report required by an APDES permit, and a submittal with any other information requested by the Department, must be signed by a person described in Appendix A, Part 1.12.2, or by a duly authorized representative of that person. A person is a duly authorized representative only if:

1.12.3.1 The authorization is made in writing by a person described in Appendix A, Part 1.12.2;

1.12.3.2 The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity, including the position of plant manager, operator of a well or a well field, superintendent, or position of equivalent responsibility; or an individual or position having overall responsibility for environmental matters for the company; and

1.12.3.3 The written authorization is submitted to the Department to the Permitting Program address in Appendix A, Part 1.1.1.

1.12.4 If an authorization under Appendix A, Part 1.12.3 is no longer effective because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of Appendix A, Part 1.12.3 must be submitted to the Department before or together with any report, information, or application to be signed by an authorized representative.

1.12.5 Any person signing a document under Appendix A, Part 1.12.2 or Part 1.12.3 shall certify as follows:

> "I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

1.13 Proprietary or Confidential Information

1.13.1 A permit applicant or permittee may assert a claim of confidentiality for proprietary or confidential business information by stamping the words “confidential business information” on each page of a submission containing proprietary or confidential business information. The Department will treat the stamped submissions as confidential if the information satisfies the test in 40 CFR §2.208, adopted by reference at 18 AAC 83.010, and is not otherwise required to be made public by state law.

1.13.2 A claim of confidentiality under Appendix A, Part 1.13.1 may not be asserted for the name and address of any permit applicant or permittee, a permit application, a permit, effluent data, sewage sludge data, and information required by APDES or NPDES application forms provided by the Department, whether submitted on the forms themselves or in any attachments used to supply information required by the forms.

1.13.3 A permittee’s claim of confidentiality authorized under Appendix A, Part 1.13.1 is not waived if the Department provides the proprietary or confidential business information to the EPA or to other agencies participating in the permitting process. The Department will supply any information obtained or used in the administration of the state APDES program to the EPA upon request under 40 CFR §123.41, as revised as of July 1, 2005. When providing information submitted to the Department with a claim of confidentiality to the EPA, the Department will notify the EPA of the confidentiality claim. If the Department provides the EPA information that is not claimed to be confidential, the EPA may make the information available to the public without further notice.

1.14 Oil and Hazardous Substance Liability

Nothing in this permit shall be construed to preclude the institution of any action or relieve a permittee from any responsibilities, liabilities, or penalties to which the permittee is or may be subject to under state laws addressing oil and hazardous substances.

1.15 Cultural and Paleontological Resources

If cultural or paleontological resources are discovered because of this disposal activity, work that would disturb such resources is to be stopped, and the Office of History and Archaeology, a Division of Parks and Outdoor Recreation of the Alaska Department of Natural Resources (http://www.dnr.state.ak.us/parks/oha/), is to be notified immediately at (907) 269-8721.

1.16 Fee

A permittee must pay the appropriate permit fee described in 18 AAC 72.

1.17 Other Legal Obligations

This permit does not relieve the permittee from the duty to obtain any other necessary permits from the Department or from other local, state, or federal agencies and to comply with the requirements contained in any such permits. All activities conducted and all plan approvals implemented by the permittee pursuant to the terms of this permit shall comply with all applicable local, state, and federal laws and regulations.

2.0 Special Reporting Obligations

2.1 Planned Changes

2.1.1 The permittee shall give notice to the Department as soon as possible of any planned physical alteration or addition to the permitted facility if:

2.1.1.1 The alteration or addition may make the facility a “new source” under one or more of the criteria in 18 AAC 83.990(44); or

2.1.1.2 The alteration or addition could significantly change the nature or increase the quantity of pollutants discharged if those pollutants are not subject to effluent limitations in the permit or to notification requirements under 18 AAC 83.610.

2.1.2 If the proposed changes are subject to plan review, then the plans must be submitted at least 30 days before implementation of changes (see 18 AAC 15.020 and 18 AAC 72 for plan review requirements). Written approval is not required for an emergency repair or routine maintenance.

2.1.3 Written notice must be sent to the Permitting Program address in Appendix A, Part 1.1.1.

2.2 Anticipated Noncompliance

2.2.1 A permittee shall give seven days’ notice to the Department before commencing any planned change in the permitted facility or activity that may result in noncompliance with permit requirements.

2.2.2 Written notice must be sent to the Compliance and Enforcement Program address in Appendix A, Part 1.1.2.

2.3 Transfers

2.3.1 A permittee may not transfer a permit for a facility or activity to any person except after notice to the Department in accordance with 18 AAC 83.150. The Department may modify or revoke and reissue the permit to change the name of the permittee and incorporate such other requirements under 33 U.S.C. 1251-1387 (Clean Water Act) or state law.

2.3.2 Written notice must be sent to the Permitting Program address in Appendix A, Part 1.1.1.

2.4 Compliance Schedules

2.4.1 A permittee must submit progress or compliance reports on interim and final requirements in any compliance schedule of a permit no later than 14 days following the scheduled date of each requirement.

2.4.2 Written notice must be sent to the Compliance and Enforcement Program address in Appendix A, Part 1.1.2.

2.5 Corrective Information

2.5.1 If a permittee becomes aware that it failed to submit a relevant fact in a permit application or submitted incorrect information in a permit application or in any report to the Department, the permittee shall promptly submit the relevant fact or the correct information.

2.5.2 Information must be sent to the Permitting Program address in Appendix A, Part 1.1.1.

2.6 Bypass of Treatment Facilities

2.6.1 Prohibition of Bypass

Bypass is prohibited. The Department may take enforcement action against a permittee for any bypass, unless:

2.6.1.1 The bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;

2.6.1.2 There were no feasible alternatives to the bypass, including use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. However, this condition is not satisfied if the permittee, in the exercise of reasonable engineering judgment, should have installed adequate back-up equipment to prevent a bypass that occurred during normal periods of equipment downtime or preventive maintenance; and

2.6.1.3 The permittee provides notice to the Department of a bypass event in the manner, as appropriate, under Appendix A, Part 2.6.2.

2.6.2 Notice of bypass

2.6.2.1 For an anticipated bypass, the permittee submits notice at least 10 days before the date of the bypass. The Department may approve an anticipated bypass, after considering its adverse effects, if the Department determines that it will meet the conditions of Appendix A, Parts 2.6.1.1 and 2.6.1.2.

2.6.2.2 For an unanticipated bypass, the permittee submits 24-hour notice, as required in 18 AAC 83.410(f) and Appendix A, Part 3.4, Twenty-four Hour Reporting.

2.6.2.3 Written notice must be sent to the Compliance and Enforcement Program address in Appendix A, Part 1.1.2.

2.6.3 Notwithstanding Appendix A, Part 2.6.1, a permittee may allow a bypass that:

2.6.3.1 Does not cause an effluent limitation to be exceeded, and

2.6.3.2 Is for essential maintenance to assure efficient operation.

2.7 Upset Conditions

2.7.1 In any enforcement action for noncompliance with technology-based permit effluent limitations, a permittee may claim upset as an affirmative defense. A permittee seeking to establish the occurrence of an upset has the burden of proof to show that the requirements of Appendix A, Part 2.7.2 are met.

2.7.2 To establish the affirmative defense of upset, the permittee must demonstrate, through properly signed, contemporaneous operating logs or other relevant evidence that:

2.7.2.1 An upset occurred and the permittee can identify the cause or causes of the upset;

2.7.2.2 The permitted facility was at the time being properly operated;

2.7.2.3 The permittee submitted 24-hour notice of the upset, as required in 18 AAC 83.410(f) and Appendix A, Part 3.4, Twenty-four Hour Reporting; and

2.7.2.4 The permittee complied with any mitigation measures required under 18 AAC 83.405(e) and Appendix A, Part 1.5, Duty to Mitigate.

2.7.3 Any determination made in administrative review of a claim that noncompliance was caused by upset, before an action for noncompliance is commenced, is not final administrative action subject to judicial review.

2.8 Existing Manufacturing, Commercial, Mining, and Silvicultural Discharges

2.8.1 In addition to the reporting requirements under 18 AAC 83.410, an existing manufacturing, commercial, mining, and silvicultural discharger shall notify the Department as soon as that discharger knows or has reason to believe that any activity has occurred or will occur that would result in:

2.8.1.1 The discharge, on a routine or frequent basis, of any toxic pollutant that is not limited in the permit, if that discharge will exceed the highest of the following notification levels:

2.8.1.1.1 One hundred micrograms per liter (100 µg/L);

2.8.1.1.2 Two hundred micrograms per liter (200 µg/L) for acrolein and acrylonitrile, 500 micrograms per liter (500 µg/L) for 2,4-dinitrophenol and for 2-methyl-4,6-dinitrophenol, and one milligram per liter (1 mg/L) for antimony;

2.8.1.1.3 Five times the maximum concentration value reported for that pollutant in the permit application in accordance with 18 AAC 83.310(c)-(g); or

2.8.1.1.4 The level established by the Department in accordance with 18 AAC 83.445.

2.8.1.2 Any discharge, on a non-routine or infrequent basis, of a toxic pollutant that is not limited in the permit, if that discharge will exceed the highest of the following notification levels:

2.8.1.2.1 Five hundred micrograms per liter (500 µg/L);

2.8.1.2.2 One milligram per liter (1 mg/L) for antimony;

2.8.1.2.3 Ten times the maximum concentration value reported for that pollutant in the permit application in accordance with 18 AAC 83.310(c)-(g); or

2.8.1.2.4 The level established by the Department in accordance with 18 AAC 83.445.

3.0 Monitoring, Recording, and Reporting Requirements

3.1 Representative Sampling

A permittee must collect effluent samples from the effluent stream after the last treatment unit before discharge into the receiving waters. Samples and measurements must be representative of the volume and nature of the monitored activity or discharge.

3.2 Reporting of Monitoring Results

The permittee shall summarize monitoring results on the annual report form or approved equivalent. The permittee shall submit its annual report at the interval specified in the permit. The permittee shall sign and certify all annual reports and other reports in accordance with the requirements of Appendix A, Part 1.12, Signature Requirement and Penalties. The permittee shall submit the legible originals of these documents to the ADEC Compliance and Enforcement Program at the address in Appendix A, Part 1.1.2.

3.3 Additional Monitoring by Permittee

If the permittee monitors any pollutant more frequently than the permit requires using test procedures approved in 40 CFR Part 136, adopted by reference at 18 AAC 83.010, or as specified in this permit, the results of that additional monitoring must be included in the calculation and reporting of the data submitted in the DMR or annual report required by Appendix A, Part 3.2. All limitations that require averaging of measurements must be calculated using an arithmetic means unless the Department specifies another method in the permit. Upon request by the Department, the permittee must submit the results of any other sampling and monitoring regardless of the test method used.

3.4 Twenty-four Hour Reporting

A permittee shall report any noncompliance event that may endanger health or the environment as follows:

3.4.1 A report must be made:

3.4.1.1 Orally within 24 hours after the permittee becomes aware of the circumstances, and

3.4.1.2 In writing within five days after the permittee becomes aware of the circumstances.

3.4.2 A report must include the following information:

3.4.2.1 A description of the noncompliance and its causes, including the estimated volume or weight and specific details of the noncompliance;

3.4.2.2 The period of noncompliance, including exact dates and times;

3.4.2.3 If the noncompliance has not been corrected, a statement regarding the anticipated time the noncompliance is expected to continue; and

3.4.2.4 Steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.

3.4.3 An event that must be reported within 24 hours includes:

3.4.3.1 An unanticipated bypass that exceeds any effluent limitation in the permit (see Appendix A, Part 2.6, Bypass of Treatment Facilities).

3.4.3.2 An upset that exceeds any effluent limitation in the permit (see Appendix A, Part 2.7, Upset Conditions).

3.4.3.3 A violation of a maximum daily discharge limitation for any of the pollutants listed in the permit as requiring 24-hour reporting.

3.4.4 The Department may waive the written report on a case-by-case basis for reports under Appendix A, Part 3.4 if the oral report has been received within 24 hours of the permittee becoming aware of the noncompliance event.

3.4.5 The permittee may satisfy the written reporting submission requirements of Appendix A, Part 3.4 by submitting the written report via e-mail, if the following conditions are met:

3.4.5.1 The Noncompliance Notification Form or equivalent form is used to report the noncompliance;

3.4.5.2 The written report includes all the information required under Appendix A, Part 3.4.2;

3.4.5.3 The written report is properly certified and signed in accordance with Appendix A, Parts 1.12.3 and 1.12.5.;

3.4.5.4 The written report is scanned as a PDF (portable document format) document and transmitted to the Department as an attachment to the e-mail; and

3.4.5.5 The permittee retains in the facility file the original signed and certified written report and a printed copy of the conveying email.

3.4.6 The e-mail and PDF written report will satisfy the written report submission requirements of this permit provided the e-mail is received by the Department within five days after the time the permittee becomes aware of the noncompliance event and the e-mail and written report satisfy the criteria of Part 3.4.5. The e-mail address to report noncompliance is: dec-wqreporting@alaska.gov

3.5 Other Noncompliance Reporting

A permittee shall report all instances of noncompliance not required to be reported under Appendix A, Parts 2.4 (Compliance Schedules), 3.3 (Additional Monitoring by Permittee), and 3.4 (Twenty-four Hour Reporting) at the time the permittee submits monitoring reports under Appendix A, Part 3.2. (Reporting of Monitoring Results). A report of noncompliance under this part must contain the information listed in Appendix A, Part 3.4.2 and be sent to the Compliance and Enforcement Program address in Appendix A, Part 1.1.2.

4.0 Penalties for Violations of Permit Conditions

Alaska laws allow the State to pursue both civil and criminal actions concurrently. The following is a summary of Alaska law. Permittees should read the applicable statutes for further substantive and procedural details.

4.1 Civil Action

Under AS 46.03.760(e), a person who violates or causes or permits to be violated a regulation, a lawful order of the Department, or a permit, approval, or acceptance, or term or condition of a permit, approval or acceptance issued under the program authorized by AS 46.03.020 (12) is liable, in a civil action, to the State for a sum to be assessed by the court of not less than $500 nor more than $100,000 for the initial violation, nor more than $10,000 for each day after that on which the violation continues, and that shall reflect, when applicable:

4.1.1 Reasonable compensation in the nature of liquated damages for any adverse environmental effects caused by the violation, that shall be determined by the court according to the toxicity, degradability, and dispersal characteristics of the substance discharged, the sensitivity of the receiving environment, and the degree to which the discharge degrades existing environmental quality;

4.1.2 Reasonable costs incurred by the State in detection, investigation, and attempted correction of the violation;

4.1.3 The economic savings realized by the person in not complying with the requirements for which a violation is charged; and

4.1.4 The need for an enhanced civil penalty to deter future noncompliance.

4.2 Injunctive Relief

4.2.1 Under AS 46.03.820, the Department can order an activity presenting an imminent or present danger to public health or that would be likely to result in irreversible damage to the environment be discontinued. Upon receipt of such an order, the activity must be immediately discontinued.

4.2.2 Under AS 46.03.765, the Department can bring an action in Alaska Superior Court seeking to enjoin ongoing or threatened violations for Department-issued permits and Department statutes and regulations.

4.3 Criminal Action

Under AS 46.03.790(h), a person is guilty of a Class A misdemeanor if the person negligently:

4.3.1 Violates a regulation adopted by the Department under AS 46.03.020(12);

4.3.2 Violates a permit issued under the program authorized by AS 46.03.020(12);

4.3.3 Fails to provide information or provides false information required by a regulation adopted under AS 46.03.020(12);

4.3.4 Makes a false statement, representation, or certification in an application, notice, record, report, permit, or other document filed, maintained, or used for purposes of compliance with a permit issued under or a regulation adopted under AS 46.03.020(12); or

4.3.5 Renders inaccurate a monitoring device or method required to be maintained by a permit issued or under a regulation adopted under AS 46.03.020(12).

4.4 Other Fines

Upon conviction of a violation of a regulation adopted under AS 46.03.020(12), a defendant who is not an organization may be sentenced to pay a fine of not more than $10,000 for each separate violation (AS 46.03.790(g)). A defendant that is an organization may be sentenced to pay a fine not exceeding the greater of: (1) $200,00; (2) three times the pecuniary gain realized by the defendant as a result of the offense; or (3) three times the pecuniary damage or loss caused by the defendant to another, or the property of another, as a result of the offense (AS 12.55.035(c)(B), (c)(2), and (c)(3)).

Appendix B Acronyms (for the purposes of this permit)

Abbreviations	
ADEC	Alaska Department of Environmental Conservation
ADF&G	Alaska Department of Fish & Game
AK-CESCL	Alaska Certified Erosion and Sediment Control Lead
APDES	Alaska Pollutant Discharge Elimination System
BMP	Best Management Practice
CESSWI	Certified Erosion, Sediment and Storm Water Inspector
CFR	Code of Federal Regulations
CGP	Construction General Permit
CISEC	Certified Inspector of Sediment and Erosion Control
CPESC	Certified Professional in Erosion and Sediment Control
CPISM	Certified Professional in Industrial Stormwater Management
CPSWQ	Certified Professional in Storm Water Quality
CWA	Clean Water Act
DWPA	Drinking Water Protection Areas
ELG	Effluent Limit Guideline
EPA	United States Environmental Protection Agency
ESA	Endangered Species Act
FWS	United States Fish and Wildlife Service
MS4	Municipal Separate Storm Sewer System
MSGP	Multi-Sector General Permit
NHPA	National Historic Preservation Act
NMFS	United States National Marine Fisheries Service
NOI	Notice of Intent
NOT	Notice of Termination
PAM	Polyacrylamides
POTW	Publicly Owned Treatment Works
PWS	Public Water Systems
SHPO	State Historic Preservation Office
SWPPP	Storm Water Pollution Prevention Plan
THPO	Tribal Historic Preservation Officer
TMDL	Total Maximum Daily Load
WQS	Water Quality Standard

Appendix C Definitions

Definitions

2-year, 24-hour storm event	Means the maximum 24-hour precipitation event with a probable recurrence interval of once in two (2) years, respectively.
Active Treatment System (ATS)	For the purposes of this permit, means a treatment system comprised of automated chemical dispensing, mechanical aeration, pumps, and/or mechanical filtration that employs chemical coagulation, chemical flocculation, or electrocoagulation in order to reduce turbidity caused by fine suspended sediment. The system may also use gravity separation, inert media filtration and absorptive media. It does not include the passive application of treatment chemicals through the use of pre-manufactured products (e.g. floc logs, floc blocks, etc).
Actively Staffed	Projects that employ a sufficient number of essential personnel to maintain day-to-day operations at a construction site. Examples of essential personnel usually include a project engineer, foreman, or inspectors.
Activity	Any “point source” or any other facility or activity (including land or appurtenances thereto) that is subject to regulation under the APDES program.
Alaska Climatic Regions	For the purposes of this permit, means the climatic region (Coastal, South-central, Western, Interior, and Arctic) that the construction activity is located.
Anionic Polyacrylamide	Means a negatively charged chemical agent that binds soil particles together, which promotes coagulation and rapid settling.
Arid Areas	Areas with an average total precipitation of 0 to 10 inches. See xmacis.rcc-acis.org/ for precipitation data from the weather station closet to the construction project.
Best Management Practices (BMPs)	Schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the discharge of pollutants to waters of the United States (U.S.). BMPs also include treatment requirements, operating procedures, and practice to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.
Buffer	For the purposes of this permit, means a setback that establishes a no-disturbance vegetated zone along and around waters of the U.S.. The buffer consists of a dense turf or vegetation judiciously placed across the path of surface runoff in a way that promotes sheet flow that can reduce the velocity of flow, increase the likelihood of infiltration, and promote the trapping and settling of suspended matter. It may be used in combination with other control measures in a treatment train approach to promote erosion and sediment control.
Business Day (or work day)	A day on which work is performed on site. For State offices, typically, Monday thru Friday with the exception of state holidays. For state holidays, see http://doa.alaska.gov/calendar.

Borrow Area	The areas where materials are dug for use as fill, either onsite or off-site.
Bypass	Defined in 40 CFR §122.41 and incorporated here by reference. Bypass means the intentional diversion of waste streams from any portion of a treatment facility. See Appendix A, Part 2.6.
Cationic Treatment Chemical	For the purposes of this permit, means polymers, flocculants, or other chemicals that contain an overall positive charge. Among other things, they are used to reduce turbidity in storm water discharges by chemically bonding to the overall negative charge of suspended silts and other soil materials and causing them to bind together and settle out. Common examples of cationic treatment chemicals are chitosan and cationic PAM.
Clean Water Act (CWA)	Means the Clean Water Act or the Federal Water Pollution Control Act, 33 U.S.C. section 1251 et seq.
Clearing	For the purposes of this permit, means the cutting down and removal of trees and brush without the disturbance of soils and the root mass.
Coagulants	Are substances that cause clumping of particles in a discharge to settle out impurities, often induced by chemicals such as lime, alum, and iron salts.
Commencement of Construction Activities or Construction Activity	For the purposes of this permit, means the initial disturbance of soils associated with clearing that disturbs the vegetative mat/grubbing, grading, or excavating activities or other construction-related activities (e.g., stockpiling of fill material, establishment of staging areas, or development of project-specific material sources).
Common Plan of Development or Sale	For the purposes of this permit, means a site where multiple separate and distinct construction activities may be taking place at different times on different schedules, but still under a single plan. Examples include: 1) phased projects and projects with multiple filings or lots, even if the separate phases or filings/lots will be constructed under separate contract or by separate owners (e.g., a development where lots are sold to separate builders); 2) a development plan for a rural infrastructure project that may be phased over multiple years and is under a consistent plan for long-term development (e.g., a project that is designed to be built over several years, however funding is available for those phases on a year-to-year basis). Projects that have multiple year development plans but have year-to-year funding shall file NOI and NOT at the beginning and end of each funded phase of the project; and 3) projects in a contiguous area that may be unrelated but still under the same contract, such as construction of a building extension and a new parking lot at the same facility. If the project is part of a common plan of development or sale, the disturbed area of the entire plan shall be used in determining permit requirements. For land subdivided for residential lots, see the definition of ‘Residential Subdivision’ for further discussion of the requirements.

	Where discrete construction projects within a larger common plan of development or sale are located one-quarter mile or more apart and the area between the projects is not being disturbed, each individual project can be treated as a separate plan of development or sale provided any interconnecting road, pipeline or utility project that is part of the same "common plan" is not being disturbed. If a utility company is constructing new trunk lines off an existing transmission line to serve separate residential subdivisions located more than one-quarter mile apart, the two trunk line projects could be considered to be separate projects.
Control Measure	For the purposes of this permit, refers to any BMP or other method used to prevent or reduce the discharge of pollutants to waters of the U.S..
Construction and Development Rule (C&D Rule)	As published in 40 CFR §450 is the regulation requiring effluent limitations guidelines (ELG's) and new source performance standards (NSPS) for controlling the discharge of pollutants from construction sites.
Disaster	Has the meaning in AS 26.23.900. As defined in AS 26.23.900 the term includes, but is not limited to, the occurrence or imminent threat of widespread or severe damage, injury, loss of life or property, or shortage of food, water, or fuel resulting from an incident such as storm, high water, wind-driven water, tidal wave, tsunami, earthquake, volcanic eruption, landslide, mudslide, avalanche, snowstorm, prolonged extreme cold, drought, fire, flood, epidemic, explosion, or riot; the release of oil or a hazardous substance if the release requires prompt action to avert environmental danger or mitigate environmental damage; and equipment failure if the failure is not a predictably frequent or recurring event or preventable by adequate equipment maintenance or operation.
Disaster Emergency	For the purposes of this permit, means the condition declared by proclamation of the governor or declared by the principal executive officer of a political subdivision to designate the imminence or occurrence of a disaster.
Department or DEC	Refers to the Alaska Department of Environmental Conservation
Discharge	When used without qualification means the "discharge of a pollutant"
Discharge of Storm Water Associated with Construction Activity	For the purposes of this permit, refers to a discharge of pollutants in storm water from areas where soil disturbing activities (e.g., clearing, grading, or excavation), construction materials or equipment storage or maintenance (e.g., fill piles, borrow area, concrete truck chute washdown, fueling), or other industrial storm water directly related to the construction process (e.g., concrete or asphalt batch plants) are located.
Discharge Point	Means the location where collected and concentrated storm water flows are discharged from the construction site.

Disturbed Area	Is a portion of any site that has been altered from pre-existing conditions, including but not limited to the following: providing access to a site, grubbing and clearing of vegetation (including the roots), grading, earth moving, altering land forms, and other construction-related activities (such as placement of project related stockpiles atop a soil surface).
Effluent	For the purposes of this permit, means any discharge of storm water and allowable non-storm water by a permittee either to the receiving water or beyond the property boundary controlled by the permittee.
Effluent Limit Guideline	Defined in 40 CFR §122.a as a regulation published by the Administrator under section 304(b) of the Clean Water Act to adopt or review effluent limitations.
Electronic Notice of Intent (eNOI)	For the purposes of this permit, means the ADEC online system for submitting electronic Construction General Permit forms.
Eligible	Qualified for authorization to discharge storm water under this general permit.
Equivalent Analysis Waiver	Means a waiver, available only to small construction activities which discharge to non-impaired waters only, based on the permittee performance of an equivalent analysis using existing instream concentrations, expected growth in pollutant concentrations from all sources, and a margin of safety
Erosion	Is the process of wearing away of the land surface by water, wind, ice, gravity, or other geologic agents.
Erosion Control Measures	Are control measures intended to minimize dislodging and mobilizing of sediment particles
Excavation Dewatering	The practice of dewatering excavation areas through the use of pumps placed within the excavation or well pumps in adjacent dewatering wells which lower the water table to provide a relative dry working condition.
Exceptional Recreational or Ecological Significance	For the purposes of this permit, means a waterbody that is important, unique, or sensitive ecologically and has been designated as an Outstanding Natural Resource Water or Tier 3 water.
Fall Freeze-up	For the purposes of this permit, means for planning purposes in the development of the SWPPP and initial planning of control measure maintenance the date in the fall that air temperatures will be predominately below freezing. It is the date in the fall that has an 80% probability that a minimum temperature below a threshold of 32.5 degrees Fahrenheit will occur on or after the given date. This date can be found by looking up the "Fall 'Freeze' Probabilities" for the weather station closest to the site on the website www.wrcc.dri.edu/summary/Climsmak.html. Alternatively, the Fall Freeze-up can be estimated by using the 5-year moving average from the First/Last dates where the minimum temperature below a threshold of 32.5 degrees Fahrenheit will occur on or after the given date for the weather station closest to the site on the website xmacis.rcc-acis.org. NOTE: this estimation of "Fall Freeze-up" is for planning purposes only. During construction the permittee will need to maintain control measures based on actual conditions.

Facility	See "activity."
Federal Facility	Any buildings, installations, structures, land, public works, equipment, aircraft, vessels, and other vehicles and property, owned by, or constructed or manufactured for the purpose of leasing to, the Federal government.
Field Measurements	Are testing procedures performed in the field with portable field-testing kits or meters.
Fill-only projects	For the purposes of this permit, means projects where the road prism or gravel pad is constructed using low-erodible fill material placed over an undisturbed vegetative mat. Typically, there is not soil disturbance that may be subject to erosion.
Flocculants	Are substances that interact with suspended particles and bind them together to form flocs. These flocs more readily settle out compared to individual particles.
Frozen Ground	For the purposes of this permit, is characterized by soil temperature below freezing. Frozen ground by itself is not considered an acceptable stabilization control measure. It may be used in combination with control measures (e.g. track walking, downgradient control measures, etc.)
Good Housekeeping Measures	For the purposes of this permit, means storm water controls designed to reduce or eliminate the addition of pollutants to construction site discharges through analysis of pollutant sources, implementation of proper handling and/or disposal practices, employee education, and other actions.
Grubbing	For the purposes of this permit, means the stripping and removal of the root mass on or near the ground surface. This is considered soil disturbance activity and requires coverage under this permit.
Hazardous Materials or Hazardous Substances or Hazardous or Toxic Waste	For the purposes of this permit, any liquid, solid, or contained gas that contain properties that are dangerous or potentially harmful to human health or the environment. See also 40 CFR §261.2.
Immediately	No later than the end of the next work day, following the day when the earth-disturbing activities have temporarily or permanently ceased.
Impaired Water	(or "Water Quality Impaired Water" or "Water Quality Limited Segment") is defined as a water that is impaired for purposes of this permit if it has been identified by the State of Alaska or EPA pursuant to Section 303(d) of the Clean Water Act as not meeting applicable State WQSs (These waters are called "water quality limited segments" under 40 CFR §30.2(j)). Impaired waters include both waters with approved or established TMDLs, and those for which a TMDL has not yet been approved or established. For more information and current listing of impaired waters, see http://dec.alaska.gov/water/water-quality/impaired-waters.

Indian Country	Defined at 40 CFR §122.2 to mean: 1. All land within the limits of any Indian reservation under the jurisdiction of the United States Government, notwithstanding the issuance of any patent, and including rights-of-way running through the reservation; 2. All dependent Indian communities with the borders of the United States whether within the originally or subsequently acquired territory thereof and whether within or without the limits of a state; and 3. All Indian allotments, the Indian titles to which have not been extinguished, including rights-of-ways running through the same.
Infeasible	Defined in 40 CFR §450.11 and incorporated here by reference. Infeasible means not technologically possible, or not economically practicable and achievable in light of best industry practices.
Large Construction Activity	Defined at 40 CFR §122.26(b)(14)(x) and incorporated here by reference. A large construction activity includes clearing, grading, and excavating resulting in a land disturbance that will disturb equal to or greater than five acres of land or will disturb less than five acres of total land area but is part of a larger common plan of development or sale that will ultimately disturb equal to or greater than five acres. Large construction activity does not include routine maintenance that is performed to maintain the original line and grade, hydraulic capacity of conveyance channels, or original purpose of the site.
Linear Project	Is a land disturbing activity as conducted by an underground/overhead utility or highway department, including but not limited to any cable line or wire for the transmission of electrical energy; any conveyance pipeline for transportation of gaseous or liquid substance; any cable line for communications; or any other energy resource transmission right-of-way or utility infrastructure (e.g., roads and highways) along a long narrow area.
Maintenance	Activities performed to maintain the original line and grade, hydraulic capacity of conveyance channels, or original purpose of the site. For the purposes of this permit, means projects that repair, rehabilitate, or replace existing structures or facilities, provided that the maintenance activity does not change the original purpose of the structure or facility. Maintenance may include minor deviations in the configuration of the structure or facility due to changes in materials, construction methods, or current construction codes or safety standards.
Master Plan	For the purposes of this permit, means if the permittee has a long-range master plan of development (e.g. a rural infrastructure improvement project or military base construction) where some portions of the master plan are a conceptual rather than a specific plan of future development and the future construction activities would, if they occur at all, happen over an extended time period, the permittee may consider the “conceptual” phases of a master plan to be separate “common plans” provided the periods of construction for the physically interconnected phases do not overlap.

Mean Annual Precipitation	This is the average total precipitation based on weather records. This data is available on the website for the Western Regional Climate Center https://xmacis.rcc-acis.org/.
Minimize	To reduce and/or eliminate to the extent achievable using control measures and good housekeeping measures that are technologically available and economically practicable and achievable in light of best industry practices.
Minimize Pollutant Discharge	See 'Minimize'
Municipality	A home rule municipality is a municipal corporation and political subdivision. It is a city or a borough that has adopted a home rule charter, or it is a unified municipality. A home rule municipality has all legislative powers not prohibited by law or charter. (§ 3 ch 74 SLA 1985) A general law municipality is a municipal corporation and political subdivision and is an unchartered borough or city. It has legislative powers conferred by law. (§ 3 ch 74 SLA 1985)
Municipal Separate Storm Sewer System (MS4)	Defined at 40 CFR §122.26(b)(8) to mean a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, manmade channels, or storm drains): 1. Owned and operated by a state, city, town, borough, county, parish, district, association, or other public body (created by or pursuant to State law) having jurisdiction over disposal of sewage, industrial wastes, storm water, or other wastes, including special districts under State law such as a sewer district, flood control district or drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management agency under Section 208 of the CWA that discharges to waters of the U.S.; 2. Designed or used for collecting or conveying storm water; 3. Which is not a combined sewer; and 4. Which is not part of a Publicly Owned Treatment Works (POTW) as defined at 40 CFR §122.2.
Nephelometric Turbidity Unit (NTU)	Is an expression of the optical property that causes light to be scattered and absorbed rather than transmitted in a straight line through the water.
New Project	The "commencement of construction" occurs after the effective date of this permit.
New Source	For the purpose of this permit, is any source whose discharges are defined in 40 CFR §122.26(b)(14)(x) and (b)(15), that commences construction activity after the effective date of the new Construction &Development rule.
New Source Performance Standards (NSPS)	Are technology-based standards for a construction site that qualifies as new source under 40 CFR §450.24.

Non-Storm Water Discharges	Are discharges that do not originate from storm events. They can include, but are not limited to, discharges of process water, air conditioner condensate, non-contact cooling water, vehicle wash water, sanitary wastes, concrete washout water, paint wash water, irrigation water, or pipe testing water.
Notice of Intent (NOI)	Is the form required to be submitted by an applicant to the Department to obtain authorization of coverage under the Alaska Construction General Permit.
Notice of Termination (NOT)	Is the form required for terminating coverage under the Alaska Construction General Permit.
Ongoing Project	The “commencement of construction” occurs before the effective date of this permit.
Operator	For the purpose of this permit, and in the context of storm water associated with construction activity, means any person associated with a construction project that meets either of the following two criteria: 1. The person has operational control over construction plans and specifications, including the ability to make modifications to those plans and specifications; or 2. The person has day-to-day operational control of those activities at a site which are necessary to ensure compliance with a SWPPP for the site or other permit conditions (e.g., the person is authorized to direct workers at a site to carry out activities required by the SWPPP or comply with other permit conditions). This definition is provided to inform permittees of the Department’s interpretation of how the regulatory definitions of “owner or operator” and “facility or activity” are applied to discharges of storm water associated with construction activity. Subcontractors generally are not considered operators for the purposes of this permit.
Owner	For the purposes of this permit, means the owner of any “facility or activity” subject to regulation under the APDES program.
Outfall	See ‘Discharge Point.’
Permanent Storm Water Management Controls	For the purposes of this permit, refers to “Nondomestic wastewater treatment works” as described in 18 AAC 72.990. These controls include: dry extended detention ponds, constructed wetlands, wet ponds, sand filters, oil/grit separator, rotational flow separators, etc.
Permitted Ongoing Project	Is a construction project that commenced prior to the effective date of this permit, which has been covered by a prior general permit for storm water discharges.
Permittee	Is a person who is authorized to discharge pollutants to waters of the U.S. in accordance with the conditions and requirements of this permit.

Person	For the purposes of this permit, means any public or private entity including but not limited to an individual, trust, firm, joint stock company, corporation (including government corporation), partnership, association, federal agency, state agency, city, borough, municipality, commission, political subdivision of the State, any interstate body or tribe.
Point Source	Any discernible, confined, and discrete conveyance, including but not limited to, any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock concentrated animal feeding operation, landfill leachate collection system, vessel or other floating craft from which pollutants are or may be discharged. This term does not include return flows from irrigated agriculture or agricultural storm water runoff.
Pollutant	Defined at 40 CFR §122.2. A partial listing from this definition includes: dredged spoil, solid waste, sewage, garbage, sewage sludge, chemical wastes, biological materials, heat, wrecked or discarded equipment, rock, sand, cellar dirt, and industrial or municipal waste.
Pollution Prevention Measures	See “Good Housekeeping Measures.”
Polyacrylamide (PAM)	For the purposes of this permit, is a long-chain organic polymer developed to clarify drinking water that has many other beneficial uses including erosion control, enhanced infiltration, and nutrient removal. Some forms of PAM can be used to stabilize soils and remove fine suspended sediments from storm water runoff. In powder form PAM is easy to store, easy to transport, and is not a health concern when used as directed. PAM dissolved in nonaqueous emulsions are not recommended for use in this permit.
Polymers	For the purposes of this permit, means coagulants and flocculants used to enhance sediment removal capabilities of check dams, sediment traps, or basins. Common construction site polymers include polyacyrlamide (PAM), chitosan, alum, polyaluminum chloride, and gypsum. A permittee using polymers should carefully consider the appropriateness of usage of these materials where there are sensitive or protected aquatic organisms in the receiving waters, including threatened or endangered species and their critical habitat.
Post-Construction Discharges	For the purposes of this permit, means the storm water discharges occurring after construction has been completed and final stabilization has been attained.
Practicable	For the purposes of this permit, means capable of being done after taking into consideration costs, existing technology, standards of construction practice, impacts to water quality, site conditions, and logistics in light of the overall project purpose.
Project Area	For the purposes of this permit, meant that

1. The areas on the construction site where storm water discharges originate and flow toward the point of discharge into the receiving waters (including areas where excavation, site development, or other ground disturbance activities occur) and the immediate vicinity. (Example: 1. Where bald eagles nest in a tree that is on or bordering a construction site and could be disturbed by the construction activity. 2. Where grading causes storm water to flow into a small wetland or other habitat that is on the site that contains listed species.)
2. The areas where storm water discharges flow from the construction site to the point of discharge into receiving waters. (Example: Where storm water flows into a ditch, swale, or gully that leads to receiving waters and where listed species (such as amphibians) are found in the ditch, swale, or gully.)
3. The areas where storm water from construction activities discharge into receiving waters and the areas in the immediate vicinity of the point of discharge. (Example: Where storm water from construction activities discharges into a stream segment that is known to harbor listed aquatic species.)
4. The areas where storm water BMPs will be constructed and operated, including any areas where storm water flows to and from BMPs. (Example: Where a storm water retention pond would be built.)
5. The areas upstream and /or downstream from construction activity that discharges into a stream segment that may be affected by the discharges. (Example: Where sediment discharged to a receiving stream settles downstream and impacts a breeding area of a listed aquatic species.)

Qualified Person	Given the range in size and types of projects in Alaska the following is a description of the experience and skills of a “qualified person” for the different roles typically required at a site to ensure compliance with this permit. The recommended experience or educational requirements for each of these “roles” is described below. The required training is described in Table 4. For projects that disturb 1 to less than 5 acres, all the roles described below will or may be carried out by one person. For the larger projects there will or maybe the need to have one person for each role (that is a project-specific choice by the permittee). *Storm Water Lead/SWPPP Manager* A. A person knowledgeable in the principles and practice of erosion and sediment controls who possesses the skills to assess conditions at the construction site that could impact storm water quality and to assess the effectiveness of any erosion and sediment control measures selected to control the quality of storm water discharges from the construction activity. B. Such person shall have the authority to prepare the SWPPP, stop and/or modify construction activities as necessary to comply with the SWPPP and the terms and conditions of the permit, and modify the SWPPP. C. Such a person shall be responsible for inspections and recordkeeping. D. Such a person shall have the authority to supervise or initiate corrective actions identified by inspections, monitoring, or observation to fix control measures and minimize the discharge of pollutants.

Qualified Person (continued)	*SWPPP Preparer* A person knowledgeable in the principles and practice of erosion and sediment controls who possesses the skills to assess conditions at the construction site that could impact storm water quality, the effectiveness of any erosion and sediment control measures selected to control the quality of storm water discharges from the construction activity, and is familiar with Part 5 as a means to implement this permit. *Storm Water Inspector* A person knowledgeable in the principles and practice of erosion and sediment controls who possesses the skills to assess conditions at the construction site that could impact storm water quality, the effectiveness of any erosion and sediment control measures selected to control the quality of storm water discharges from the construction activity, and is familiar with Part 6 as a means to ensure compliance with this permit. The person is familiar with the project specific inspection forms and how to fill them out, responsible for conducting inspections, and responsible for reporting the need for follow-up corrective action to the Storm Water Lead or site supervisor. *Monitoring Person* A person knowledgeable in the principles and practices of water quality monitoring who is familiar with Part 7 and the monitoring plan for the site and how to conduct water quality sampling, testing, and reporting. *Active Treatment System Operator* A person knowledgeable in the principles and practices of treatment systems that employs chemical coagulation, chemical flocculation, or electrocoagulation to aid in the treatment of storm water runoff who is familiar with Part 4.5 as a means to implement and comply with this permit.

*(*Table 4: Recommended Experience or Required Training for Specific Roles *is located on the following page.)*

Qualified Person (continued)

Table 4: Recommended Experience or Required Training for Specific Roles

Storm Water Role	**Total Project Disturbed Acreage**		
	1 to < 5 acres	**5 acres to <20 Acres**	**> 20 Acres**
Storm Water Lead/SWPPP Manager	Recommend AK-CESCL training, but not required	Be AK-CESCL certified	Be AK-CESCL certified
SWPPP Preparer	Be familiar with permit.	Recommend taking a course in SWPPP preparation.	Be AK-CESCL certified, visit the site prior to writing the SWPPP or soon after project start and revised the SWPPP based on site conditions. Recommend taking a course in SWPPP preparation.
Storm Water Inspector	Be familiar with permit and SWPPP.	Be AK-CESCL certified	Be AK-CESCL certified
Monitoring Person	Not Required	Not Required	Be AK-CESCL certified
Active Treatment System Operator	Be AK-CESCL certified and have general experience and knowledge of storm water control measures. Have operational experience with the specific equipment used on-site.	Be AK-CESCL certified and have general experience and knowledge of storm water control measures. Have operational experience with the specific equipment used on-site.	Be AK-CESCL certified and have general experience and knowledge of storm water control measures. Have operational experience with the specific equipment used on-site.

	Note: The following training and certifications may substitute for AK-CESCL training and certification: CPESC, CESSWI, CPISM or CPSWQ by EnviroCert International, Inc (ECI, http://envirocertintl.org) or CISEC by CISEC, Inc. (http://cisecinc.org).
Rain Gauge	For the purposes of this permit, means a type of instrument to gather and measure the amount of liquid precipitation occurring during a storm event for a set period of time.
Rainfall Erosivity Factor or R Factor	Means a measure of the erosive force and intensity of rain in a normal year. Two components of the factor are total energy and the maximum 30-minute intensity of storms. The R-Factor is the sum of the product of these two components for all major storms in the area during an average year.
Rainfall Erosivity Waiver	Means a waiver, available only to small construction activities, that is based on the rainfall erosivity factor for the project.
Reasonable	For purposes of this permit, means the permittee has selected, designed, installed, implemented and maintained control measures in light of manufacture's specifications and good engineering practices at the project to meet the control measures and good housekeeping measures established in Part 4.0 of the permit.
Reasonable Time(s)	For inspections it is time when inspections may occur, typically during normal business hours of 8:00 am to 5:00 pm Monday through Friday, except for those construction sites that are operational outside of these times. For information requests it is thirty (30) calendar days from the date of the receipt of a written request for information from the department, unless specified otherwise in this permit.
Receiving Water	The "Water of the United States" as defined in 40 CFR §122.2 into which the regulated storm water discharges
Residential Subdivision	For the purposes of this permit, means any parcel of land that is divided into smaller parcels with the intent of selling the smaller parcels for the development of residential homes for individual ownership.
Rural Infrastructure Improvement Project	For the purposes of this permit, means a project that is a rural water, wastewater, solid waste, or energy project that is funded, designed, or built by a third party such as the Alaska Native Tribal Health Consortium, DEC Village Safe Water Program, or the Alaska Energy Authority for a 2nd class city, Tribe, Community Association, or statutory improvement district.
Rural Infrastructure Improvement Project Operators	For the purposes of this permit, means the agency or entity with "design control over plans and specifications" that acts as the operator rather than the ultimate owner of the rural infrastructure improvement project.
Sampling Point	For the purposes of this permit, means that point at which storm water samples are collected where the storm water or authorized non-storm water is discharged from the site.
Sediment	Is solid particulate matter, both mineral and organic, that is in suspension, is being transported, or has been moved from its site of origin by air, water, gravity, or ice and has come to rest on the earth's surface either above or below sea level.

Sedimentation	Is the process of deposition of suspended matter carried by water, wastewater, or other liquids by gravity. It is usually accomplished by reducing the velocity of the liquid below the point at which it can transport the suspended material.
Sediment Control Measures	Are control measures that serve to capture sediment particles that have mobilized and are entrained in storm water with the objective of removing sediment and other pollutants from the storm water discharge. Examples of sediment control measures include but not limited to berms, dikes, fiber rolls, silt fences, sandbags, or gravel bags.
Semi-Arid Areas	Areas with an average total precipitation of 10 to 20 inches. See xmacis.rcc-acis.org/ for precipitation data from the weather station closest to the project.
Sensitive Area	For the purposes of this permit, means any lakes, ponds, perennial and intermittent streams, vernal pools, wetlands, floodplains, floodways and areas with highly erodible soils, which need special protection.
Sheet Flow	Is slow-velocity runoff that flows or is directed to flow across an overland area where there are no defined channels and the water spreads out over a large area at a uniform depth. Sometimes referred to as “sheetwash.”
Site	The land or water area where any “facility or activity” is physically located or conducted, including adjacent and off-site land used in connection with the facility or activity, including related areas for support activities.
Small Construction Activity	Defined at 40 CFR §122.26(b)(15) and incorporated here by reference. A small construction activity includes clearing, grading, and excavating resulting in a land disturbance that will disturb equal to or greater than one (1) acre and less than five (5) acres of land or will disturb less than one (1) acre of total land area but is part of a larger common plan of development or sale that will ultimately disturb equal to or greater than one (1) acre and less than five (5) acres. Small construction activity does not include routine maintenance that is performed to maintain the original line and grade, hydraulic capacity of conveyance channels, or original purpose of the site.
Snowmelt	The conversion of snow into water runoff that may infiltrate into the ground with the onset of warmer temperatures.

Spring Thaw	For the purposes of this permit, means for planning purposes in the development of the SWPPP and initial planning of control measure maintenance the date in the spring that air temperatures will be predominately above freezing. It is the date in the spring that has a 20% probability that a minimum temperature below a threshold of 32.5 degrees Fahrenheit will occur on or after the given date. This date can be found by looking up the "Spring 'Freeze' Probabilities" for the weather station closest to the project on the website www.wrcc.dri.edu/summary/Climsmak.html. Alternatively, the Spring Thaw can be estimated by using the 5-year moving average from the First/Last dates where the minimum temperature below a threshold of 32.5 degrees Fahrenheit will occur on or after the given date for the weather station closest to the project site on the website xmacis.rcc-acis.org. NOTE: this estimation of "Spring Thaw" is for planning purposes only. During construction the permittee will need to maintain control measures based on actual conditions.
Stabilization	The use of vegetative and/or non-vegetative cover to prevent erosion and sediment loss in areas exposed by Construction Activities.
Temporary Stabilization	For the purposes of this permit, means protecting soils from erosion and sediment loss by rainfall, snow melt, runoff, or wind, with a temporary vegetative and/or non-vegetative protection cover. Temporary stabilization may include a combination of surface roughening (track walking), temporary seeding, geotextiles, mulches, surface tackifers, rolled erosion control products, gravel or paving, and other techniques to reduce or eliminate erosion until either final stabilization can be achieved or until further construction activities take place to re-disturb this area.
Final Stabilization	For the purposes of this permit, means that: 1. All soil disturbing activities at the site have been completed and either of the two following criteria shall be met: a. a uniform (e.g., evenly distributed, without large bare areas) perennial vegetative cover with a density of 70 percent of the native background vegetative cover for the area has been established on all unpaved areas and areas not covered by permanent structures, or b. equivalent non vegetative permanent stabilization measures have been employed (such as the use of riprap, gabions, porous backfill (ADOT&PF Specification 703-2.10), railroad ballast or subballast, ditch lining (ADOT&PF Specification 610-2.01), geotextiles, or fill material with low erodibility as determined by an engineer familiar with the site and documented in the SWPPP). 2. When background native vegetation will cover less than 100 percent of the ground (e.g., arid areas, beaches), the 70 percent coverage criteria is adjusted as follows: if the native vegetation covers 50 percent of the ground, then 70 percent of 50 percent (0.70 X 0.50 = 0.35) would require 35 percent total cover for final stabilization. On a beach with no natural vegetation, no stabilization is required.

	3. In arid and semi-arid areas only, all soil disturbing activities at the site have been completed and both of the following criteria have been met: a. Temporary erosion control measures (e.g., degradable rolled erosion control product) are selected, designed, and installed along with an appropriate seed base to provide erosion control for at least three years without active maintenance by the permittee; b. The temporary erosion control measures are selected, designed, and installed to achieve 70 percent vegetative coverage within three years. 4. For individual lots in residential construction, final stabilization means that either: a. The homebuilder has completed final stabilization as specified above, or b. The homebuilder has established temporary stabilization including perimeter controls for an individual lot prior to occupation of the home by the homeowner and informing the homeowner of the need for, and benefits of, final stabilization. 5. For construction projects on land used for agricultural purposes (e.g., pipelines across crop or range land, staging areas for highway construction, etc.), final stabilization may be accomplished by returning the disturbed land to its preconstruction agricultural use. Areas disturbed that were not previously used for agricultural activities, such as buffer strips immediately adjacent to ‘‘water of the United States,’’ and areas which are not being returned to their preconstruction agricultural use must meet the final stabilization criteria (1) or (2) or (3) above.
Steep Slope	For the purposes of this permit, mean any slope occurring on the construction site that is 20 percent or greater in grade for a length of the slope that exceeds 25 feet.
Storm Event	For the purposes of this permit, means a rainfall event that produces more than 0.5 inch of precipitation in 24 hours and that is separated from the previous storm event by at least 3 days of less than 0.1 inch of rain per day.
Storm Water	Storm water runoff, snow melt runoff, and surface runoff and drainage.
Storm Water Controls	See ‘Control Measure’
Storm Water Discharge-Related Activities	Activities that cause, contribute to, or result in storm water point source pollutant discharges, including but not limited to: excavation, site development; grading and other surface disturbance activities; and measures to control storm water including the sitting, construction and operation of BMPs to control, reduce or prevent storm water pollution.
Storm Water Inlet	A structure placed below grade to conduct water used to collect storm water runoff for conveyance purposes.

Storm Water Pollution Prevention Plan (SWPPP)	Means a site-specific, written document that: (1) identifies potential sources of storm water pollution at the construction site; (2) describes practices to reduce or eliminate pollutants in storm water discharges from the construction site; and (3) identifies procedures the permittee will implement to comply with the terms and conditions of this general permit.
Support Activities	For the purposes of this permit, means any concrete or asphalt batch plants, equipment staging yards, material storage areas, excavated material disposal areas, and borrow areas provided: 1. The support activity is directly related to the construction project that is covered under this general permit, 2. The support activity is not a commercial operation serving multiple unrelated construction projects by different permittees, 3. The support activity does not operate beyond the completion of the construction activity at the project it supports, and 4. Appropriate control measures are identified in the SWPPP covering the discharges from the support activity areas. Material borrow areas that are developed specific for the projects and are non-contiguous to the project site (e.g. the material is barged in from another area not nearby the project area) are considered “support activities” however, they would not need to be routinely inspected as part of the project. These areas would need to comply with other conditions of the permit to control storm water discharge as described in the SWPPP. The permit provides an exception for concrete or asphalt plants used for highway paving projects that may also, incidental to the main project contract, pave residential driveways. This additional paving is allowed under this permit provided those activities are covered under the SWPPP. For communities where equipment or materials are barged in, flown in, or shipped by Alaska Marine Highway, the support activities may serve more than one project if: (1) each project that qualifies for coverage under this permit files a project-specific NOI and includes an acknowledgement of the shared support activities; (2) identifies the operator responsible for maintaining those support activities in compliance with permit requirements; and (3) identifies the operator responsible for the support activities until an NOT is filed at the conclusion of use of the support activity.
Tackifier and Soil Stabilizer (binder)	For the purposes of this permit, means hydraulically applied chemicals derived from natural and synthetic sources used for erosion control to promote adhesion among soil particles or mulch materials. In general soil stabilizers (also known as soil binders) are used to increase soil adhesion, which improves soil stabilization by reducing water and wind driven erosion. Tackifiers are used as “glue” to bind and immobilize straw, cellulose products, pine needles, or other mulch that has been applied to a seeded area. Common examples include polyacrylamide, guar, chloride compounds, psyllium, resins, enzymes, surfactants, and various polymers, starches, and other compounds.

Total Maximum Daily Load (TMDL)	The sum of the individual wasteload allocations (WLAs) for point sources and load allocations (LAs) for nonpoint sources and natural background. If receiving water has only one point source discharger, the TMDL is the sum of that point source WLA plus the LAs for any nonpoint sources of pollution and natural background sources, tributaries, or adjacent segments. TMDLs can be expressed in terms of either mass per time, toxicity, or other appropriate measure.
TMDL Waiver	Means a waiver, available only to small construction activities, based on an EPA established or approved TMDL.
Treatment Chemicals	For the purposes of this permit, means polymers, flocculants, or other chemicals used to reduce turbidity in storm water. Tackifiers and soil stabilizers (binders) are not considered treatment chemicals.
Turbidmeter	For the purposes of this permit, means an instrument that measures the amount of light scattered at right angles to an incident light beam by particles present in a storm water sample.
Turbidity	Means a condition of water quality characterized by the presence of suspended solids and/or organic material.
Upset	Defined in 40 CFR §122.41 and incorporated here by reference. Upset means an exceptional incident in which there is unintentional and temporary non-compliance with technology-based permit effluent limitations because of factors beyond the reasonable control of the permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation. See Appendix A, Part 2.7.
Water Quality Impaired	See ‘Impaired Water.’
Water Quality Standard (WQS)	For the purposes of this permit, means the Alaska Water Quality Standards (18 AAC 70) as approved by U.S. EPA. As defined in 40 CFR § 131.3 water quality standards are provisions of State or Federal law which consist of a designated use or uses for the waters of the U.S. and water quality criteria for such waters based upon such uses. Water quality standards are to protect the public health or welfare, enhance the quality of water and serve the purposes of the Clean Water Act.
waters of the U.S. (WOUS)	Defined in 40 CFR §122.2 and incorporated here by reference.
Wetland	Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.
Winter Construction	For the purposes of this permit, means the commencement of construction specifically during frozen conditions to aid in construction. Typically, this period is from December to March and is approximately from after fall freeze-up to before spring thaw.

Winter Shutdown	For the purposes of this permit, means the cessation of soil disturbing or soil stabilizing construction activity for the winter. Typically this period is from October/November to April/May and is approximately from fall freeze-up to spring thaw.

Appendix D Small Construction Waivers and Instructions

These waivers are only available to storm water discharges associated with small construction activities (i.e., 1-5 acres). As the operator of a small construction activity, the operator may be able to qualify for a waiver in lieu of needing to obtain coverage under this general permit based on: (A) a low rainfall erosivity factor, (B) a TMDL analysis, or (C) an equivalent analysis that determines allocations for small construction sites are not needed. Each applicant, otherwise needing permit coverage, must notify DEC of its intention for a waiver. It is the responsibility of that person wishing to obtain a waiver from coverage under this general permit to submit a complete and accurate waiver certification as described below. Where the operator changes or another is added during the construction project, the new operator must also submit a waiver certification to be waived.

D.1 Rainfall Erosivity Waiver

Under this scenario the small construction project's rainfall erosivity factor calculation ("R" in the Revised Universal Soil Loss Equation) is less than 5 during the period of construction activity. The operator must certify to the Department that construction activity will occur only when the rainfall erosivity factor is less than 5. The period of construction activity begins at initial earth disturbance and ends with final stabilization. Where vegetation will be used for final stabilization, the date of installation of a stabilization practice that will provide temporary non-vegetative stabilization can be used for the end of the construction period, provided the operator commits (as a condition of waiver eligibility) to periodically inspect and properly maintain the area until the criteria for final stabilization as defined in the construction general permit have been met. If use of this temporary stabilization eligibility condition was relied on to qualify for the waiver, signature on the waiver with its certification statement constitutes acceptance of and commitment to complete the final stabilization process. The applicant must submit a waiver certification to the Department prior to commencing construction activities.

Note: The basis of the rainfall erosivity factor "R" was determined in accordance with Chapter 2 of Agriculture Handbook Number 703, Predicting Soil Erosion by Water: A Guide to Conservation Planning With the Revised Universal Soil Loss Equation (RUSLE), pages 21–64, dated January 1997; United States Department of Agriculture (USDA), Agricultural Research Service. R factor information for Alaska can be found in the Fact Sheet and were obtained from RUSLE2 Version 1.26.6.4 http://fargo.nserl.purdue.edu/rusle2_dataweb/RUSLE2_Index.htm. (Database last modified on Feb, 28, 2008).

If the operator is eligible for a waiver based on low erosivity potential, the operator may submit a rainfall erosivity waiver to the address listed in Appendix A, Part 1.1.1 and provide the following information on the waiver certification form in order to be waived from permitting requirements:

1. Name, address and telephone number of the operator;
2. Name (or other identifier), address, county or similar governmental subdivision, and latitude/longitude of the construction project or site;
3. Estimated construction start and completion (i.e., final stabilization) dates, and total acreage (to the nearest quarter acre) to be disturbed;
4. The rainfall erosivity factor calculation that applies to the active construction phase at your project site; and
5. A statement, signed and dated by an authorized representative as provided in Appendix A, Part 1.12, which certifies that the construction activity will take place during a period when the value of the rainfall erosivity factor is less than five.

An applicant can access the waiver certification form from ADEC's website at: (http://dec.alaska.gov/water/wastewater/stormwater/). The form must be sent to the address listed in Appendix A, Part 1.1.1, Permitting Program of this permit.

Note: If the R factor is five or greater, you cannot apply for the rainfall erosivity waiver, and must apply for permit coverage as per Part 2.2 of the construction general permit, unless you qualify for the Water Quality Waiver as described below.

If the small construction project continues beyond the projected completion date given on the waiver certification, the applicant must recalculate the rainfall erosivity factor for the new project duration. If the R factor is below five, the owner or operator must update all applicable information on the waiver certification and retain a copy of the revised waiver as part of the site SWPPP. The new waiver certification must be submitted prior to the projected completion date listed on the original waiver form to assure exemption from permitting requirements is uninterrupted. If the new R factor is five or above, the applicant must submit an NOI, in accordance with Part 2.0 of the permit.

D.2 TMDL Waiver

This waiver is available if DEC or EPA has established or approved a TMDL that addresses the pollutant(s) of concern and has determined that controls on storm water discharges from small construction activity are not needed to protect water quality. The pollutant(s) of concern include sediment (such as total suspended solids, turbidity, or siltation) and any other pollutant that has been identified as a cause of impairment of any water body that will receive a discharge from the construction activity. Information on TMDLs that have been established or approved by EPA is available from EPA online at https://www.epa.gov/tmdl/impaired-waters-and-tmdls-region-10 and from DEC online at http://dec.alaska.gov/water/water-quality/impaired-waters.

If an applicant of the construction activity is eligible for a waiver based on compliance with a DEC or EPA established or approved TMDL, the operator must provide the following information on the Waiver Certification form in order to be waived from permitting requirements:

1. Name, address and telephone number of the operator;
2. Name (or other identifier), address, county or similar governmental subdivision, and latitude/longitude of the construction project or site;
3. Estimated construction start and completion (i.e., final stabilization) dates, and total acreage (to the nearest quarter acre) to be disturbed;
4. The name of the water body(s) that would be receiving storm water discharges from your construction project;
5. The name and approval date of the TMDL;
6. A statement, signed and dated by an authorized representative as provided in Appendix A, Part 1.12 that certifies that the construction activity will take place and that the storm water discharges will occur, within the drainage area addressed by the TMDL.

D.3 Equivalent Analysis Waiver

This waiver is available for non-impaired waters only (see *2018 Approved Integrated Report*, or most current EPA-approved version: http://dec.alaska.gov/water/water-quality/integrated-report/ and http://dec.alaska.gov/water/water-quality/impaired-waters/ for list of impaired waters). The operator can develop an equivalent analysis that determines allocations for the small construction site for the pollutant(s) of concern or determines that such allocations are not needed to protect water quality. This waiver requires a small construction site to develop an equivalent analysis based on existing in-stream concentrations, expected growth in pollutant concentrations from all sources, and a margin of safety.

If an operator wants to use this waiver, the operator must develop an equivalent analysis and provide the following information to be waived from permitting requirements:

1. Name, address and telephone number of the operator;
2. Name (or other identifier), address, county or similar governmental subdivision, and latitude/longitude of the construction project or site;
3. Estimated construction start and completion (i.e., final stabilization) dates, and total acreage (to the nearest quarter acre) to be disturbed;
4. The name of the water bodies that would be receiving storm water discharges from your construction project;
5. The equivalent analysis;
6. A statement, signed and dated by an authorized representative as provided in Appendix A, Part 1.12, that certifies that the construction activity will take place and that the storm water discharges will occur, within the drainage area addressed by the equivalent analysis.

D.4 Waiver Deadlines and Submissions

1. Waiver certifications must be submitted prior to commencement of construction activities.
2. If an operator submits a TMDL or equivalent analysis waiver request, the operators request is not waived until the Department approves the request. As such, the operator may not commence construction activities until receipt of approval from the Department.
3. Late Notifications: operators are not prohibited from submitting waiver certifications after initiating clearing, grading, excavation activities, or other construction activities. The Department reserves the right to take enforcement for any unpermitted discharges that occur between the time construction commenced and waiver authorization is granted.

Submittal of a waiver certification is an optional alternative to obtaining permit coverage for discharges of storm water associated with small construction activity, provided the operator qualifies for the waiver. Any discharge of storm water associated with small construction activity not covered by either a permit or a waiver may be considered an unpermitted discharge under the CWA. As mentioned above, the Department reserves the right to take enforcement for any unpermitted discharges that occur between the time construction commenced and either discharge authorization is granted or a complete and accurate waiver certification is submitted. The Department may notify any operator covered by a waiver that they must apply for a permit. The Department may notify any construction project that has been in non-compliance with a waiver that they may no longer use the waiver for future projects. Any member of the public may petition the Department to take action under this provision by submitting written notice along with supporting justification.

Appendix E Forms

- Notice of Intent (NOI)
- Notice of Termination (NOT)
- Notice of Intent Modification
- Low Erosivity Waiver
- Annual Report

(For Agency Use) Permit Authorization #: ________________

Notice of Intent (NOI) for Storm Water Discharges Associated with Construction Activity under an APDES Construction General Permit

Submission of this Notice of Intent (NOI) constitutes notice that the party identified in Section II of this form requests authorization to discharge pursuant to the APDES Construction General Permit (CGP, AKR100000). Submission of this NOI also constitutes notice that the party identified in Section II of this form meets the eligibility requirements of the CGP for the project identified in Section III of this form. Permit authorization is required prior to commencement of construction activity until you are eligible to terminate coverage as detailed in the CGP. To obtain authorization, you must submit a complete and accurate NOI form. Refer to the instructions at the end of this form.

I. Single/Multiple NOI Project

Is this NOI for a project with a single NOI? ☐ Yes ☐ No

If "No," then your project has multiple NOIs, will the fee be paid with this NOI? ☐ Yes ☐ No

If "No," then enter the name of the operator paying the fee:

II. Operator Information

Type of Operator/Responsibility per Permit Part 1.2.1:

☐ Day-to-day operational control of on-site activities ☐ Construction Plans and Specifications

Organization:	Name:	Title:

Phone:	Fax (optional):	Email:

Mailing Address: Street or PO Box:	City	State:	Zip:

Primary SIC or NAICS Code: SIC: NAICS:

III. Project / Site Information

Project Name:	Estimated Start Date:	Estimated End Date:

Brief Description of Project:

Estimated Area to be Disturbed *(nearest tenth acre)*:

Location Address:

Borough or similar government subdivision:

Street:	City:	State:	Zip:
		Alaska	

Latitude (decimal degree, 5 places):	Longitude (decimal degree, 5 places):	Determined By: ☐ GPS ☐ Web, Source: ☐ USGS Topographic Map, scale: ☐ Other:

IV. SWPPP (Storm Water Pollution Prevention Plan)

Location of SWPPP for Viewing: ☐ Address in Section II, ☐ Address in Section III, ☐ Other

If other: Street: City: State: Zip:

Additional Info:

SWPPP Contact Information (if different than that in Section II):

Organization:	Name:	Title:

Phone:	Fax (optional):	Email:

Mailing Address: ☐ Check if same as Operator Information

Street (PO Box):

City: State: Zip:

Has the SWPPP been prepared in advance of filing this NOI?	☐ Yes ☐ No
For projects with 5 or more acres of disturbance, has a SWPPP been submitted to DEC?	☐ Yes ☐ No, ≤ 5 acres

Is your project / site less than one-acre, but part of a common plan of development? ☐ Yes ☐ No

If "Yes", provide the Permit Authorization Number and name of the common plan of development: Number: Name:

Have storm water discharges from your project / site been authorized previously by a DEC permit? ☐ Yes ☐ No

If "Yes," provide the Permit Authorization Number for the previous DEC permit?

If "Yes," have you updated your SWPPP according to the most recently issued CGP? ☐ Yes ☐ No

V. Permanent Storm Water Controls

Will you construct a permanent storm water management control measure at the project site (Part 4.11)? ☐ Yes ☐ No

If "Yes", indicate the type of measure to be installed:

☐ Pond ☐ Oil/Water/Grit Separator ☐ Proprietary Storm Water Sedimentation Device

☐ Other:

VI. Discharge Information

Does your project discharge into a Municipal Separate Storm Sewer System (MS4)? ☐ Yes ☐ No

If yes, name of the MS4 Operator:

Receiving Water and Wetlands Information: (if additional space is needed for this question, attach separate sheet or annotate in Section XI.)

a. Identify the name(s) of waterbodies or wetlands to which you discharge.	**Impaired waters/303d Listed waters**: (see http://dec.alaska.gov/water/water-quality/impaired-waters or GIS map of Impaired Waters, and Integrated Water Quality and Monitoring and Assessment Reports Webpage. **b.** Are any of your discharges directly into any segment of a 303d Listed Water, i.e. "Impaired" Water?		**c.** If you answered **YES** to question **b**, then answer the following three questions: **i.** What pollutant(s) are causing the impairment?	**ii.** Are the pollutant(s) causing the impairment present in your discharge?		**iii.** Is the discharge consistent with the assumptions and requirements of applicable EPA approved or established Total Maximum Daily Load (TMDL(s))?	
	Yes	**No**		**Yes**	**No**	**Yes**	**No**
	☐	☐		☐	☐	☐	☐
	☐	☐		☐	☐	☐	☐
	☐	☐		☐	☐	☐	☐

VII. Billing Contact Information

Organization:	Name:	Title:
Phone:	Fax (optional):	Email:

Mailing Address: ☐ Check if same as Operator Information

Street (PO Box):

City: State: Zip:

VIII. NOI Preparer (Complete if NOI was prepared by someone other than the certifier.)

Organization:	Name:	Title:
Phone:	Fax (optional):	Email:

Mailing Address: ☐ Check if same as Operator Information

Street (PO Box):

City: State: Zip:

IX. Certification Information

An Alaska Pollutant Discharge Elimination System (APDES) permit application or report must be signed by an individual with the appropriate authority per 18 AAC 83.385. For additional information, please refer to 18 AAC 83.385 at the following link: http://www.legis.state.ak.us/basis/aac.asp#18.83.385.

Corporate Executive Officer 18 AAC 83.385 (a)(1)(A)	For a corporation, a president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy- or decision-making functions for the corporation.
Corporate Operations Manager 18 AAC 83.385 (a)(1)(B)	For a corporation, the manager of one or more manufacturing, production, or operating facilities, if (i) the manager is authorized to make management decisions that govern the operation of the regulated facility, including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long term environmental compliance with environmental statutes and regulations; (ii) the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and (iii) authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.
Sole Proprietor or General Partner 18 AAC 83.385 (a)(2)	For a partnership or sole proprietorship, the general partner or the proprietor respectively.
Public Agency, Chief Executive Officer 18 AAC 83.385 (a)(3)(A)	For a municipality, state, or other public agency, the chief executive officer of the agency.
Public Agency, Senior Executive Officer 18 AAC 83.385 (a)(3)(B)	For a municipality, state, or other public agency, a senior executive officer having responsibility for the overall operations of a principal geographic unit or division of the agency.
**For Delegated Authority: the delegation must be made in writing and submitted to the DEC. An Example of written authorization delegating authority can be found at http://dec.alaska.gov/media/13316/delegation-of-signatory-authority.pdf*	
Operations Manager *(Delegated Authority)** 18 AAC 83.385 (b)(2)(A)	For a duly authorized representative, an individual or a position having responsibility for the overall operation of the regulated facility or activity, including the position of plant manager, operator of a well or a well field, superintendent or position of equivalent responsibility.
Environmental Manager *(Delegated Authority)** 18 AAC 83.385 (b)(2)(B)	For a duly authorized representative, an individual or position having overall responsibility for environmental matters for the company.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Organization:	Name:	Title:
Phone:	Fax (optional):	Email:

Mailing Address: ☐ Check if same as Operator Information

Street (PO Box):		
City:	State:	Zip:

Signature

Date

X. Document Attachments and Supplemental Information

Documents attached with this application:

☐ Copy of SWPPP if ≥ 5 acres of disturbance.

☐ Delegation of Signatory Authority.

☐ Other:

Instructions for Completing a Notice of Intent (NOI) Form for Storm Water Discharges Associated with Construction Activity under an APDES Construction General Permit

Who Must File an NOI Form:

Operators of construction sites where one or more acres are disturbed, smaller sites that are part of a larger common plan of development or sale where there is a cumulative disturbance of at least one acre, or any other site specifically designated by the Director, must submit an NOI to obtain coverage under an APDES construction general permit. Each person, firm, public organization, or any other entity that meets either of the following criteria must file this form: (1) they have operational control over construction plans and specifications, including the ability to make modifications to those plans and specifications; or (2) they have day-to-day operational control of those activities at the project necessary to ensure compliance with SWPPP requirements or other permit conditions.

Completing the Form:

Obtain and read a copy of the APDES Construction General Permit. Type or print, in the appropriate areas only. “NA” can be entered in areas that are not applicable. If you have any questions about how or when to use this form, contact the DEC Storm Water Program at (907) 269-6285 or online at http://dec.alaska.gov/water/wastewater/stormwater/.

Section I. Single/Multiple NOI Project:

Indicate whether or not this is a single NOI project. If not, indicate if the fee will be paid with this NOI or another associated with this project. Provide the name of the operator that will be paying the fee.

Section II. Operator Information:

Provide the name of the contact person, title, and the legal name of the firm, public organization, or any other entity that operates the project described in this application. (An operator of a project is a legal entity that controls at least a portion of site operations and is not necessarily the site manager.) Also provide the operator’s mailing address, telephone number, fax number (optional) and e-mail address (to be notified via e-mail of NOI approval when available). Correspondence for the NOI will be sent to this address.

Section III. Project/Site Information:

Enter the official or legal name, a brief description of the project or site, and complete street address, including city, state, zip code, and county or similar government subdivision of the project or site. If the project or site lacks a street address, indicate the general location of the site (e.g., Intersection of State Highways 61 and 34). Complete site information must be provided for permit authorization to be granted.

Provide the latitude and longitude of the facility in decimal degrees format with up to 5 digit accuracy. The latitude and longitude of your facility can be determined in several different ways, including through the use of global positioning system (GPS) receivers, U.S. Geological Survey (U.S.G.S.) topographic or quadrangle maps, Google Earth, Bing Maps, and EPA’s web-based siting tools, among others. For consistency, DEC requests that measurements be taken from the approximate center of the construction site. Applicants must specify which method they used to determine latitude and longitude. If a U.S.G.S. topographic map is used, applicants are required to specify the scale of the map used. Enter the estimated construction start and completion dates using four digits for the year (i.e., 05/27/2021).

Enter the estimated area (acres) to be disturbed including but not limited to grubbing, excavation, grading, and utilities and infrastructure installation. Indicate to the nearest tenth of an acre. Note: 1 acre = 43,560 sq. ft.

Indicate whether or not the project/site has been previously covered by an EPA or DEC permit. If “Yes” provide the permit authorization number that the project/site was covered under.

If this is a project that was covered under a previous DEC construction general permit indicate whether or not the SWPPP has been updated in accordance with the most recently issued Alaska Construction General Permit.

If the project or site is less than one-acre, but part of a common plan of development, provide the permit authorization number and name of the common plan of development.

Section IV. SWPPP (Storm Water Pollution Prevention Plan) Information:

Note the SWPPP should be prepared in advance of filing the NOI form. For projects with 5 acres or more of disturbance, the initial SWPPP will need to be submitted to DEC with the NOI. Check the appropriate box for the location where the SWPPP may be viewed. Provide the name, fax number (optional), and e-mail address of the contact person if different than that listed in Section II of the NOI form.

Section V. Permanent Storm Water Controls

A permittee must comply with applicable APDES MS4 permit requirements, local requirements, and the applicable requirements under 18 AAC 72.600 (i.e., Nondomestic Wastewater System Plan Review) regarding the design and installation of permanent storm water management controls. Annotate the type of measure to be installed and see Permit Part 4.11 for additional requirements regarding plan submittal deadlines.

Section VI. Discharge Information:

Identify the receiving water bodies or wetlands to which the project’s storm water will discharge. These should be the first bodies of water that the discharge will reach. (Note: If you discharge to more than one water body, please indicate all such waters in the space provided and attach a separate sheet if necessary.) For example, if the discharge leaves your site and travels through a roadside swale or a storm sewer and then enters a stream that flows to a river, the stream would be the receiving water body. Waters of the U.S. include lakes, streams, creeks, rivers, wetlands, impoundments, estuaries, bays, oceans, and other surface bodies of water within the confines of the U.S. and U.S. coastal waters. (Waters of the U.S. do not include man-made structures created solely for the purpose of wastewater treatment.) U.S.G.S. topographical maps may be used to make this determination. If the map does not provide a name, use a format such as "unnamed tributary to Cross Creek". If you discharge into a municipal separate storm sewer system (MS4), you must identify the water body into which that portion of the storm sewer discharges. That information should be readily available from the operator of the MS4.

Indicate if any of your storm water discharges from construction activities will be reach a 303d listed water (i.e., impaired water body)?
For a listing of impaired waters and an interactive map, see http://dec.alaska.gov/water/water-quality/impaired-waters.

Indicate whether your storm water discharges from construction activities will be consistent with the assumptions and requirements of applicable EPA approved or established total maximum daily load(s)(TMDL(s)). To answer this question, refer to http://dec.alaska.gov/water/water-quality/impaired-waters/. You may also have to contact DEC. If there are no applicable TMDLs or no related requirements, please check the "yes" box in the NOI form.

Section VII. Billing Contact Information

Provide the name of the contact person, title, and the legal name of the firm, public organization, or any other entity that is responsible for accounts payable for this project. Also provide the billing contact's mailing address, telephone number, fax number (optional), and email address. Correspondence for billing purposes will be sent to this address. If the billing contact is that same as the operator, check the box.

Section VIII. NOI Preparer Information.

If the NOI was prepared by someone other than the certifier (for example, if the NOI was prepared by the project SWPPP contact or a consultant for the certifier's signature), include the name, title, organization, address, telephone number, and email address of the NOI preparer.

Section IX. Certification Information:

The NOI must be signed as follows:

(1) For a corporation, a responsible corporate officer shall sign the NOI, a responsible corporate officer means:
  - (A) a president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy - or decision-making functions for the corporation; or
  - (B) the manager of one or more manufacturing, production, or operating facilities, if
    - (i) the manager is authorized to make management decisions that govern the operation of the regulated facility, including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long term environmental compliance with environmental statutes and regulations;
    - (ii) the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and
    - (iii) authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.

(2) For a partnership or sole proprietorship, the general partner or the proprietor, respectively; or

(3) for a municipality, state, or other public agency, either a principal executive officer or ranking elected official shall sign the application; in this subsection, a principal executive officer of an agency means
  - (A) the chief executive officer of the agency; or
  - (B) a senior executive officer having responsibility for the overall operations of a principal geographic unit or division of the agency.

(4) Include the name, title, organization, address, telephone number, and email address of the person signing the form and the date of signing. An unsigned or undated NOI form will not be considered valid application for permit coverage.

Section X. Document Attachments and Supplemental Information

Include a copy of the SWPPP if ≥ 5 acres of disturbance. Indicate documents attached and supplemental information.

Where to File NOI form

Select one of three options:

1) **Preferred Option**: DEC encourages you to complete the NOI form electronically via DEC's Online Application System (OASys): https://myalaska.state.ak.us/dec/water/OASys/Login.aspx. Filing electronically is the fastest way to obtain permit coverage and help ensure that your NOI is complete.

2) If you file by mail please submit the original form with a signature in ink. Remember to retain a copy for your records.

   NOIs sent by mail:
   Alaska Dept. of Environmental Conservation
   Division of Water
   Wastewater Discharge Authorization Program
   555 Cordova Street
   Anchorage, AK 99501
   Phone: (907) 269-6285

3) Submit all pages of scanned original form via Email: DEC.Water.WQPermit@alaska.gov. *(Note, 20MB limit).*

Notice of Termination (NOT) for Storm Water Discharges Associated with Construction Activity filed under an APDES General Permit

Submission of this Notice of Termination (NOT) constitutes notice that the operator identified in Section II of this form is no longer authorized discharge pursuant to the APDES Construction General Permit (CGP) from the site identified in Section III of this form. All necessary information must be included on this form.

Coverage under the APDES CGP is terminated at midnight of the day the NOT is signed. The NOT must be submitted within 30 calendar days of one of the conditions in Section 10.2 of the CGP being met. Refer to the instructions at the end of this form for information on submitting a NOT.

Note: As per 18 AAC 83.130(k), a permittee subject to pending state or federal enforcement actions, including citizen suits brought under state or federal law, may not submit a NOT.

I. Permit Information

Permit Tracking Number:

Reason for Termination (Check only one):

☐	Final stabilization has been achieved on all portions of the site for which you are responsible, all ground disturbing construction activity or use of support activities has been completed and all temporary BMP's have been removed.
☐	Another operator has assumed control, according to Appendix A, Part 2.3, over all areas of the site that have not been finally stabilized. Provide the other operator's permit authorization number:
☐	Coverage under an individual permit or alternative APDES general permit has been obtained.
☐	For residential construction only, temporary stabilization has been completed and the residence has been transferred to the homeowner.
☐	The planned construction activity identified on the original NOI was never initiated (e.g., no grading or earthwork was ever started) and plans for the construction have been permanently abandoned or indefinitely postponed.

II. Operator Information (as it appears on your NOI):

Organization:	Name:	Title:	
Phone:	Fax (optional):	Email:	
Mailing Address: Street or PO Box:	City	State:	Zip:

III. Project / Site Information (as it appears on your NOI):

Project / Site Name:

Location Address:	Street:			
	City:	State: Alaska	Zip:	Borough or similar government subdivision:

IV. Certification Information

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

I certify that I am not subject to any pending state or federal enforcement actions, including citizen suits brought under state or federal law.

Organization	Name	Title		
Phone	Fax (Optional)	Email		
Mailing Address: ☐ check if same as Operator Information	Street (PO Box)	City	State	Zip

Signature ______________________ Date ______________

Instructions for Completing a Notice of Termination (NOT) Form for APDES Construction General Permit

Who May File an NOT Form

Permittees presently covered under the Alaska Pollutant Discharge Elimination System (APDES) General Permit for Storm Water Discharges Associated with Construction Activity may submit an NOT form when:

- *final stabilization has been achieved on all portions of the site for which you are responsible;*
- *another operator has assumed control, in accordance with Appendix A, Part 2.3 of the General Permit, over all areas of the site that have not been finally stabilized;*
- *coverage under individual permit or an alternative APDES permit has been obtained;*
- *for residential construction only, temporary stabilization has been completed and the residence has been transferred to the homeowner; or*
- *the planned construction activity identified on the original NOI was never initiated (e.g., no grading or earthwork was ever started) and plans for the construction have been permanently abandoned or indefinitely postponed.*

"Final stabilization" means that all soil disturbing activities at the site have been completed and that a uniform perennial vegetative cover with a density of at least 70% of the native background vegetative cover for the area has been established on all unpaved areas and areas not covered by permanent structures, or equivalent permanent stabilization measures (such as the use of riprap, gabions, or geotextiles) have been employed. See "final stabilization" definition in Appendix A of the Construction General Permit for further guidance where background native vegetation covers less than 100 percent of the ground, in arid or semi-arid areas, for individual lots in residential construction, and for construction projects on land used for agricultural purposes.

Completing the Form:

Type or print, in the appropriate areas only. "NA" can be entered in areas that are not applicable. If you have any questions about how or when to use this form, contact the DEC Storm Water Program at (907) 269-6285 or online at http://dec.alaska.gov/water/wastewater/stormwater/.

Section I. Permit Number:

Enter the existing APDES Construction General Permit authorization number assigned to the project by ADEC's Storm Water Program. If you do not know the tracking number, you can find the tracking number assigned to your project/facility on DEC's Water Permit Search: http://dec.alaska.gov/Applications/Water/WaterPermitSearch/Search.aspx?number=akr10.

Indicate your reason for submitting this Notice of Termination by checking the appropriate box. Check only one.

Section II. Operator Information:

Provide the name of the contact person, and the legal name of the firm, public organization, or any other entity that operates the project described in this application. (An operator of a project is a legal entity that controls at least a portion of site operations and is not necessarily the site manager.)

Also provide the operator's mailing address, telephone number, fax number (optional) and e-mail address.

Section III. Project/Site Information:

Enter the official or legal name, and complete street address, including city, state, zip code, and county or similar government subdivision of the project or site. If the project or site lacks a street address, indicate the general location of the site (e.g., Intersection of State Highways 61 and 34). Complete site information must be provided for termination of permit authorization to be valid.

Section IV. Certification Information:

The NOT must be signed as follows:

(1) For a corporation, a responsible corporate officer shall sign the NOT, a responsible corporate officer means:

  (A) a president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy - or decision-making functions for the corporation; or

  (B) the manager of one or more manufacturing, production, or operating facilities, if

    (i) the manager is authorized to make management decisions that govern the operation of the regulated facility, including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long term environmental compliance with environmental statutes and regulations;

    (ii) the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and

    (iii) authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.

(2) For a partnership or sole proprietorship, the general partner or the proprietor, respectively; or

(3) for a municipality, state, or other public agency, either a principal executive officer or ranking elected official shall sign the application; in this subsection, a principal executive officer of an agency means

  (A) the chief executive officer of the agency; or

  (B) a senior executive officer having responsibility for the overall operations of a principal geographic unit or division of the agency.

(4) Include the name, title, and email address of the person signing the form and the date of signing. An unsigned or undated NOT form will not be considered valid termination for permit coverage.

As per 18 AAC 83.130(k) A permittee subject to pending state or federal enforcement actions, including citizen suits brought under state or federal law, may not proceed under expedited termination procedures. A permittee requesting expedited permit termination procedures must certify that it is not subject to any pending state or federal enforcement actions, including citizen suits brought under state or federal law.

Where to File NOT form

DEC encourages you to complete the NOT form electronically via DEC's Online Application System (OASys) can be found at https://myalaska.state.ak.us/dec/water/OASys/Login.aspx.Filing electronically is the fastest way to terminate permit coverage and help ensure that your NOT is complete. If you choose not to file electronically, you must send the NOT to the address listed below.

If you file by mail, please submit the original form with a signature in ink. Remember to retain a copy for your records.

NOTs sent by mail:

Alaska Dept. of Environmental Conservation
Division of Water, Wastewater Discharge Authorization Program
555 Cordova Street
Anchorage, AK 99501
Phone: (907) 269-6285
Email: DEC.Water.WQPermit@alaska.gov

Notice of Intent (NOI) Modification for Storm Water Discharges Associated with Construction Activity filed under an APDES General Permit

(***Please copy content exactly from your NOI. Indicate changes** on the **next page**.*)

I. Current NOI Information
I. Permit Authorization Number:

II. Operator Information *(as it appears on your NOI)*

Organization:	Name:	Title:	
Phone:	Fax (optional):	Email:	
Mailing Address: Street or PO Box:	City	State:	Zip:

III.Project / Site Information

Project Name:			
Brief Description of Project:			
Location Address:		Borough or similar government subdivision:	
Street:	City:	State: Alaska	Zip:

Instructions for Completing a Modification to an APDES Notice of Intent (NOI)
Use the form on the subsequent pages to indicate the items for which you are submitting this modification. Only enter the information you wish to change. You may use this form to modify an NOI that you submitted to ADEC for coverage under the Construction General Permit (CGP). If you have any questions about modifying your NOI, call the DEC Storm Water Program at (907) 269-6285.

When Should You Modify Your Notice of Intent (NOI)?

- You can use this form to update or correct information on your NOI, including:
- Owner/Operator address and contact information
- Site Information
- Start or End dates *(if estimated start or end dates differ greater than 30 days)*
- Number of acres to be disturbed
  (Note, if the original project disturbance was between 1 and < 5 acres, and now will disturb five acres or more, a SWPPP must also be submitted with the NOI modification. Please note the CGP has different provisions for small and large construction projects.)
- Storm Water Pollution Prevention Plan (SWPPP) location and contact information
- Continuation of expired permit in accordance with Part 2.6.

When must you Submit a Notice of Termination (NOT) Instead of a Modification Form?

- The owner/operator has changed: You must submit a NOT when you transfer control of a site to a new owner/operator. The new owner/operator must then file a new NOI to obtain coverage under DEC's CGP. Coverage is not transferable.

(For Agency Use) Permit Authorization #: ________________

Notice of Intent (NOI)
for Storm Water Discharges Associated with Construction Activity
under an APDES Construction General Permit

Submission of this Notice of Intent (NOI) constitutes notice that the party identified in Section II of this form requests authorization to discharge pursuant to the APDES Construction General Permit (CGP, AKR100000). Submission of this NOI also constitutes notice that the party identified in Section II of this form meets the eligibility requirements of the CGP for the project identified in Section III of this form. Permit authorization is required prior to commencement of construction activity until you are eligible to terminate coverage as detailed in the CGP. To obtain authorization, you must submit a complete and accurate NOI form. Refer to the instructions at the end of this form.

I. Single/Multiple NOI Project

Is this NOI for a project with a single NOI? ☐ Yes ☐ No

If "No," then your project has multiple NOIs, will the fee be paid with this NOI? ☐ Yes ☐ No

If "No," then enter the name of the operator paying the fee:

II. Operator Information

Type of Operator/Responsibility per Permit Part 1.2.1:

☐ Day-to-day operational control of on-site activities ☐ Construction Plans and Specifications

Organization:	Name:	Title:

Phone:	Fax (optional):	Email:

Mailing Address: Street or PO Box:	City	State:	Zip:

Primary SIC or NAICS Code: SIC:	NAICS:

III. Project / Site Information

Project Name:	Estimated Start Date:	Estimated End Date:

Brief Description of Project:	Estimated Area to be Disturbed *(nearest tenth acre)*:

Location Address:

Borough or similar government subdivision:

Street:	City:	State: Alaska	Zip:

Latitude (decimal degree, 5 places):	Longitude (decimal degree, 5 places):	Determined By: ☐ GPS ☐ Web, Source: ☐ USGS Topographic Map, scale: ☐ Other:

IV. SWPPP (Storm Water Pollution Prevention Plan)

Location of SWPPP for Viewing: ☐ Address in Section II, ☐ Address in Section III, ☐ Other

If other: Street:	City:	State:	Zip:

Additional Info:

SWPPP Contact Information (if different than that in Section II):

Organization:	Name:	Title:

Phone:	Fax (optional):	Email:

Mailing Address: ☐ Check if same as Operator Information

Street (PO Box):		
City:	State:	Zip:

Has the SWPPP been prepared in advance of filing this NOI? ☐ Yes ☐ No

For projects with 5 or more acres of disturbance, has a SWPPP been submitted to DEC? ☐ Yes ☐ No, ≤ 5 acres

Is your project / site less than one-acre, but part of a common plan of development? ☐ Yes ☐ No

If "Yes", provide the Permit Authorization Number and name of the common plan of development: Number: Name:

Have storm water discharges from your project / site been authorized previously by a DEC permit? ☐ Yes ☐ No

If "Yes," provide the Permit Authorization Number for the previous DEC permit?

If "Yes," have you updated your SWPPP according to the most recently issued CGP? ☐ Yes ☐ No

V. Permanent Storm Water Controls

Will you construct a permanent storm water management control measure at the project site (Part 4.11)? ☐ Yes ☐ No

If "Yes", indicate the type of measure to be installed:

☐ Pond ☐ Oil/Water/Grit Separator ☐ Proprietary Storm Water Sedimentation Device

☐ Other:

VI. Discharge Information

Does your project discharge into a Municipal Separate Storm Sewer System (MS4)? ☐ Yes ☐ No

If yes, name of the MS4 Operator:

Receiving Water and Wetlands Information: (if additional space is needed for this question, attach separate sheet or annotate in Section XI.)

Impaired waters/303d Listed waters:
(see http://dec.alaska.gov/water/water-quality/impaired-waters or GIS map of Impaired Waters, and Integrated Water Quality and Monitoring and Assessment Reports Webpage.

a. Identify the name(s) of waterbodies or wetlands to which you discharge.	**b.** Are any of your discharges directly into any segment of a 303d Listed Water, i.e. "Impaired" Water?		**c.** If you answered **YES** to question **b**, then answer the following three questions: **i.** What pollutant(s) are causing the impairment?	**ii.** Are the pollutant(s) causing the impairment present in your discharge?		**iii.** Is the discharge consistent with the assumptions and requirements of applicable EPA approved or established Total Maximum Daily Load (TMDL(s))?	
	Yes	**No**		**Yes**	**No**	**Yes**	**No**
	☐	☐		☐	☐	☐	☐
	☐	☐		☐	☐	☐	☐
	☐	☐		☐	☐	☐	☐

VII. Billing Contact Information

Organization:	Name:	Title:
Phone:	Fax (optional):	Email:

Mailing Address: ☐ Check if same as Operator Information

Street (PO Box):		
City:	State:	Zip:

VIII. NOI Preparer (Complete if NOI was prepared by someone other than the certifier.)

Organization:	Name:	Title:
Phone:	Fax (optional):	Email:

Mailing Address: ☐ Check if same as Operator Information

Street (PO Box):		
City:	State:	Zip:

IX. Certification Information

An Alaska Pollutant Discharge Elimination System (APDES) permit application or report must be signed by an individual with the appropriate authority per 18 AAC 83.385. For additional information, please refer to 18 AAC 83.385 at the following link: http://www.legis.state.ak.us/basis/aac.asp#18.83.385.

Corporate Executive Officer 18 AAC 83.385 (a)(1)(A)	For a corporation, a president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy- or decision-making functions for the corporation.
Corporate Operations Manager 18 AAC 83.385 (a)(1)(B)	For a corporation, the manager of one or more manufacturing, production, or operating facilities, if (i) the manager is authorized to make management decisions that govern the operation of the regulated facility, including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long term environmental compliance with environmental statutes and regulations; (ii) the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and (iii) authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.
Sole Proprietor or General Partner 18 AAC 83.385 (a)(2)	For a partnership or sole proprietorship, the general partner or the proprietor respectively.
Public Agency, Chief Executive Officer 18 AAC 83.385 (a)(3)(A)	For a municipality, state, or other public agency, the chief executive officer of the agency.
Public Agency, Senior Executive Officer 18 AAC 83.385 (a)(3)(B)	For a municipality, state, or other public agency, a senior executive officer having responsibility for the overall operations of a principal geographic unit or division of the agency.
**For Delegated Authority: the delegation must be made in writing and submitted to the DEC. An Example of written authorization delegating authority can be found at http://dec.alaska.gov/media/13316/delegation-of-signatory-authority.pdf*	
Operations Manager *(Delegated Authority)** 18 AAC 83.385 (b)(2)(A)	For a duly authorized representative, an individual or a position having responsibility for the overall operation of the regulated facility or activity, including the position of plant manager, operator of a well or a well field, superintendent or position of equivalent responsibility.
Environmental Manager *(Delegated Authority)** 18 AAC 83.385 (b)(2)(B)	For a duly authorized representative, an individual or position having overall responsibility for environmental matters for the company.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Organization:	Name:	Title:
Phone:	Fax (optional):	Email:

Mailing Address: ☐ Check if same as Operator Information

Street (PO Box):

City:	State:	Zip:

_______________________ Signature

_______________________ Date

X. Document Attachments and Supplemental Information

Documents attached with this application:

☐ Copy of SWPPP if ≥ 5 acres of disturbance.

☐ Delegation of Signatory Authority.

☐ Other:

Instructions for Completing a Notice of Intent (NOI) Form for Storm Water Discharges Associated with Construction Activity under an APDES Construction General Permit

Who Must File an NOI Form:

Operators of construction sites where one or more acres are disturbed, smaller sites that are part of a larger common plan of development or sale where there is a cumulative disturbance of at least one acre, or any other site specifically designated by the Director, must submit an NOI to obtain coverage under an APDES construction general permit. Each person, firm, public organization, or any other entity that meets either of the following criteria must file this form: (1) they have operational control over construction plans and specifications, including the ability to make modifications to those plans and specifications; or (2) they have day-to-day operational control of those activities at the project necessary to ensure compliance with SWPPP requirements or other permit conditions.

Completing the Form:

Obtain and read a copy of the APDES Construction General Permit. Type or print, in the appropriate areas only. "NA" can be entered in areas that are not applicable. If you have any questions about how or when to use this form, contact the DEC Storm Water Program at (907) 269-6285 or online at http://dec.alaska.gov/water/wastewater/stormwater/.

Section I. Single/Multiple NOI Project:

Indicate whether or not this is a single NOI project. If not, indicate if the fee will be paid with this NOI or another associated with this project. Provide the name of the operator that will be paying the fee.

Section II. Operator Information:

Provide the name of the contact person, title, and the legal name of the firm, public organization, or any other entity that operates the project described in this application. (An operator of a project is a legal entity that controls at least a portion of site operations and is not necessarily the site manager.) Also provide the operator's mailing address, telephone number, fax number (optional) and e-mail address (to be notified via e-mail of NOI approval when available). Correspondence for the NOI will be sent to this address.

Section III. Project/Site Information:

Enter the official or legal name, a brief description of the project or site, and complete street address, including city, state, zip code, and county or similar government subdivision of the project or site. If the project or site lacks a street address, indicate the general location of the site (e.g., Intersection of State Highways 61 and 34). Complete site information must be provided for permit authorization to be granted.

Provide the latitude and longitude of the facility in decimal degrees format with up to 5 digit accuracy. The latitude and longitude of your facility can be determined in several different ways, including through the use of global positioning system (GPS) receivers, U.S. Geological Survey (U.S.G.S.) topographic or quadrangle maps, Google Earth, Bing Maps, and EPA's web-based siting tools, among others. For consistency, DEC requests that measurements be taken from the approximate center of the construction site. Applicants must specify which method they used to determine latitude and longitude. If a U.S.G.S. topographic map is used, applicants are required to specify the scale of the map used. Enter the estimated construction start and completion dates using four digits for the year (i.e., 05/27/2021).

Enter the estimated area (acres) to be disturbed including but not limited to grubbing, excavation, grading, and utilities and infrastructure installation. Indicate to the nearest tenth of an acre. Note: 1 acre = 43,560 sq. ft.

Indicate whether or not the project/site has been previously covered by an EPA or DEC permit. If "Yes" provide the permit authorization number that the project/site was covered under.

If this is a project that was covered under a previous DEC construction general permit indicate whether or not the SWPPP has been updated in accordance with the most recently issued Alaska Construction General Permit.

If the project or site is less than one-acre, but part of a common plan of development, provide the permit authorization number and name of the common plan of development.

Section IV. SWPPP (Storm Water Pollution Prevention Plan) Information:

Note the SWPPP should be prepared in advance of filing the NOI form. For projects with 5 acres or more of disturbance, the initial SWPPP will need to be submitted to DEC with the NOI. Check the appropriate box for the location where the SWPPP may be viewed. Provide the name, fax number (optional), and e-mail address of the contact person if different than that listed in Section II of the NOI form.

Section V. Permanent Storm Water Controls

A permittee must comply with applicable APDES MS4 permit requirements, local requirements, and the applicable requirements under 18 AAC 72.600 (i.e., Nondomestic Wastewater System Plan Review) regarding the design and installation of permanent storm water management controls. Annotate the type of measure to be installed and see Permit Part 4.11 for additional requirements regarding plan submittal deadlines.

Section VI. Discharge Information:

Identify the receiving water bodies or wetlands to which the project's storm water will discharge. These should be the first bodies of water that the discharge will reach. (Note: If you discharge to more than one water body, please indicate all such waters in the space provided and attach a separate sheet if necessary.) For example, if the discharge leaves your site and travels through a roadside swale or a storm sewer and then enters a stream that flows to a river, the stream would be the receiving water body. Waters of the U.S. include lakes, streams, creeks, rivers, wetlands, impoundments, estuaries, bays, oceans, and other surface bodies of water within the confines of the U.S. and U.S. coastal waters. (Waters of the U.S. do not include man-made structures created solely for the purpose of wastewater treatment.) U.S.G.S. topographical maps may be used to make this determination. If the map does not provide a name, use a format such as "unnamed tributary to Cross Creek". If you discharge into a municipal separate storm sewer system (MS4), you must identify the water body into which that portion of the storm sewer discharges. That information should be readily available from the operator of the MS4.

Indicate if any of your storm water discharges from construction activities will be reach a 303d listed water (i.e., impaired water body)?
For a listing of impaired waters and an interactive map, see http://dec.alaska.gov/water/water-quality/impaired-waters.

Indicate whether your storm water discharges from construction activities will be consistent with the assumptions and requirements of applicable EPA approved or established total maximum daily load(s)(TMDL(s)). To answer this question, refer to http://dec.alaska.gov/water/water-quality/impaired-waters/. You may also have to contact DEC. If there are no applicable TMDLs or no related requirements, please check the "yes" box in the NOI form.

Section VII. Billing Contact Information

Provide the name of the contact person, title, and the legal name of the firm, public organization, or any other entity that is responsible for accounts payable for this project. Also provide the billing contact's mailing address, telephone number, fax number (optional), and email address. Correspondence for billing purposes will be sent to this address. If the billing contact is that same as the operator, check the box.

Section VIII. NOI Preparer Information.

If the NOI was prepared by someone other than the certifier (for example, if the NOI was prepared by the project SWPPP contact or a consultant for the certifier's signature), include the name, title, organization, address, telephone number, and email address of the NOI preparer.

Section IX. Certification Information:

The NOI must be signed as follows:

(1) For a corporation, a responsible corporate officer shall sign the NOI, a responsible corporate officer means:
   (A) a president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy - or decision-making functions for the corporation; or
   (B) the manager of one or more manufacturing, production, or operating facilities, if
      (i) the manager is authorized to make management decisions that govern the operation of the regulated facility, including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long term environmental compliance with environmental statutes and regulations;
      (ii) the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and
      (iii) authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.

(2) For a partnership or sole proprietorship, the general partner or the proprietor, respectively; or

(3) for a municipality, state, or other public agency, either a principal executive officer or ranking elected official shall sign the application; in this subsection, a principal executive officer of an agency means
   (A) the chief executive officer of the agency; or
   (B) a senior executive officer having responsibility for the overall operations of a principal geographic unit or division of the agency.

(4) Include the name, title, organization, address, telephone number, and email address of the person signing the form and the date of signing. An unsigned or undated NOI form will not be considered valid application for permit coverage.

Section X. Document Attachments and Supplemental Information

Include a copy of the SWPPP if ≥ 5 acres of disturbance. Indicate documents attached and supplemental information.

Where to File NOI form

Select one of three options:

1) **Preferred Option**: DEC encourages you to complete the NOI form electronically via DEC's Online Application System (OASys): https://myalaska.state.ak.us/dec/water/OASys/Login.aspx. Filing electronically is the fastest way to obtain permit coverage and help ensure that your NOI is complete.

2) If you file by mail please submit the original form with a signature in ink. Remember to retain a copy for your records.

   NOIs sent by mail:
   Alaska Dept. of Environmental Conservation
   Division of Water
   Wastewater Discharge Authorization Program
   555 Cordova Street
   Anchorage, AK 99501
   Phone: (907) 269-6285

3) Submit all pages of scanned original form via Email: DEC.Water.WQPermit@alaska.gov. *(Note, 20MB limit).*

Permit #: _________________

Low Erosivity Waiver Certification
Storm Water Discharges Associated with Construction Activity
under an APDES Construction General Permit

This form provides notice to DEC that the project operator identified in Section I of this form are certifying that construction activity at the project site identified in Section II, will take place during a period when the rainfall erosivity factor is less than five [40 CFR 122.26(b)(15)(i)(A) adopted by reference at 18 AAC 83.010(b)(3)]. By submitting a complete and accurate form, the otherwise applicable APDES permitting requirements for stormwater discharges associated with construction activity, are waived. Based on your certification, a waiver is granted for the period beginning on the date this Low Erosivity Waiver Form is mailed to DEC (i.e., postmark date), or the project start date specified in Part III of this form, whichever shall occur last, and ending on the project completion date specified in Part III. Refer to the instructions at the end of this form for more details.

Note this waiver is only available to storm water discharges associated with small construction activities (i.e., 1-5 acres). See 2021 CGP, Appendix D.

I. Operator Information

Organization:	Name:	Title:	
Phone:	Fax (optional):	Email:	
Mailing Address: Street or PO Box:	City	State:	Zip:
Primary SIC or NAICS Code: SIC:		NAICS:	

II. Project / Site Information

Project / Site Name:	Estimated Start Date:	Estimated End Date:
Brief Description of the Project / Site:	Estimated Area to be Disturbed *(nearest tenth acre)*:	

location Address:	Street:	City:	State	Zip:	Borough or similar government subdivision:
			Alaska		
	Latitude (decimal degree, 5 places):	Longitude (decimal degree, 5 places):	Determined By: ☐ GPS ☐ USGS Topographic Map ☐ Other		
	If you used a USGS Topographic map, what was the scale?				

III. Rainfall Erosivity Factor Calculation Data

Are interim non-vegetative site stabilization measures used to establish the project completion date for purposes of obtaining this waiver? ☐ Yes ☐ No

Rainfall erosivity factor (R factor):

***Note**: To qualify for this waiver, the construction activity must take place during a period when the R factor is less than five.*

Rainfall erosivity factor was calculated by using: ☐ Online calculator, ☐Table 4-3 of 2016 CGP Fact Sheet, ☐USDA Handbook 703

IV. Certification Information

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Organization	Name	Title	
Phone	Fax (Optional)	Email	
Mailing Address: ☐ check if same as Operator Information / Street (PO Box)	City	State	Zip

Signature _______________ Date _______________

Instructions for Completing a Notice of Intent (NOI) Form for Storm Water Discharges Associated with Construction Activity under an APDES Construction General Permit

Who May Qualify for a Low Erosivity Waiver

Under the Alaska Pollutant Discharge Elimination System (APDES) Program, operators of construction projects that result in land disturbances equal to or greater than one acre, including sites that are less than one acre but are part of a larger common plan of development or sale where there is a cumulative disturbance of at least one acre, are required to obtain coverage under an APDES permit for stormwater discharges associated with construction activity.

DEC may waive the otherwise applicable permit requirements for stormwater discharges from construction activities that disturb less than five acres if the construction activity will take place during a period when the rainfall erosivity factor (R factor) is less than five. More information on the low erosivity waiver is available in the 2021 CGP Fact Sheet Appendix D. For questions related to completion of this form, you may contact DEC's Stormwater Program at (907) 269-6285.

Completing the Form:

You must type or print in appropriate areas only. One form must be completed for each facility or site for which you are seeking to obtain a Low Erosivity Waiver. Additional guidance on completing this form can be accessed at DEC's Storm Water Program website: http://dec.alaska.gov/water/wastewater/stormwater.

Please make sure you have addressed all applicable questions and have made a photocopy for your records before sending the completed form to DEC.

Section I. Operator Information:

Each legal entity that meets DEC's definition of "operator" (see definitions in Appendix C of DEC's APDES Construction General Permit) and that meets the eligibility conditions for the low erosivity waiver must file this form to have the permit requirements waived. The operator is the legal entity that either (1) has operational control over construction plans and specifications, including the ability to make modifications to those plans and specifications, or (2) has day-to-day operational control of some or all of those activities.

It is possible that there will be more than one operator at a site and, in such cases, each entity that meets the operator definition must complete a Low Erosivity Waiver Certification.

Provide the legal name of your firm, public organization, or other entity that operates the project described in this waiver certification. Usually this will be a company or organization's name but for construction activities undertaken by you as an individual, this should be your name. Enter the operator's complete mailing address and name of contact person, telephone number, fax number (optional) and email who can answer questions about the site (e.g., a project or site manager).

Section II. Project/Site Information:

Enter the official or legal name, a brief description of the project or site, and complete street address, including city, state, zip code, and county or similar government subdivision of the project or site. If the project or site lacks a street address, indicate the general location of the site (e.g., Intersection of State Highways 61 and 34). Complete site information must be provided for permit authorization to be granted.

Provide the latitude and longitude of the facility in , decimal degrees format with up to 5 digit accuracy. The latitude and longitude of your facility can be determined in several different ways, including through the use of global positioning system (GPS) receivers, U.S. Geological Survey (U.S.G.S.) topographic or quadrangle maps, Google Earth, Bing Maps, and EPA's web-based siting tools, among others. Refer to https://www.epa.gov/npdes/construction-general-permit-resources-tools-and-templates for further guidance on the use of these methodologies. For consistency, DEC requests that measurements be taken from the approximate center of the construction site. Applicants must specify which method they used to determine latitude and longitude. If a U.S.G.S. topographic map is used, applicants are required to specify the scale of the map used. Enter the estimated construction start and completion dates using four digits for the year (i.e., 05/27/2015).

Enter the estimated area (acres) to be disturbed including but not limited to: grubbing, excavation, grading, and utilities and infrastructure installation. Indicate to the nearest tenth of an acre. Note: 1 acre = 43,560 sq. ft.

Section III. Rainfall Erosivity Factor Calculation Data

The construction period begins with the initial earth disturbance and ends with final site stabilization. To qualify for this waiver, the rainfall erosivity factor for the project must be less than five during the entire construction period. Specify the construction period by entering the project start date (date of initial earth disturbance) and project completion date (date of final site stabilization). For example, a grading contractor that is operating on-site for only one week during a nine month construction project, must enter the start date and completion date of the entire nine month construction period.

DEC believes, where the environmental threat is low (i.e., in arid and semi-arid climates), that "final stabilization" can include techniques that employ re-vegetation combined with other stabilization measures, consisting of temporary degradable rolled erosion control products, also known as "erosion control blankets (ECBs). With proper selection, design, and installation of the combination re-vegetation/ECB technique in arid or semi-arid areas, an operator can be considered to have achieved final stabilization upon completion of the installation process. Note that if more than three years is required to establish 70 percent of the natural vegetative cover, this technique cannot be used or cited for fulfillment of the final stabilization requirement. If your waiver is based on use of interim non-vegetative stabilization measures, such as erosion control blankets, to establish the end of the construction period, you must indicate so on this form. In doing so, you must commit and certify (as a condition of waiver eligibility) to periodically inspect and properly maintain the area until the criteria for final stabilization, as defined in the Construction General Permit, have been met.

The rainfall erosivity factor "R" is determined in accordance with the U.S. Department of Agriculture *Agriculture Handbook Number 703, Predicting Soil Erosion by Water: A Guide to Conservation Planning with the Revised Universal Soil Loss Equation (RUSLE)*, Chapter 2 pages 21-64, dated January 1997.

If the R factor is five or greater during the project's construction period, you must have or obtain coverage under an APDES stormwater permit. If the project was eligible for the waiver during the original construction period, but the construction activity will extend past the project completion date specified in the Low Erosivity Waiver Certification, the operator must recalculate the R factor using the original start date and a new project completion date. If the recalculated R factor is still less than five, a new waiver certification form must be submitted before the end of the original construction period. If the new R factor is five or greater, the operator must submit a Notice of Intent to be covered by the Construction General Permit before the original project completion date. The Notice of Intent (NOI) form may be submitted electronically using DEC's Online Application System (OASys). OASys can be accessed at http://dec.alaska.gov/water/oasys.aspx. If you choose to fill out an NOI and mail it to DEC you can obtain a copy at http://dec.alaska.gov/water/wastewater/stormwater/forms/#tab-CGP.

Section IV. Certification Information:

The Low Erosivity Waiver must be signed as follows:

(1) For a corporation, a responsible corporate officer shall sign the Low Erosivity Waiver, a responsible corporate officer means:
   (A) a president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy - or decision-making functions for the corporation; or
   (B) the manager of one or more manufacturing, production, or operating facilities, if
      (i) the manager is authorized to make management decisions that govern the operation of the regulated facility, including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long term environmental compliance with environmental statutes and regulations;
      (ii) the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and
      (iii) authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.

(2) For a partnership or sole proprietorship, the general partner or the proprietor, respectively; or

(3) for a municipality, state, or other public agency, either a principal executive officer or ranking elected official shall sign the application; in this subsection, a principal executive officer of an agency means
   (A) the chief executive officer of the agency; or
   (B) a senior executive officer having responsibility for the overall operations of a principal geographic unit or division of the agency.

(4) Include the name, title, and email address of the person signing the form and the date of signing. An unsigned or undated waiver form will not be considered valid application for exclusion from permit coverage.

Where to File Low Erosivity Certification Form

Please submit the original form with a signature in ink. Remember to retain a copy for your records.

NOIs sent by mail:

Alaska Dept. of Environmental Conservation
Division of Water
Wastewater Discharge Authorization Program
555 Cordova Street
Anchorage, AK 99501
Phone: (907) 269-6285
Email: DEC.Water.WQPermit@alaska.gov

Alaska Department of Environmental Conservation
CGP Annual Reporting Form

Complete one set of tables for each storm event (rainfall or snowmelt) that resulted in a discharge from the site. At a minimum per part 7.3.2.2 of the CGP two samples per discharge point shall be collected and averaged. Attach additional tables as necessary. See instructions on the next page for more information.

I. Project Information

Permit Tracking Number:	Project Name:	Project Location:

Project Operator Name

Do you have substantially identical discharge points on a linear project as described in Part 7.3.4 of the ACGP? ☐ Yes ☐ No

List identical discharge point names or ID numbers which are identified in your SWPPP that are not sampled but visually monitored.

Nature of Discharge		
Rainfall Amount (inches)	Rainfall	Snowmelt
	☐	☐

Measurement Method	
On Site Gauge:	At Nearest National Weather Service Precipitation Gauge
☐	☐
Date Samples Collected (mm/dd/yyyy):	

II. Monitoring Results

All discharge points on your site subject to monitoring shall have two turbidity samples collected, averaged, and reported as average downstream turbidity. Compliance is determined based upon the difference between the individual upstream sample for that specific discharge point and the average downstream turbidity result.

Upstream location ID *(used in the SWPPP)*								
Latitude/Longitude *(Decimal Degrees)*								
Time Sample collected:								
Turbidity (NTUs):								
Downstream location ID								
Latitude/Longitude *(Decimal Degrees)*								
Time Samples collected:								
Turbidity (NTUs):								
Average Downstream Turbidity (NTUs):								
Difference								
Difference in Turbidity (NTUs):								

III. Certification

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Title	**Printed Name**	**Signature**	**Date**

Instructions for Completing the CGP Annual Report

Who Must Submit an Annual Report to DEC?

The operator of a construction site must submit an Annual Report if their site meets the requirements of Section 3.2 (Discharge to Impaired Water Body) of the 2021 APDES Construction General Permit (CGP).

Completing the Form

Obtain and read a copy of the CGP. Type or print in the appropriate areas only. "NA" can be entered in areas that are not applicable. If you have questions about how or when to use this form contact the DEC Storm Water Program at 907-269-6285 or online at http://dec.alaska.gov/water/wastewater/stormwater/construction.

For each storm event sampled, collect a minimum of two representative samples of each discharge point. To meet the requirements of Part 9.1 of the CGP, all completed forms must be submitted to DEC by December 31st of each year during construction and with the NOT upon submittal. The form must be submitted to the appropriate address in Appendix A, Part 1.1.2 of the CGP.

Section I. Project Information

Provide the APDES permit tracking number assigned by DEC to the project. If you do not know the tracking number, you can find the tracking number assigned to your project on DEC's Water Permit Search http://dec.alaska.gov/Applications/Water/WaterPermitSearch/search.aspx?number=akr10

Provide the project name, location and project operator. Use the same name provided on your NOI. Enter the outfall name or number identified in the SWPPP for all discharge points subject to monitoring. If no discharge occurs at some outfalls simply state "No Discharge". Also indicate any discharge points that are considered substantially identical and list on the form pursuant to Section 7.3.4 of the CGP.

Indicate if the discharge was a result of a rain event or snowmelt. If the discharge was the result of rainfall provide the total amount of rain for the storm event in inches. Indicate if the measurement of rainfall was taken using an onsite gauge or a National Weather Service precipitation gauge.

Section II. Monitoring Results

Provide the date and time the samples were collected. Enter the measured turbidity for each sample in Nephelometric Turbidity Units (NTUs). Provide the average of the two samples collected from each discharge point.

Provide the difference between the upstream and average downstream sampling results from each discharge point sampled to determine compliance with Part 3.2 of the CGP.

Per Part 3.2.1 upstream monitoring must take place at a representative location (upgradient) from the point of discharge or outside the area of influence.

Downstream monitoring must take place at a representative location inside the area of influence or at the point the storm water discharge leaves the construction site.

Section III. Certification Information:

The Annual Report must be signed as follows:

(1) For a corporation, a responsible corporate officer shall sign the Annual Report, a responsible corporate officer means:
- (A) a president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy - or decision-making functions for the corporation; or
- (B) the manager of one or more manufacturing, production, or operating facilities, if
  - (i) the manager is authorized to make management decisions that govern the operation of the regulated facility, including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long term environmental compliance with environmental statutes and regulations;
  - (ii) the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and
  - (iii) authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.

(2) For a partnership or sole proprietorship, the general partner or the proprietor, respectively; or

(3) for a municipality, state, or other public agency, either a principal executive officer or ranking elected official shall sign the application; in this subsection, a principal executive officer of an agency means
- (A) the chief executive officer of the agency; or
- (B) a senior executive officer having responsibility for the overall operations of a principal geographic unit or division of the agency.

(4) Include the name, title, and email address of the person signing the form and the date of signing. An unsigned or undated form will not be considered valid submittal.

Where to File Annual Report form

Please submit the original form with a signature in ink. Remember to retain a copy for your records.

Annual Reports sent by mail:

State of Alaska
Department of Environmental Conservation
Division of Water
Compliance and Enforcement Program
555 Cordova Street
Anchorage, Alaska 99501
Telephone Nationwide (877) 569-4114
Anchorage Area / International (907) 269-4114
Fax (907) 269-4604
Email: dec-wqreporting@alaska.gov

APPENDIX G
GRADING AND STABILIZATION RECORDS

A..G-01

B..G-02

C..G-03

D..G-04

E..G-05

APPENDIX H
TRAINING RECORDS

H1- Training Records Log..1 page

Municipality of Anchorage
Public Works Department
Project Management Division
Watershed Management Section

SWPPP TRAINING LOG

Project Number:

Project Name:

Project Location:

Instructor's Name(s):____

Instructor's Title(s):____

Course Location:____Date:___________________

Course Length (hours):_______________________________________

Storm Water Training Topic: (check as appropriate)

☐ Erosion Control BMPs
☐ Non-Storm Water BMPs
☐ Emergency Procedures
☐ Sediment Control BMPs
☐ How to conduct Inspection/Inspection Report
☐ Good Housekeeping BMPs
☐ SWPPP Provisions or Conditions

Attendee Roster: (attach additional pages as necessary)

NO.	Name of Attendee	Company
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

Form F-125

APPENDIX I
CORRECTIVE ACTION

I1- Corrective Action Log .... 1 page

	Municipality of Anchorage Public Works Department Project Management Division Watershed Management Section	

SWPPP CORRECTIVE ACTION LOG PAGE__________

Project #____________ Project Name:

Corrective Action #	Inspection Date	Description of Corrective Action and Related SWPPP Amendment #	Date Action Taken/ Responsible Person

Form (F-112)

APPENDIX J
INSPECTION RECORDS

J1- Inspection Records Form .... 3 pages

Stormwater Construction Site Inspection Report

General Information			
Project Name			
NPDES Tracking No.		**Location**	
Date of Inspection		**Start/End Time**	
Inspector's Name(s)			
Inspector's Title(s)			
Inspector's Contact Information			
Inspector's Qualifications			
Describe present phase of construction			

Type of Inspection:
❑ Regular ❑ Pre-storm event ❑ During storm event ❑ Post-storm event

Weather Information

Has there been a storm event since the last inspection? ❑Yes ❑No
If yes, provide:
Storm Start Date & Time: Storm Duration (hrs): Approximate Amount of Precipitation (in):

Weather at time of this inspection?
❑ Clear ❑Cloudy ❑ Rain ❑ Sleet ❑ Fog ❑ Snowing ❑ High Winds
❑ Other: Temperature:

Have any discharges occurred since the last inspection? ❑Yes ❑No
If yes, describe:

Are there any discharges at the time of inspection? ❑Yes ❑No
If yes, describe:

Site-specific BMPs

- *Number the structural and non-structural BMPs identified in your SWPPP on your site map and list them below (add as many BMPs as necessary). Carry a copy of the numbered site map with you during your inspections. This list will ensure that you are inspecting all required BMPs at your site.*
- *Describe corrective actions initiated, date completed, and note the person that completed the work in the Corrective Action Log.*

	BMP	BMP Installed?	BMP Maintenance Required?	Corrective Action Needed and Notes
1		❑Yes ❑No	❑Yes ❑No	
2		❑Yes ❑No	❑Yes ❑No	
3		❑Yes ❑No	❑Yes ❑No	
4		❑Yes ❑No	❑Yes ❑No	
5		❑Yes ❑No	❑Yes ❑No	
6		❑Yes ❑No	❑Yes ❑No	
7		❑Yes ❑No	❑Yes ❑No	
8		❑Yes ❑No	❑Yes ❑No	
9		❑Yes ❑No	❑Yes ❑No	
10		❑Yes ❑No	❑Yes ❑No	
11		❑Yes ❑No	❑Yes ❑No	

	BMP	BMP Installed?	BMP Maintenance Required?	Corrective Action Needed and Notes
12		❑Yes ❑No	❑Yes ❑No	
13		❑Yes ❑No	❑Yes ❑No	
14		❑Yes ❑No	❑Yes ❑No	
15		❑Yes ❑No	❑Yes ❑No	
16		❑Yes ❑No	❑Yes ❑No	
17		❑Yes ❑No	❑Yes ❑No	
18		❑Yes ❑No	❑Yes ❑No	
19		❑Yes ❑No	❑Yes ❑No	
20		❑Yes ❑No	❑Yes ❑No	

Overall Site Issues

Below are some general site issues that should be assessed during inspections. Customize this list as needed for conditions at your site.

	BMP/activity	Implemented?	Maintenance Required?	Corrective Action Needed and Notes
1	Are all slopes and disturbed areas not actively being worked properly stabilized?	❑Yes ❑No	❑Yes ❑No	
2	Are natural resource areas (e.g., streams, wetlands, mature trees, etc.) protected with barriers or similar BMPs?	❑Yes ❑No	❑Yes ❑No	
3	Are perimeter controls and sediment barriers adequately installed (keyed into substrate) and maintained?	❑Yes ❑No	❑Yes ❑No	
4	Are discharge points and receiving waters free of any sediment deposits?	❑Yes ❑No	❑Yes ❑No	
5	Are storm drain inlets properly protected?	❑Yes ❑No	❑Yes ❑No	
6	Is the construction exit preventing sediment from being tracked into the street?	❑Yes ❑No	❑Yes ❑No	
7	Is trash/litter from work areas collected and placed in covered dumpsters?	❑Yes ❑No	❑Yes ❑No	
8	Are washout facilities (e.g., paint, stucco, concrete) available, clearly marked, and maintained?	❑Yes ❑No	❑Yes ❑No	

	BMP/activity	Implemented?	Maintenance Required?	Corrective Action Needed and Notes
9	Are vehicle and equipment fueling, cleaning, and maintenance areas free of spills, leaks, or any other deleterious material?	❑Yes ❑No	❑Yes ❑No	
10	Are materials that are potential stormwater contaminants stored inside or under cover?	❑Yes ❑No	❑Yes ❑No	
11	Are non-stormwater discharges (e.g., wash water, dewatering) properly controlled?	❑Yes ❑No	❑Yes ❑No	
12	(Other)	❑Yes ❑No	❑Yes ❑No	

Non-Compliance

Describe any incidents of non-compliance not described above:

CERTIFICATION STATEMENT

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Print name and title: ____

Signature:____________________________________ **Date:**_______________

APPENDIX K
MONTHLY OIL SPILL REPORTING

K1- Monthly Oil Spill Reporting Log .... 1 page

ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION

MONTHLY OIL SPILL REPORTING LOG

FACILITY NAME AND ADDRESS:	
REPORT MONTH/YEAR:	
REPORTED BY:	PHONE #:
EMAIL:	

Only for spills less than 10 gallons, solely to land, not to creeks, sewers or storm drains.
(see Discharge Reporting requirements, 18 AAC 75.300)

SPILLS GREATER THAN 55 GALLONS SOLELY TO LAND OUTSIDE SECONDARY CONTAINMENT, HAZARDOUS SUBSTANCE SPILLS OR SPILLS TO WATER MUST BE REPORTED IMMEDIATELY.

Call the nearest ADEC office for more information: **Anchorage:** 269-3063 **Fairbanks**: 451-2121 **Juneau**: 465-5340

Please submit the completed monthly spill reporting log to the nearest ADEC office:

Anchorage: dec.carspillreport@alaska.gov
Fairbanks: dec.narspillreport@alaska.gov
Juneau: dec.spar.seregion.spills@alaska.gov

DATE / TIME OF SPILL	LOCATION	PRODUCT SPILLED	QTY SPILLED (GALLONS)	CAUSE OF SPILL & AREA AFFECTED	WHO RESPONDED	CLEANUP & METHOD / PLACE OF DISPOSAL