



Road Maintenance and Operations Manual

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Land Use and Transportation Division – Road Services
Department of Community Services
Multnomah County

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I. INTRODUCTION AND PURPOSE

The Multnomah County Road Services Division manages and preserves the County road infrastructure, and provides a safe and efficient transportation system that supports economic and community vitality. The Road Maintenance Program within Road Services (in cooperation with Bridge Services) is responsible for maintaining 297 miles of roads, 26 vehicular bridges and 2 pedestrian bridges in four services districts (Figure 1). One Environmental Specialty Crew focuses on maintaining the municipal stormwater system, vegetation management, and litter control across districts.

- District 1 – West Multnomah County
- District 2 – Unincorporated pockets in and near Portland
- District 4 – County owned roads within Fairview, Troutdale, and Wood Village and surrounding areas
- District 5 – East Multnomah County

The goal of the Multnomah County Road Maintenance and Operations Manual (RMOM) is to ensure that the roadway system functions as needed, while minimizing impacts from routine road maintenance on natural resources, and conducting those activities in a safe and effective manner.

Road safety is the first priority for the Road Maintenance Program. Routine road maintenance when properly modified and implemented also can contribute to the conservation of protected salmon and steelhead and the ecosystems upon which they depend. Ensuring that the transportation system is functioning efficiently through routine maintenance minimizes and avoids the potential for mass failure and subsequent impact to receiving waterbodies.

The RMOM was crafted to formalize the changes to routine road maintenance practices, and designed to meet the requirements for a Limit 10 exemption under the 4(d) rule of the Endangered Species Act. In conjunction with the County's two NPDES permits for the municipal stormwater system, this manual is intended to help reduce pollutants and habitat degradation, and restore habitat from road impacts as feasible.

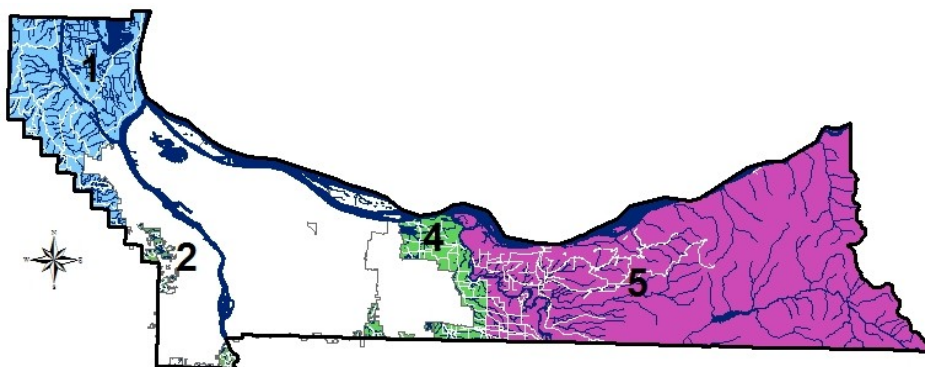


Figure 1. Map of the County road maintenance districts.

II. BEST MANAGEMENT PRACTICE GUIDANCE

Expected outcomes

The BMPs in this manual were developed with the idea that they must be outcome based. Rather than providing a “cookbook recipe” approach to BMPs, the RMOM BMPs focus on the following outcomes:

- Minimize erosion/sedimentation.
- Contain pollutants.
- Maximize habitat improvements.

Each maintenance activity has unique challenges given by their location, type of available equipment, weather, and so forth. While not every activity can be accomplished under ideal conditions, it is critical that staff understand and implement avoidance and minimization measures using the best professional judgment to achieve outcomes.

State water quality standards, particularly for turbidity, are expected to be met through the use of erosion control techniques if timing and or other reduction in soil disturbance cannot be met.

Avoidance and Minimization Measures

A standard practice of roadway maintenance is to avoid adverse impacts to the aquatic environment. Whenever avoidance is not attainable, impacts will be minimized. These measures are stated in the following chapters as "Best Management Practices", or BMPs.

When reviewing a proposed maintenance or construction activity, it is important to have some basic understanding of erosion and sediment control. It is easier and more effective to prevent or reduce soil particles and contaminants from becoming waterborne or airborne (entering or mixing with the water) than to separate them after they have mixed.

The following principles guide each activity:

- Reduce soil disturbance
- Keep water from work area
- Reduce potential for soil erosion
- Preserve desirable vegetation
- Find creative solutions for chronic problems

Professional Judgment

BMPs will be implemented based on worksite conditions. There are many difficulties encountered when implementing BMPs. Conditions vary dramatically from site to site based on many factors:

- Soils/geological conditions.
- Stream/surface water hydrology.
- Groundwater conditions.
- Presence of utility lines or structures.
- Vegetation.
- Resource availability.
- Regulatory requirements (i.e. permit requirements).
- Legal requirements (such as safety standards, regulations).
- Terrain.
- Space available in ROW.

This Manual emphasizes the development of professional judgment to achieve outcomes. Professional judgment is based on experience and knowledge. In many cases, optimum conditions will not exist and full implementation measures may not be possible. Professional judgment must be exercised to find creative and suitable alternatives.

Phrases such as “where feasible” and “where practicable” are not to be used for convenience or ease of operation. Compliance with this Manual means that Road Maintenance staff will use the discretion provided by these phrases where one or more of these constraints make implementation of the full measure impossible.

For example, the Manual states: “Perform ditch work in optimum weather (when the ditch is dry but there is still sufficient soil moisture to prevent dust and the movement of small particulates) to minimize environmental impacts where feasible....” Road Maintenance will strive to do so. However, where safety of the road requires ditch maintenance regardless of the weather and time of year, the County Road Maintenance will proceed with the maintenance activity and implement the suitable BMP for erosion control to achieve the desired outcome.

Restricted Activity Zones

A Restricted Activity Zone (RAZ) is an area adjacent to natural streams, rivers, and wetlands where extra protective measures are needed. An area is designated as a RAZ if the routine road maintenance activities have a potential of impacting a waterway. The RAZ typically will extend one hundred fifty (150) feet either side of a stream or wetland, measured from the outer edge of an intersecting stream or the centerline of an adjacent roadway. The actual distance of a particular RAZ from a stream may vary depending on the roadway design, extent of the riparian area, or other factors, such as slope and vegetation.

Riparian areas provide a natural buffer between a resource water and adjacent activity and also provide an opportunity for potential contaminants to be filtered from run-off before entering resource waters. RAZ areas are delineated in maps for each road maintenance district, and are physically identified on the roadways with colored road markers, so road crews can easily identify where special RAZ BMPs apply.

Providing for the safety of roadway users and the structural integrity of the roadway system will require certain roadway management activities to be performed within a RAZ. Following Avoidance and Minimization measures and Best Management Practices will reduce the potential impacts that roadway management may have on resource waters or the quality of a RAZ.

Additional guidance

The role of the Environmental Specialist, as referenced in this manual, is fulfilled by the Water Quality Program staff. Water Quality Program facilitates coordination with outside agencies, and internally, along with the Road Engineering staff and Land Use and Transportation Planning staff.

Activities that require Army Corps of Engineers permits are not included in the 4(d) exemption, nor are they described in this manual. These activities are only mentioned in the manual, with guidance to staff to seek further expertise. The Oregon Department of Fish and Wildlife (ODFW), Department of State Lands (DSL), and the National Marine Fisheries Services (NMFS) must be consulted when capital projects or other non-routine projects have the potential to impact waterways and aquatic resources. If there are questions about impacts from routine road maintenance activities in this manual, contact the Environmental Specialist.

Agriculture is the predominant land use in the unincorporated County. Where agricultural land is adjacent to County roadways, there may be impacts to roadway and road infrastructure from agricultural practices: stormwater runoff from fields, driveways, roads, and associated sediment and erosion. These agricultural practices are regulated by the Oregon Department of Agriculture (ODA); the Department of Environmental Quality (DEQ) may have a regulatory role in water quality issues if grading or filling causes violations of State water quality standards. The Water Quality section of ODA has enforcement authority for violations of water quality for agricultural operations, as defined in the Lower Willamette Agricultural Water Quality Management Area Plan. The Environmental Specialist is the liaison to ODA for water quality complaints.

This manual provides guidance for only for County-owned roadways. For road maintenance standards on roads within the County but owned by a city, state agency or other jurisdiction, refer to the respective standards for the jurisdiction in which the work is done. Jurisdictions with road services within the Multnomah County boundary include the Cities of Portland, Gresham, Troutdale, Wood Village, Maywood Park, and Fairview, the Port of Portland, and ODOT.

Safety of Road Maintenance Staff

Before any activities are started, staff are required to obtain a daily safety briefing by the District supervisor or lead worker. Safety measures are referenced in the County Job Hazard Analysis. Personal protective equipment is required for each activity, and vehicle and equipment maintenance and safety reviews must be conducted prior to their use.

RMOM Field Guide and Training

Using the Field Guide

Road Maintenance staff members are expected to be familiar with the contents of this Manual. Staff must understand the concepts of avoidance and minimization, Restricted Activity Zones (RAZ), and safety measures in all maintenance activities. For any BMP, best professional judgment must be applied to deliver the most effective result obtained for that activity.

The RMOM Field Guide is the hands-on version of the RMOM that allows the staff to follow a sequential process to consider the safety protocols and minimization and avoidance techniques for a maintenance activity. The staff members are expected to review the relevant sections of the field guide before beginning any maintenance activity. If difficulties are encountered for a work site to achieve the desired outcome, the staff member will contact the Environmental Specialist and/or the direct staff supervisor.

Training

Formal training for the manual and erosion control practices is conducted through the Road Services Program annually to review knowledge, skills and new methods. Weekly supervisor meetings may include RMOM issues as they arise. Daily briefs on activities and BMPs are given at each district. Quarterly meetings to review activities, BMP and other issues will be summarized in an annual report. Other related training are given in the table below.

Training for this Manual is considered an on-going process, as staff members are expected to develop increasing skills in applying best professional judgment. Each new situation encountered in the field is considered a learning opportunity to develop effective alternatives to correct maintenance problems.

<i>Training/Updates</i>	<i>Facilitator</i>	<i>Timeframe</i>
New employee orientation	Environmental Specialist	As needed
Daily environmental and safety briefing	District Supervisor/Lead	Daily
Weekly Supervisor's Meeting	Road Maintenance Manager	Weekly
RMOM Evaluation and Review	Environmental Specialist	Quarterly
RMOM Training	Environmental Specialist	Annual
Water Quality Program Update	Environmental Specialist	Annual
Spill Response Committee meeting	City of Portland	Quarterly
Spill Response Training	County Risk Management	Annual
Erosion Control Training	ODOT/varies	As needed
Professional symposiums/conferences	Varies	As needed

III. BEST MANAGEMENT PRACTICES

A. General Work

	<i>Maintenance Activity</i>	
1	Moving Equipment	
2	Equipment Maintenance	
3	Stockpiling	
4	Material Handling and Loading	
5	Vehicle washing	
6	Aboveground storage tanks and fueling	

Material and equipment handling, storage, and transport are routine road maintenance practices that occur at each district shop and on work sites. Precautions are needed to reduce accidental exposure to harmful chemicals and products, to reduce injury, and to reduce risks of spills and environmental impacts.

Safety concerns: Ensure that all safety regulations for material handling are readily available for staff, particularly fuel and other toxic materials. Material Safety Data Sheets and other reference material must be available for staff handling potentially hazardous products. The appropriate personal protection equipment (PPE) must be worn to prevent accidents and reduce the risk of injury.

Environmental concerns: Minimize impacts to natural resources by containing materials and properly maintaining equipment.

BMP outcomes:

- Minimize work site pollutants from material handling.
- Eliminate work hazards.
- Eliminate accidents.
- Reduce risks and impacts of spills.
- Prevent material from entering watercourses or streams.

1. Moving Equipment and Materials

Activities include transporting working and disabled equipment and road maintenance materials.

BMPs:

1. Use proper traffic safety operations.
2. Conduct pre-/post-safety inspection of equipment and vehicles.

3. Follow all pertinent state and federal rules and regulations regarding transport of vehicles and materials.
4. At the end of the work shift, store vehicles and equipment outside the RAZ, or in an area approved by the District Supervisor.
5. Maintain Commercial Driver License, endorsements and a current medical card.

2. Equipment Maintenance

Operation, repair and maintenance of equipment used to perform maintenance activities. These actions occur at maintenance yards, in shops, along the right-of-way, etc. Equipment may include medium and heavy trucks and equipment, and assorted power tools.

BMPs:

1. Use the appropriate equipment for the job.
2. Check equipment for leaks before using.
3. Ensure that necessary spill containing materials are available in vehicles, where feasible.
4. Contain and stop leaks, where possible. If the maintenance employee has not had spill training or if it is a gasoline spill, contact the District Hazmat specialists.
5. When working in RAZ, install containment and use BMPs to ensure spills don't enter waterbodies. Do not store equipment below OHWL. If equipment breaks down below OHWL, move above OHWL for repair, if possible. If unable to move equipment, repair immediately, and incorporate appropriate containment. Work zone isolation may be required if equipment is below OHWL. Coordinate with the Environmental Specialist.

3. Stockpiling

Activity includes stockpiling materials in County maintenance yards or maintenance sites for maintenance activities.

BMPs:

1. Identify and minimize concerns for stockpile areas adjacent to or near riparian areas, including erosion and sediment control needs, and stability of the stockpiled material.
2. Identify sites as part of local disposal plans.
3. See the Material Handling and Loading BMP for additional information.

4. Material Handling and Loading

Various materials that are used in the maintenance of highways, structures, equipment and fleet vehicles are stored at maintenance yards. Materials stored will vary by location,

but include: oils, automotive fluids, sand and gravel, winter maintenance chemicals, and pesticides.

BMPs:

1. Keep equipment properly maintained.
2. Load materials in trucks according to recognized load and safety limits
3. Store vehicles and materials away from stormdrains.
4. Locate storage piles of loose materials (such as sand, cedar, or gravel) away from waterbodies.
5. Use erosion or sediment controls where appropriate.
6. Minimize the use of hazardous materials.
7. Properly dispose of hazardous and excess materials, and empty containers.
8. Store material in appropriate labeled containers.
9. Protect containers from rain, either by covering containers or keeping them inside, where practical.
10. Keep containers closed when not in use.
11. Protect containers from vehicle impact and vandalism.
12. Inspect containers for deterioration and leaks.
13. Provide secondary containment needs for materials stored near creeks or streams
14. Have absorbents and/or emergency response equipment on-site to clean spills.
15. Provide spill prevention training to maintenance employees.

5. Vehicle washing (8 or more per week; 7 or less per week)

Equipment washing to ensure proper operation, function and safety of equipment and fleet vehicles is performed at maintenance yards.

BMPs:

1. Direct wash water away from catch basins or other drainage systems that discharge to natural waterways. Keep wash water on site at maintenance yards.
2. Rinsing dirt and debris from dump truck beds, vector truck parts, and sweepers is allowed at the Vance facility where the rinse water is directed to the stormwater facility.
3. Use the vehicle wash bay at the Yeon Shop when practicable (drains are connected to a municipal waste water system).

6. Aboveground storage tanks and vehicle fueling

Aboveground storage tanks are used at maintenance yards to store fluids used to maintain and fuel equipment and fleet vehicles. Diesel and gasoline tanks are stored aboveground at County maintenance facilities in the rural areas (District 1 and 5). Aboveground storage tanks are also used to store bulk fluids needed to perform certain maintenance activities, including oil for road patching and winter maintenance chemicals.

BMPs:

1. Design new fueling areas so that spills, overfills and leaks will not enter nearby waterbodies or stormdrains. Protect tanks from vehicle impact. Maintain tanks on a foundation and impervious surface to minimize opportunity for subsurface contamination in the event of a spill.
2. Clean spills using dry methods such as absorbent materials. Fueling areas will be swept rather than sprayed down with a hose.
3. Contact the Environmental Specialist if significant fuel spills occur or if any amount of petroleum products leaves the District Shop areas or enters waters of the state.
4. Label tanks and piping.
5. Secure valves in the closed position and/or lock dispensers when not in use.
6. Post warning signs and/or operating instructions.
7. Use overfill indicators and/or overfill protection on fuel tanks.
8. Provide secondary containment in areas where spills, leaks, or ruptures could enter nearby creeks or streams.
9. Vehicle and equipment fueling in the field will occur outside the RAZ or in an area approved by the District Supervisor.

B. Vegetation Management

	<i>Maintenance Activity</i>	
1	Integrated Roadside Vegetation Management Plan	
2	Grass Mowing	
3	Brush Mowing	
4	Hand Brushing and Pruning	
5	Median Landscape Maintenance	
6	Herbicide Application and Chemical Inventory	
7	Hazard Tree Removal	

Vegetation management is conducted by staff at all districts. The primary purpose of vegetation maintenance is to promote, maintain, sustain, manage, or encourage vegetation growing in the right-of-way (ROW) to comply with state and federal regulations and standards. By enhancing desirable vegetation and suppressing non-desirable vegetation, the activities improve public safety, protect habitat and water quality, and preserve roadway structural integrity.

Activities include brush cutting, tree pruning, roadside mowing, noxious weed control, and hazard tree removal. Targeted noxious and invasive weed control is conducted through an Integrated Vegetation Management Plan for Right-of-Ways (IVM). Chemical applications are conducted by a licensed chemical applicator on staff.

Vegetation in the ROW is managed according to the functions of the roadway, shoulder, or structural element, including medians. The functions are defined by three zones of the ROW: clear zone, operational zone, and transitional zone. Refer to the IVM for more detail. Functions of the vegetation are also considered at stream crossings and near waterbodies, to maximize habitat integrity in riparian (streamside) areas, while complying with road safety standards.

Safety concerns: Ensure that all staff have adequate training to operate heavy equipment and hand tools. Material safety data sheets for chemicals and other reference materials must be available to staff handling potentially hazardous products. The appropriate personal protection equipment (PPE) must be worn to prevent accidents and reduce the risk of injury.

Environmental concerns: Riparian areas provide shade for streams and create a micro-climate for wildlife and insect communities needed to sustain healthy streams. Removal of native vegetation, encroachment by invasive weeds, chemical runoff or overspray, and physical trampling can cause impairments to riparian area function. Precautions must be taken to reduce risks to harm the riparian area during a maintenance activity.

BMP Outcomes:

- Improved water quality and riparian (streamside) areas.
- Increased sight distance.

- Improved visibility of shoulder for emergencies and obstacles.
- Reduce shading on roadway (reduced icing, reduced accidents).
- Reduced fire hazard.
- Facilitation of inspection and maintenance of other features and structures.
- Reduced flooding.
- Improved driver guidance (provides visual definition).
- Improved pedestrian safety (divides uses: pedestrian rather than vehicular).
- Reduced storm (blow down) hazard.
- Improve drainage by increasing bio-filtration, infiltration and percolation.
- Reduce spread of noxious weeds and undesirable vegetation.
- Limit erosion.
- Lower herbicide use when used in conjunction with other BMPs or other integrated management components.

1. Integrated Vegetation Management (IVM)

IVM includes four major elements:

- Mechanical: using equipment such as mowers, chain saws, brushers, etc.
- Biological: using a natural predator to control the noxious weed or unwanted vegetation
- Cultural: incorporating native or more appropriate plant material to out-compete the unwanted vegetation.
- Chemical: applying appropriate chemicals.

The IVM includes:

- Goals and objectives for IVM,
- Descriptions of management zones,
- Methods to be used to control vegetation,
- Monitoring and evaluation methods, and
- BMPs including timing activities in consideration of fish and wildlife species,
- Coordination with other maintenance activities as appropriate.

BMPs:

- Maintain clear objectives of the IVM through annual IVM review.
- Follow maintenance plans and procedures identified in the IVM, and update as necessary to minimize impacts to receiving waters.

2. Grass Mowing

This activity includes mowing of grass using drop down mowers and tractors, and push or walk-behind mowers, to maintain safety sight distances and visual clearance of sign controls, and to maintain a pleasing roadside for roadway users.

BMPs:

- Minimize scalping of soil surface and reducing soil erosion by maintaining a desirable height of two (2) to six (6) inches.
- Mow to the maximum extent of the ROW, except in the RAZ, to reduce the frequency of mowing needed to maintain a safe roadway.
- Limit mowing to within eight (8) feet of the pavement edge within RAZ unless a greater mowing width is necessary to maintain the proper functioning condition of roadway assets.

3. Brush Mowing

This activity involves the removal of vegetation along rural and urban roadsides using tractor-powered flail or rotary brush cutters to maintain safety sight distance as well as visual clearance of traffic control signs, to maintain safety "clear zones" and to provide for a safe and visually pleasing roadside for roadway users.

BMPs:

- Maintain a finished height for native vegetation that supports natural growth of understory foliage as site conditions allow. Remove brush around utilities to allow maintenance and access to those features.
- Limit mowing to within eight (8) feet of the pavement edge within RAZ unless a greater mowing width is necessary to maintain the proper functioning condition of roadway assets.
- Remove brush only within twenty feet (20) on either side and under bridge structures. All other brush not within the clear zone will be left in its current condition, unless it interferes with sight distance, shades the structure, or if the brush is a noxious weed.
- Remove brush only as necessary to perform maintenance required at culverts, including maintaining the clear zone, line of sight, and addressing other safety issues, unless the brush is a noxious weed. If other brush removal is needed, coordinate with the Environmental Specialist.

4. Hand-brushing and Pruning

Roadside clearing includes the removal of encroaching or overhanging vegetation to provide for visibility of traffic control signs and other roadway assets. In usual circumstances, encroaching vegetation will be removed from within twenty feet either side of bridges. Vegetation will be removed to enhance public safety by maintaining safety "clear zones" and visibility of roadway assets and to prevent compromising the structural integrity of the roadway.

Significant consideration should be given to preserving those trees that provide stream shading.

BMPs:

- Brush cut within ROW will be left in place where doing so does not interfere with sight distance, compromise drainage systems or public safety, cause fire hazards, involve noxious weeds or impact the proper functioning of roadway structures or systems.
- If brush cannot be left in place, brush will be chipped and spread within the ROW. In circumstances where brush must be removed and chipped at a district maintenance yard, the chipped material will be used on landscaped facilities.
- Brush within twenty feet of and underneath bridge structures will typically be removed. Proper caution will be exercised when conflicts with the resting zones of migrating fish may be possible.
- All roadside trees will have their canopies raised to a minimum of fifteen (15) feet on paved roads and as needed on gravel roads.

5. Median Landscape Maintenance

This activity includes the maintenance of landscaped areas along roadway medians, boulevards and walkways including the maintenance, operation and repair of irrigation systems and other landscape facilities is usually accomplished through manual labor, often with Inmate Work Crews.

BMPs:

- Use proper traffic control.
- Refuel equipment away from stormdrains and vegetation.
- Keep roadway medians reasonably free of weeds by mechanical or chemical application, according to the IVM.
- Maintain shrubs so that vegetation does not encroach outside the median into the travel lane.
- Clippings should be removed from the sidewalk to avoid pedestrian hazards.
- Dead trees or shrubs and dying limbs will be removed and chipped for landscape use.
- Landscaped areas will be raked free of leaves, twigs and other debris.

6. Herbicide Application and Chemical Inventory

Chemical control consists of the selective application of approved herbicides to control the growth of undesirable vegetation according to the IVM. Road Maintenance does not use any (EPA) restricted-use chemicals to control roadside vegetation. Materials that may be applied include broad-based foliar-active herbicides and soil residual herbicides.

Computer-assisted delivery systems are used to control the mixture, rate of application and placement to prevent an impact to resource waters and habitats.

The application of selected herbicides along roadsides and within ROW is a proven method of vegetation management designed to retard the growth of weeds and other undesirable species. Pre-emergent pesticide applications on landscaped areas should result in the absence of weeds for up to six months depending on the soil type and organic matter and the germination of the targeted seeds. Chemical agents used for brush control must not reach the stream system or a wetland.

BMPs:

- Full consideration will be given to alternative management methods before approving the use of chemical applications, according to the IVM.
- Within the RAZ, hand spray around structures that require chemical control.
- Chemical applications will not be used sixty (60) feet of any fish bearing stream.
- Only those chemicals approved for use near aquatic resources (EPA labels) will be used.
- Herbicides will be used and stored in accordance with EPA labels.
- Pre-emergent herbicides should be applied when moderate rainfall is expected in order to transport the materials into the top inch of soil. Application should be avoided when heavy precipitation or flooding is expected.

7. Hazard Tree Removal

Maintain riparian trees along streams or rivers unless those trees are hazard trees, could potentially impact bridge structures, or could impact the line of sight as determined by a District supervisor. Maintain shade trees within RAZ unless they have been identified as Hazard Trees.

BMPs:

- Hazard trees which otherwise provide shade or bank stabilization, or grow within RAZ and are determined to be removed, removal will be coordinated with the Environmental Specialist.
- Replant two seedlings or cuttings for every tree removed when removing trees over 12 inches DBH (diameter at breast height) in the RAZ. Locate the replanted trees in the watershed so they will not pose a threat to roadway structures.
- Coordinate with the Environmental Specialist on species and location of seedlings or cuttings to be replanted. Ensure that replacement trees will not compromise future management operations.

C. Traffic Operations

	Maintenance Activity	
1	Striping	
2	Sign Installation	

The Traffic Aids program is responsible for the installation, monitoring and maintenance of all roadway pavement markings, roadway striping, traffic control signs and advisory signs.

Safety concerns: Ensure proper traffic control while working in the ROW and roadway. Material safety data sheets must be available for all staff who may handle potentially hazardous products.

Environmental concerns: Use of grinders to remove markings can potentially create sediment fines that can enter drainage systems and waterways. Accidental paint and chemical spills can impact water quality. Sign installations in riparian areas need to consider brush removal and soil disturbance.

BMP Outcomes:

- Restore markings and signage to maintain road safety
- Minimize work site pollutants from maintenance/repair activities.
- Reduce impacts to vegetation.
- Reduce sediments from entering watercourses or streams.

1. Striping

This activity involves the placement of roadway striping (centerline or edge-line) using air-delivered, low-VOC, non-toxic paint and reflective glass beads. The roadway surface must be dry and reasonably warm to allow paint to dry quickly. The loading of materials will be performed at maintenance yards to preclude any chance of accidental discharge to resource waters.

BMPs:

- Striping is done in dry weather. Avoid working in wet weather.
- Follow manufacturer standards for air and road surface temperature to allow proper paint curing.
- Heat paint on board during application to decrease drying time.
- Use brooms or vacuums to clean up grindings or abrasives and dispose of properly.
- Use extra caution when applying the materials in the RAZ to prevent accidental discharge to those waters.
- Use extra caution where catch basins may be located in the striping path. Turn off paint to prevent paint from entering drainage system.

- Clean equipment in the maintenance yard facility using biodegradable soap products
- Clean all liquid material spills with absorbent materials and dispose of properly.

2. Sign Installation

Activity includes washing, locating, installing, repairing, and replacing signs in the ROW. Installation of signs typically entails setting posts in visible locations according to state and federal standards with pressure treated wood posts.

BMPs:

- Use best professional judgment when installing signs that are placed within cut faces, fill slopes, or are replaced in kind. Use proper erosion control and implementing good housekeeping practices on disturbed areas, as needed.
- Collect all broken sign parts and fasteners and dispose of properly. When drilling pressure treated posts, sweep or collect shavings.
- Appropriately dispose of excess materials and debris. Protect drainage infrastructure and waterways from green concrete, if such is used.
- Coordinate with Environmental Specialist if sign placement involves tree removal or significant disturbance of vegetation in the RAZ. Avoid sign installation in wetlands.

D. Surface Maintenance

	<i>Maintenance Activity</i>	
1	Release Agents	
2	Asphalt Concrete Patching	
3	Grinder Patching	
4	Cold Patching	
5	Tarpot Patching	
6	Chip Sealing	
7	Crack Sealing	
8	Sweeping and Flushing – non-pick up	
9	Sweeping – pick up	
10	Gravel Roads	

These activities are performed to provide a safe roadway surface for the traveling public and to reduce further roadway deterioration or failure. Activities include the following: pothole and square cut patching; removing paved surface or roadway base; repairing roadway base; repaving; adding gravel or grading roads, or ROW surfaces; extending pavement edge; paving graveled shoulder; crack sealing; overlay; chip seal; resurfacing.

Most patching and resurfacing activities occur from March to October during dry weather (to prevent tack from leaving road surface) and warmer weather. Potholes are repaired as they occur within established guidelines to reduce accidents, vehicle damage, and adverse environmental impacts.

Safety concerns: Material Safety Data Sheets and other reference material must be available for staff handling potentially hazardous products. The appropriate personal protection equipment (PPE) must be worn and necessary training performed to prevent accidents and reduce the risk of injury.

Environmental concerns: Surface repair oil and materials can runoff surfaces if work is done during wet weather, or if proper containment is not used. Effective maintenance practices can minimize the amount of sediment and pollutants from the road surface entering enter waterbodies.

BMP Outcomes:

- Restore/clean pavement surface.
- Minimize work site pollutants from maintenance/repair activities.
- Restore or maintain surface water drainage.
- Restore or maintain road surface/safety.
- Reduce sediment loading of shoulders, ditches, detention ponds and watercourses and/or streams.
- Reduce turbidity.
- Reduce sediments and debris from entering watercourses or streams.

1. Release Agents

Release agents are used to soften hard asphalt or release asphalt and oils from paving equipment. Release agents are also used to pre-treat equipment to prevent asphalt from adhering to the equipment. Soy-based release agents are the preferred material.

A facility at the Vance Pit maintenance yard is designated as the area to apply release agents. The area contains a sand blanket to capture excess product from the truck aprons and equipment.

BMPs:

- Eliminate the use of diesel fuel as a releasing or cleaning agent.
- Use environmentally sensitive cleaning and releasing agents.
- Use only products marketed as release agents.
- When applying release agent to truck and equipment, use the designated facility at Vance Pit to prevent excess material from entering drainage system.
- Transport excess materials to the stockpile at the Vance Pit maintenance yard, and stage for recycling to the supply point of origin.
- Clean equipment at the Vance Pit maintenance yard in the designated area.
- Capture and contain all excess material containing release agents when cleaning equipment in the field, or retain all material on the pavement.
- Recycle or dispose of all release agents and materials released as directed by the materials safety data sheet or manufacturer's direction.
- Prevent all release agents and released material from reaching the roadside environment. Use limited amounts of release agents or capture material as necessary.
- Use heat sources to heat and clean tack nozzles during operations.
- Carry adequate spill kits with absorbent materials (diapers, kitty litter, shovels, etc.) to keep materials out of water bodies.

2. Asphalt Concrete Patching

Activity involves hand patching of potholes, small depressions, distortions, rutting, surface irregularities, and edge breaks in the road surfaces and shoulder with hot mix material. Surface is swept prior to application. Mason sand may be used to reduce surface tackiness.

BMPs:

- Asphalt Concrete (AC) patching is typically done in dry weather to prevent tack from running off to a drainage facility or waterbody. If patching must be done during wet weather, precautions must be taken to prevent tack from running off the road surface into drainage system and waterways.
- During surface preparations, dispose of grindings or broken asphalt properly.
- Check tarpot and wand for leaks. Inspect all hoses and nozzles.

- If mason sand is used on finished surface, sweep sand within 24 hours to prevent material from entering catch basin.

3. Grinder Patching

Grinder patching is the similar to AC patching except the distressed surface is removed with a milling machine. A loader mounted screed is used to apply AC material, which compacted with a roller.

BMPs:

- Grindings are automatically picked up by the grinding equipment, and is deposited in a dump truck. Ensure that the spoils are properly disposed.
- Inspect and maintain equipment to prevent leaks.
- Control dust with flusher trucks where necessary.

4. Cold Patching

Activity involves hand patching of potholes, rutting, and edge breaks in the road surfaces and shoulders with a temporary repair.

5. Tarpot Patching

Activity involves applying water-based oil and aggregate covering on sections of road surfaces to seal cracks. Surface may be rolled with steel roller depending on size of patch.

BMPs:

- Check tarpot and wand for leaks. Inspect all hoses and nozzles.
- After application, finished surface is swept with sidecast or vacuum sweeper, depending on curb type.
- In RAZ, vacuum sweeping is the preferred method of sweeping. If vacuum sweeping is not available, slow the sweeper and broom speed and change the angle of broom to prevent sweepings from leaving the road shoulders.

6. Chip Sealing

Activity involves applying water-based oil and aggregate covering on sections of roadway surfaces to seal cracks and provide wear surface. Aggregate (1/4 - 10 size) is specified as clean oil rock, so the concerns for sediment runoff from aggregate are not existent.

BMPs:

- Catch basins need to be covered to prevent oil and chip to entering.
- Manhole and utility covers need to be covered before application to be visible and accessible after application.
- Prevent spills and leaks from equipment.
- After application, finished surface is swept with a vacuum or sidecast sweeper to remove any loose rock.
- In RAZ, vacuum sweeping is the preferred method of sweeping. If vacuum sweeping is not available, slow the sweeper and broom speed and change the angle of broom to prevent sweepings from leaving the road shoulders.

7. Crack Sealing

Activity involves the cleaning and filling of crack in hard surface pavements, using a rubberized asphalt material.

BMPs:

- Check crack sealing equipment for leaks and integrity of hoses before application.
- Perform clean up in the maintenance yard away from waterbodies.
- Carry adequate spill kits with absorbent materials (diapers, kitty litter, shovels, etc.) to keep materials out of water bodies.

8. Sweeping and flushing – non-pick up

Activity includes sweeping and flushing of roadways, curbs, and bridge decks to remove dirt and debris. Materials are sidecast (not recovered) under this activity. Activities are performed year round.

Remove materials such as sanding material, dirt, debris, etc. from the travel lanes and shoulders, while preventing suspended sediment and pollutants from reaching waterbodies so that water quality is not impacted.

BMPs:

- Schedule sweeping during damp weather, to minimize dust production when feasible. If sweeping cannot be done during damp weather, use water (as needed) to reduce dust.
- In RAZ, vacuum sweeping is the preferred method of sweeping. If vacuum sweeping is not available, slow the sweeper and broom speed and change the angle of broom to prevent sweepings from leaving the road shoulders.
- Slow the sweeper and broom speed, where shoulder widths are narrow, to prevent excessive casting of materials from entering ditches.

- Reduce use of sanding material and the need for sweeping by using winter maintenance chemicals instead of sand and gravel during winter condition, where and when feasible.
- When flushing rural roadways to remove sanding materials or dirt, limit practice to areas outside the RAZ. Prevent flushed materials from leaving the road shoulders. Prevent flush water and materials from entering waterways and drainage ditches.
- When sweeping or flushing bridges, refer to the Bridge Maintenance BMPs.

9. Sweeping – pick up

This activity includes sweeping of roadways, and curbs, Materials are recovered (not sidecast) and disposed of during this activity. This activity is performed year round. This activity includes the removal of materials, such as sanding material, dirt, debris, etc from the site to further prevent impact to the water resources.

BMPs:

- Schedule sweeping during damp weather, to minimize dust production when feasible. If sweeping cannot be done during damp weather, use water (as needed) to reduce dust.
- Store collected materials at the Vance Pit maintenance yard. Collected material may be temporarily stored and dewatered at the facility.
- Recycle sweeping materials where appropriate.
- Reduce use of sanding material and the need for sweeping by using winter maintenance chemicals instead of sand and gravel during winter conditions.
- When sweeping bridges, refer to the Bridge Maintenance BMPs.

10. Gravel Roads

Activity involves applying aggregate covering on non-paved surfaces to reduce potholing and wash boarding.

BMPs:

- Restrict working during heavy rainfall, which may cause erosion concerns.
- Restrict working when materials are very dry and may not properly compact, creating potential for erosion.
- When working in the RAZ, apply additional erosion control measures where necessary to achieve outcomes.

E. Right-of-Way Maintenance

	<i>Maintenance Activity</i>	
1	Shoulder Maintenance	
2	Litter Removal and Adopt-a-Road Program	
3	Owner-Maintained ROW Program	
4	Curb and Sidewalk Maintenance	
5	Guardrail Maintenance	

The right-of-way (ROW) provides a safe zone for traffic and a transition from the road surface to the drainage system and adjacent lands. The physical structure of the ROW consists of the shoulder, curb and sidewalk, and guardrails.

Safety concerns: Ensure that proper traffic controls are used during maintenance activities.

Environmental concerns: Sediment, road debris and litter enter the drainage system and waterways, if ROW areas are not properly maintained.

BMP Outcomes:

- Restore structure.
- Minimize the amount of construction or repair to reduce the amount of worksite sediments and debris to from entering watercourses, streams or water bodies.
- Restore or maintain surface water drainage.
- Reduce or trap sediments in gravel in shoulder.
- Reduce road surface flooding by allowing water to run off roadway.
- Reduce turbidity.
- Allow infiltration of water through gravel.
- In areas where open ditch sections abut the roadway, use gravel and vegetation on the roadway shoulder to provide a filter strip for runoff before water enters the ditch.

1. Shoulder Maintenance

Maintenance tasks performed on gravel shoulders improve drainage, restore proper grade, restore filtering capability, maintain vegetation to provide adequate site distance, smooth rutting, and remove buildup of sediment before entering drainage system.

Maintenance activities are performed to ensure the gravel shoulder functions to stabilize the road surface edge and provide a safe zone for traffic, pedestrians and bicycles. Shoulder also many act as filter for sediments, provides bio-filtration, and controls surface water runoff. Maintenance of a vegetative buffer (grasses and small forbs) between the shoulder and ditch, if the area is wide enough, reduces erosion. Periodically remove sediment deposits and vegetation during the dry season when possible with a

motor grader, Vactor, loader, excavator or backhoe. Inmate work crews are sometimes assigned to maintain vegetation in shoulders and ROW.

Shoulder aggregate is typically 1-inch fractured aggregate (or less) or asphalt grindings. Use of asphalt grindings is limited to road segments that are outside the RAZ (~150 feet from waterway). Ditches are not considered waterways in the context of this activity.

BMPs:

- Install check dams or other erosion control devices in adjacent ditches to protect resource water during shoulder maintenance activities.
- Evaluate for alternatives to recurrent grading, such as berming or paving the shoulder. If new impervious pavement is added, contact the Environmental Specialist if stormwater management is needed.
- Evaluate the width of the grading; modify to minimize disturbance of vegetation.
- Grade in dry weather but while moisture is still present in soil and aggregate, where feasible.
- If shoulder maintenance is necessary during emergency situations, check dams are installed in the adjacent ditch, or vegetated portions of the ditch are left undisturbed to provide filtering capacity.
- Permanently stabilize disturbed roadway slopes with BMPs: jute matting, native vegetation, or other erosion control techniques.
- Asphalt grindings are used on road segments outside the RAZ (~150 feet from waterway). Refer to RAZ maps.
- Maintain vegetation buffers to catch sanding material and other pollutants to protect the water quality of nearby waterbodies where appropriate.

2. Owner-Maintained ROW Program

Private property owners can choose to maintain the vegetation along the frontage of the privately-owned property by signing an agreement with the County. Typically private property owners are involved in the program because they want to eliminate herbicide use adjacent to their property, or because they desire to maintain brush and other vegetation adjacent to their property.

BMPs:

- Participants in the OM program are expected to maintain their property frontage to County standards for road safety.
- If participating areas fall within a RAZ, landowners will be notified of special RAZ concerns and restrictions.
- Maintain signed OM program agreements with participants.

3. Litter Removal and Adopt-a-Road Program

This activity involves employing community volunteers and inmate work crews to perform litter clean up along County roadways. Debris collected by community volunteers is stacked close to roadway shoulder while litter is bagged, tied and stacked. Inmate work crews dispose the debris they collect during the activity.

BMPs:

- Roadway shoulders and ditches and other areas within the rights-of-way should be reasonably clear of debris.
- Only trained personnel will handle potentially hazardous or unidentified materials. Contact the Environmental Specialist or Nuisance Code Enforcement officer if suspicious material is found.

4. Curb and sidewalk Maintenance

Activity involves removal of sanding materials from sidewalks and vegetation maintenance, including trimming, pruning, weed-eating and moss removal by hand tools, chemicals and other mechanical means. A licensed chemical applicator handles chemical applications. Seasonal employees and inmate work crews typically perform other activities.

BMPs:

- Sweep and dispose of debris from sidewalks and adjacent road.
- Maintain vegetation on sidewalks so that it is clear of obstructions and trip hazards. Vegetation should be cleared to a vertical height of ten (10) feet.
- Dispose of debris properly.
- If herbicides are used, follow IVM. Herbicides are applied by a licensed chemical applicator.

5. Guardrail maintenance

This includes the repair, replacement and installation of roadside guardrail and bridge-rail installations to enhance public safety. Work may be accomplished throughout the year. Cleaning under guardrails is conducted by hand using hand tools.

Accurate layout and marking is critical to ensure the proper alignment of posts and rail. Dig postholes, set posts and attach rail to posts. Compact back-fill around posts and securely tighten all connections. Installation of silt fence or other erosion controls between work areas and the stream may be necessary when working near resource water.

BMPs:

- Areas down-slope from the guardrail installation will be protected through the placement of appropriate erosion control measures where necessary.
- Prevent green concrete from entering drainage and waterways.
- Dispose of waste materials properly.
- Ensure proper traffic control is used during activity.

F. Drainage Maintenance

	Maintenance Activity	
1	Stormwater Management	
2	Ditch Maintenance	
3	Culvert Maintenance	
4	Sump Maintenance	
5	Catch Basin Cleaning and Repair	
6	One-Call Response for Drainage System	
7	Water Quality Facilities	

The stormwater drainage system includes enclosed system, such as sumps (drywells) and catch basins, as well as open systems, such as swales and ditches. The drainage system is part of the ROW structure that routes water and sediments from roadways and surface structures to outlet areas. These systems accumulate sediment over time, and because of the limited storage capacity, need to be cleaned to maintain treatment effectiveness.

Activities include removing debris, sediments, and liquids from enclosed and open drainage systems using a vacuum/flush truck (“Vactor”), by hand, or other mechanical means. Enclosed drainage systems include the following: facilities, retention/detention facilities, manholes, catch basins, vaults, pipes, access roads, pollution control devices and inlets.

Open drainage systems include stormwater conveyance systems that were created entirely by artificial means, such as roadside ditches and storm or surface water runoff facilities. These structures are not watercourses, streams or wetlands.

Maintenance tasks performed on open drainage systems include, but are not limited to, activities such as the following:

- Cleaning.
- Reshaping/re-grading.
- Erosion control/bank stabilization of drainage system.
- Vegetation management.
- Removing debris, trash, yard waste, sediment.
- Repairing structures.

Safety concerns: Ensure that all staff have proper training to operate heavy equipment and hand tools. Proper traffic control must be used in the ROW.

Environmental concerns: Sediment from disturbed work areas can enter waterbodies and cause water quality impairments, such as turbidity, excess nutrients, mercury input, and cause sedimentation in stream habitat. Sediment from water quality facilities can also contain metals, hydrocarbons, and other pollutants, and must be disposed properly to prevent materials from entering waterbodies.

BMP Outcomes:

- Restore structure.
- Improve water quality.
- Minimize work site pollutants from leaving construction/repair area.
- Reduce turbidity.
- Restore surface water drainage.
- Clean up and remove sediment from drainage system.
- Minimize flooding from plugged system.
- Reduce potential plugging of systems.
- Reduce overflows/ flooding.
- Reduce sediment and debris loading to watercourses, streams and other water bodies.
- Maintain and restore water quality by cleaning ditches or structures.
- Maintain or restore structure.
- Minimize sediment or debris from leaving construction/repair area.
- Maintain or restore surface water drainage and storage.
- Maintain or restore sediment storage capacity.
- Reduce flooding from plugging of system/reduced storage area.
- Keep structure clear of debris, trash, and yard waste.
- Reduce sediments and debris from entering watercourses or streams.
- Reduce sediment conveyance through drainage system by trapping and removal.
- Leave vegetated sections in ditch where sediment buildup has not impeded flow or infiltration.

1. Stormwater management

Stormwater management is not a unique road maintenance activity, but a broad suite of BMPs, engineering solutions, and education efforts designed to minimize stormwater pollutants to the maximum extent practical. Road Services developed a county-wide Stormwater Management Plan in response to the NPDES Municipal Separate Storm Sewer System Permit for the Portland and Gresham areas. The NPDES permit area includes the arterial roads within Fairview, Wood Village and Troutdale, and five Willamette River Bridges.

The County Road Services Water Quality Program manages, tracks, and reports BMP activity for areas within the NPDES permit areas (arterial and collector roads in the urban areas of Wood Village, Fairview, and Troutdale; the Willamette River Bridges, and pockets of unincorporated urban areas in Portland and Fairview). The County's Stormwater Management Plan and NPDES Annual reports are available online at www.co.multnomah.or.us/waterquality.

Stormwater management in the rural unincorporated areas relies on maintaining the drainage infrastructure (i.e., vegetation in ditches, promoting sheet flow where possible), reducing sediment disturbance and erosion, and other BMPs as described in this manual.

2. Ditch Maintenance

Roadside ditches generally consist of in-slopes, a ditch, and back slopes. The in-slopes can be vegetated with grass or small forbs. Small trees and brush may be allowed outside of the back slope of ditches (in compliance with federal and state regulations). Roadside ditch maintenance operations are performed when sediment, debris, or vegetation in a ditch impedes flows or storage of water and sediments to a point where safety or structural integrity of the roadway system is jeopardized. Maintenance of roadside ditches improves properly functioning systems, which can reduce:

- Sheet flow of surface water across the roadway, which creates slope erosion.
- Hazardous driving conditions, particularly during cold weather.
- Roadway washouts during storm events.
- Flooding of adjacent property.
- Saturation of the road sub-base.
- Large quantities of sediment transported to watercourses or streams.

This activity is performed in all weather, throughout the year. Restrictions may include periods of heavy rainfall or sustained rainfall while working on steeper roadway grades. When activity has been completed, the ditch should provide good flow and filtration for the water run off. The ideal drainage system would be a two-foot road shoulder with 3:1 in-slope, one-foot flat bottom and a 4:1 back-slope. However, ROW widths, slopes, or other geographic features may limit the ditch shape. Work in ditches twenty (20) feet from the ends of a culvert is considered culvert maintenance.

BMPs:

- Where a vegetated ditch is designed to help control soil erosion, disturb only when necessary to maintain proper drainage activity. Clean only those ditch segments that have filled in to the extent where the drainage may not function properly during a major weather event. Limit soil and vegetation disturbance by using a Vactor or bucket to remove material behind check dams, where feasible.
- Use erosion control devices such as check dams (Bio-bags or rock), silt mats, and other erosion control measures, when the potential exists to have sediment or other material enters streams or wetlands. Install check dams between the disturbed segment and the nearest down-slope stream crossing.
- Perform ditch work in optimum weather (when the ditch is dry but there is still sufficient soil moisture to prevent dust and the movement of small particulates) to minimize environmental impacts, where feasible. Coordinate with the Environmental Specialist when ditch work must be performed under urgent circumstances where erosion potential is high.
- Grade ditch slopes to support establishment of desirable vegetation and sediment trapping function.
- Re-seed or re-establish vegetation in drainage ditches and steep slopes as appropriate.

- Excess, or waste, materials are to be removed to an appropriate location for disposal or storage.
- Refer to RAZ maps to ensure proper precautions are taken in resource sensitive areas.
- If there is standing water in the ditch or the ditch contains wetland vegetation, contact the Environmental Specialist. A permit may be needed to conduct maintenance. Refer to channel maintenance activity in this manual (page 45).

3. Culvert Maintenance

This activity refers to maintaining culverts that carry stormwater drainage, not instream culverts. (For instream culverts, see page 44.) Culverts need to be free of all obstructions so stormwater can flow easily. This activity is to clear obstructions from inside culvert pipes such as gravel, silt and other types of debris in order to restore proper function. This may also include resetting culvert sections that have separated at the joints.

For cleaning out culverts, no permit or authorization is needed from either the Corps or DSL for removal of sediment or debris inside the culvert or within 20 feet of the ends of the culvert. For repairing and reattaching the end, no permit is needed if the length of the culvert is not changed and the road prism is not disturbed. Fish passage requirements kick in when the repair/replacement work affects more than 50% of the culvert length.

Culvert maintenance is often done using heavy equipment including a backhoe, excavator, vacator truck or jet router (a machine with a high-pressure hose and a powerful vacuum), and hand shovels. Vegetation may be removed during cleaning.

Culvert maintenance is done in all weather to prevent flooding and roadway failure and includes the removal of beaver dam materials that may plug culverts. Culvert cleaning can occur at any time it is necessary, so the in-water work window is not an issue for that work. Work in a ditch within twenty (20) feet upstream and downstream of the culvert barrel end is considered culvert cleaning.

BMPs:

- Install erosion and sediment controls during culvert or trash rack cleaning.
- Inspect roadway culverts on a regular basis.
- Use Vacator or hand tools to clear debris where feasible.
- Clean culvert inlets prior to the on-set of winter weather conditions.

4. Sump Maintenance

Stormwater sumps are used in select areas of the County to manage stormwater from County-owned arterial roads and facilities. These sumps are stormwater infiltration devices regulated as Underground Injection Controls (UIC) by the Oregon Department of

Environmental Quality. Road Maintenance maintains 118 sumps or drywells, of which 27 are within the roadway, and 91 are in parking lots of County owned facilities.

(As of January 2010, DEQ has not issued permits for UICs.)

Activities include cleaning of sump by Vactor, and associated catch basins or sediment manholes, annually, unless conditions warrant otherwise. The UIC Stormwater Management Plan outlines the inspection and maintenance plan for County UICs.

BMPs:

- Refer to the UIC Stormwater Management Plan for system inspection and maintenance.
- Properly dispose of decant water and sediment removed from catch basins and sumps.

5. Catch Basin Cleaning

Catch basins are the first points for receiving and distributing stormwater in the urban area. Catch basins trap sediment and debris before it reaches watercourses, streams and/or waterbodies. The effectiveness of the catch basin decreases substantially when the sump exceeds 70% capacity; hence, regular cleaning is required to ensure that the catch basin performance is maintained.

These catch basins are managed under the Stormwater Management Plan of the County's NPDES permit. Removing sediments and debris from drainage system using catch basins is often the primary stormwater treatment on the County-owned arterials in Wood Village, Fairview and Troutdale.

When using high-pressure flushing equipment, vacuum out solids to reduce sediment and turbidity from moving downgrade throughout the drainage system.

BMPs:

- Refer to the NPDES Stormwater Management Plan for system inspection and maintenance
- Properly dispose of decant water and sediment removed from catch basins.

6. One-Call Response for Drainage System

Road Maintenance locates and identifies underground stormwater infrastructure for private development.

BMP:

- Ensure proper traffic control is used when locating utilities.

7. Water Quality Facilities

As the Road Engineering section implements the policy to consider stormwater retrofits for capital improvement projects, the number and types of water quality facilities will increase over time. Long and short term maintenance needs must be considered to maintain the effectiveness of the stormwater quality facilities. Currently, Road Maintenance maintains only a few facilities: proprietary stormwater filter devices, swales, and assorted treatment technologies. Maintenance plans are needed for each type of facility based on the specific function or technology.

BMPs:

- Establish regular inspection and maintenance schedules for each water quality facility.
- Ensure that the facility is functioning as designed.
- Work with the Road Engineering section when alterations or improvements are needed to upgrade or repair a facility.
- Establish and maintain vegetation according to facility design, where appropriate.
- Dispose sediment and waste materials properly.

G. Emergency Work

	Maintenance Activity	
1	Snow Plowing	
2	Sanding	
3	Anti-icing	
4	Storm Clean-up	
5	Slides and Washouts	
6	Emergency Response	

Emergency Work includes the management of snow and ice on roadways, the stabilization, repair and restoration of roadways, rights-of-way and structures damaged by storm events, and clean-up of traffic accidents, spills, or other extraordinary events.

An emergency operation typically ends when the threat of loss of life, injury, suffering or financial loss is mitigated and a pre-emergency level of service is restored. Personal safety is the primary concern during an emergency. When the emergency event is over greater consideration must be given to the environmental concerns.

Safety concerns: Ensure that all staff have adequate training and emergency response materials to safely and effectively respond to emergencies. Material Safety Data Sheets and other reference material must be available for staff handling potentially hazardous products. The appropriate personal protection equipment (PPE) must be worn to prevent accidents and reduce the risk of injury. Call Emergency Response Coordinator (ERC) to report safety concerns.

Environmental concerns: Minimize impacts to natural resources by containing spills, road maintenance chemicals and products, and properly disposing materials. Minimize direct impacts to riparian habitat and waterways by reducing risks for accidents, and taking preventative measures.

BMP Outcomes:

- Control sediment and debris from ROW.
- Stabilize slide/washout area within the ROW to reduce environmental, transportation and/or structural impacts.
- Repair roadways, repair access roads, surface drainage, storm water system, and/or other ROW structures.
- Provide a reasonably safe roadway surface for the traveling public.
- Minimize pollutants resulting from vehicle accidents such as petroleum hydrocarbons, heavy metals, and road wash-off from entering storm drainage/stream system.
- Reduce sediment from entering water bodies.
- Reduce the occurrence of vehicles leaving the road surface and entering sensitive areas.

1. Snow Plowing

Road maintenance crews are responsible for sanding and plowing operations during periods of inclement weather. Snow and ice removal is considered to be work of such importance that it is classified as an emergency operation. Safety for the traveling public and road department personnel and access for emergency services shall be given primary consideration at all times. Snow and ice removal reduces vehicle accidents that may adversely impact sensitive areas.

Road Services has a dedicated plan - Snow & Ice Plan – for prioritizing snow related activities. This plan is found in Appendix B.

BMPs:

- Reduce plowing (truck) speed in identified RAZ.
- Clean culvert inlets prior to the on-set of winter weather conditions.
- Modify snowplow blade angles in identified RAZ.
- Plow snow in areas that allow vegetation to filter and contain sand.

2. Sanding

The application of crushed, graded aggregate on roadway surfaces is to provide for motorist safety. Improving traction keeps vehicles on roadway and out of aquatic habitats or riparian areas. Improving traction also reduces accidents, which reduces pollutants from entering aquatic habitats.

Removing sand from roadway surface reduces sediment contribution to adjacent water bodies and reduces dust and minimizes resulting air quality impacts. Road Maintenance captures and reuses sanding materials where feasible.

Post-event cleanup is considered a continuation of the event and removal of sediment from the road surface reduces sediment loading and preserves water quality.

BMPs:

- Limit sanding to curves, intersections and hills as identified by the Road Maintenance Manager, except when requested by emergency services due to extreme hazards.
- Treat sand cleanup as part of the emergency: remove sand as a priority in order to remove sediments, where feasible.
- Prioritize cleanup efforts to areas where impacts to aquatic habitat areas are greatest in order to minimize impacts.
- Prioritize cleanup in areas with high volume traffic and curbed roads.
- Recycle sanding material into roadway shoulders in rural areas, except within RAZ.
- Capture sanding materials from around bridges and near streams where possible.

- Sanding materials may be flushed from roadways in rural uncurbed areas outside the RAZ, but the material is not to be flushed into the ditch or drainages. Sanding materials are to be moved only to the road shoulder.
- Vacuum sweepers will be employed in RAZ to capture sanding materials, whenever feasible.
- Vacuum sweep sanding materials in curbed areas as soon as practicable and clean catch basins in curbed areas as needed to maintain function.

3. Anti-icing

Activity includes applying anti-icing chemicals to road surfaces to prevent snow and ice from bonding to the roadway. This activity is performed solely for safety purposes.

Reducing the use of sanding material by applying anti-icing chemicals may reduce sanding related impacts to air quality, water quality, and aquatic habitat. However, the effectiveness of anti-icing chemicals is heavily dependent on weather, and this strategy may reduce the safety of the road in many cases if circumstances are less than optimum. Best professional judgment is needed when applying this strategy. The use of anti-icing and deicing chemicals has been associated with vehicle accident reduction. Reducing accidents reduces the risk of petroleum and debris entering waterbodies and reduces the opportunity for structural damage to stream systems and habitat.

Road Maintenance uses Calcium Magnesium Acetate (CMA) as the preferred anti-icing chemical for application on County roadways. Use of new alternative chemicals will be determined based on effectiveness, environmental impact and cost following the recommendations of the ODOT and Pacific Northwest Snowfighters.

BMPs:

- Use anti-icing techniques on select hazard areas including steep slopes and bridges, as determined by the Road Maintenance Manager.
- Use anti-icing materials on bridges and roadways rather than anti-skid aggregates.
- Desirable conditions include a vegetative buffer between the roadway and the protected water with no idle, shallow water.
- Use the lowest application rate necessary to achieve Road Services mission.
- Continue to research new products for their cost, effectiveness and environmental impact.
- Keep accurate application records including when, where and quantity of chemical applied.
- Routinely inspect equipment, including nozzles and storage tanks, for damage.
- Promptly repair or replace all damaged equipment.

4. Storm Clean-up

This involves the removal of materials that have been deposited upon roadways or onto rights-of-way through weather-related events. Specific response activity may vary

depending upon the type of debris - organic or vegetative, roadway structure materials or soils.

BMPs:

- Provide a quick response as feasible to maintain the safety of the roadway.
- Leave downed limbs and brush in place in the streamside areas of the RAZ, where doing so does not interfere with sight distance, create safety issues, cause fire hazards, involve noxious weeds or impact the proper functioning of roadway features (e.g. drainage).
- Down limbs and brush in roadway may be hauled to District maintenance yards and chipped, or chipped on site.

5. Slides and Washouts

Activities include the prevention, stabilization, repair and restoration of roadway settlements, slides, and washouts. Erosion repair on shoulders and drainage systems are also included in this activity. Affected areas are maintained by placing fill, removing material or applying alternative measures designed to preclude an emergency when a roadway is in danger of failure or public safety is threatened. All activity near a waterbody should be first coordinated with the Environmental Specialist and appropriate regulatory agencies.

Road Maintenance handles the clean up of small slide events and washouts. For larger events Road Maintenance coordinates with contractors for cleanup and restoration work. Contractors are required to follow appropriate guidance, including ODOT and Federal Highway Administration guidance.

BMPs:

- Coordinate slide management activity including habitat repair within RAZ with Road Engineering, the Environmental Specialist and appropriate regulatory agencies.
- Provide quick response and first inspection, and notify appropriate resource staff in a timely manner.
- Avoid and or minimize additional impacts to wetlands or waterbodies. Mitigation may be required depending on resource impacts.
- Provide adequate erosion control or bank stabilization necessary to keep material from entering watercourses. Refer to ODOT Erosion Control Manual and RMOM field guide for appropriate erosion control measures. Inspect BMPs in the field as needed (e.g., daily during wet weather) to ensure adequate function.
- Look for opportunities to plant vegetation on failing banks to prevent further deterioration of the roadbed and reduce sediment and pollutants from reaching nearby waterbodies, where appropriate.
- Identify appropriate sites for long and short- term material disposal. Identified sites will be identified and cleared for any potential wetland or sensitive species

- Pursue permanent solutions to chronically unstable slope areas through the project development process, including artificial hillside drainages or permanent shoring, where feasible.
- Follow ODFW in-water work periods or as negotiated with ODFW.

6. Emergency Response

Activity includes removal of accident debris, and may include response to hazardous spills. Road Maintenance is responsible for maintaining public safety and working with DEQ, contractors and responsible parties to ensure the cleanup is done in an appropriate manner. Activities also include response to law enforcement actions, fire response, or other extraordinary events that require assistance from Road Maintenance.

In the event of an emergency response, staff will minimize spills and the impacts to natural resources, where appropriate. Annual HAZMAT training is provided to all maintenance staff. Road Maintenance maintains contacts for local contractors and agencies in case of an emergency. Fluid spills in excess of forty gallons must be reported to DEQ.

Personal safety is the first consideration for staff responding to an emergency. While spill containment kits are provided staff, best professional judgment must be used when approaching each situation.

BMPs:

- Refer to the County Emergency Response Plan.
- Assess the situation for safety considerations.
- Ensure proper traffic controls are in place.
- Have absorbents and/or emergency response equipment on-site to contain spills.
- Stop and contain any spill, if appropriate.
- Call Emergency Response Coordinator for assistance as needed.
- Ensure that the Oregon Emergency Response System is notified by a local public safety agency.
- Provide spill prevention training to maintenance employees.
- Contact **Belfour Environmental** (or other spill response contractor) as quickly as possible to clean up spills, if the spill is beyond the scope of Road Maintenance staff.
- Ensure that spill materials and accident debris is properly disposed.
- Provide erosion control or bank stabilization as needed. Inspect erosion control BMPs as needed (e.g., daily during wet weather) to ensure adequate function.
- Develop plans to repair any damage to fish habitat or riparian areas that may occur during a response activity in coordination with the Environmental Specialist.

H. Bridge Maintenance

	Maintenance Activity	
1	Bridge Maintenance	
2	Bridge Repair	
3	Drift Removal	

Bridge repair and maintenance activities are performed to provide a safe roadway system for the traveling public, and to protect bridge infrastructure according to local, state and federal regulations. These practices are focused on the protection of habitat and ensuring that potentially harmful materials are not allowed to enter resource waters. This is achieved through the proper use of containment devices, sound work-site practices, a minimum removal of material from streams and the proper timing of the activity.

The County's Bridge Maintenance section maintains six large Willamette River Bridges (Sauvie Island, Hawthorne, Burnside, Broadway, Morrison, and Sellwood), as well as many smaller bridges and large diameter culverts. Road Maintenance supports the work on these smaller (not Willamette River) bridges.

Safety concerns: Flooding can cause the failure of structures and create hazardous work situations. Equipment operators working near or below the Ordinary High Water Line should use extra caution.

Environmental concerns: The primary concern is the potential for material, debris and contaminants from bridge maintenance activities to enter the waterway. Maintenance activities can also cause damage to the stream banks and vegetation, and cause erosion.

BMP Outcomes:

- Reduce sediment at construction or repair area.
- Reduce streambed or stream bank erosion.
- Reduce flooding by removal of blockages.
- Reduce failure of structure.
- Reduce debris from entering waterway.
- Large woody material may be relocated within the ROW to help maintain stream forming processes and to support fish habitat as permit, public safety, and ROW structure conditions allow.

1. Bridge maintenance

Bridge maintenance activities include cleaning, painting or resurfacing components of the bridge such as the electrical system, substructure, superstructure, surface footings, piers, supports, abutments, and ramps. Large diameter culverts are maintained as part of the County bridge inventory.

Bridge washing and sweeping should be done in a manner that minimizes the chance of debris entering the waterway. This activity includes flushing of structural steel caps and bridge seats is done during in water work period following ODFW Bridge washing guidelines.

Scupper cleaning involves unplugging the scuppers with a rod, sweeping excess material away from the scupper, and then cleaning with high-pressure water. Cleaning scuppers allows water to drain off the bridge decks.

Equipment and machinery on Willamette River Bridges require periodic maintenance. The fluids are changed and grease is applied carefully using precautions to prevent materials from entering the Willamette River.

BMPs:

- The following ODFW guidelines for bridge washing will be required.
 - Activity must occur between November 15 and March 15.
 - Activity must occur during a high-water event.
 - Use only high-pressure water to scour the debris deposits.
 - If paint is observed being displaced, cease washing operations.
 - Avoid washing tight areas (cracks and crevices) where bats may be present. If bats are observed to be displaced, cease washing operations.
 - If birds are building nests, laying eggs or tending young, no washing will occur.
- If any of the above criteria cannot be met, contact ODFW to discuss specific bridge conditions.
- Implement adequate measures to ensure that paint and other hazardous material does not enter waters of the State. Any material which does fall into the water will be removed (if possible) in the least destructive way possible, or left in place if this would be less destructive to fisheries habitat.
- Use absorbent materials to absorb and spills or contain maintenance fluids and grease during maintenance. Properly dispose of absorbents and excess material.
- Temporarily block deck drains and scuppers over streams when sandblasting, or scraping structures, to route water off deck into vegetated areas where practicable.
- Sweep excess debris before pressure washing or flushing.
- When using water from a municipal source that will enter a waterbody, allow chlorine to evaporate (e.g., allow tank truck to sit overnight with water) or use a de-chlorinating agent.
- Remove debris from bridge decks in a manner that minimizes material entering waterbodies. Preferred methods may include removal of debris from bridge decks with a sweeper or a shovel. Other material may be scraped by hand before being collected, removed (prior to flushing).
- Vacuum sweeping is the preferred method to clean bridges and large diameter culverts within RAZ.
- Heavier debris should be removed from bridge structure - decks and disposed of outside the project area prior to flushing.
- Dispose of waste materials at an appropriate site, in an appropriate manner.

2. Bridge repair

Activities include the repair of bridges and large culverts over six feet in diameter. In-water bridge repairs may include the installation, repair or replacement of rip-rap, drainage structures and catch basins and the replacement of structural components.

These activities may require a permit, temporary water management, and fish salvage. Activities that occur in the stream channel or below the Ordinary High Water Line (OHWL) may require permits. Activities that occur on the deck, superstructure, or other parts of the bridge structure outside the stream channel and above OHWL, do not require permits.

BMPs:

- Coordinate with the Bridge Engineering section or the Environmental Specialist when planning work, and determine if permits are needed to make repairs.
- Consider use of bio-engineered solutions for bridge repair work that requires installation of riprap, where practicable. "Practicable" use areas will include areas unshaded by bridge elements, above the OHWL where success is probable and safety of the bridge structure is assured. Bio-engineered solutions are not restricted to an all or nothing approach. Some solutions may be completely bio-engineered; others may include an engineered solution that incorporates vegetation.
- Coordinate bridge repairs that require in-water work with ODFW.
- Structural repairs need to be coordinated with the responsible Engineer to minimize impacts. These actions may require a Biological Assessment and consultation with NOAA Fisheries/USFWS. If activities are required to be performed outside the in-water work window negotiate timeframes with ODFW.
- If stream channel is disturbed, where feasible, mimic natural stream channel upstream and downstream of the bridge.
- Attempt to incorporate fish passage solutions and enhancements such adding roughness in the engineering solution when repairing drainage features.
- Dispose of waste materials at an appropriate site, in an appropriate manner. Ensure green concrete does not come in contact with the water. Provide a stable concrete chute clean out area for contractors and require contractors to use it.
- Ensure that the active flowing stream will not come into contact with fresh, plastic concrete.
- Use temporary water management techniques for structural repairs as appropriate.
- Contain construction debris including treated wood saw chips, where feasible.
- Delay bridge repair work if birds are found nesting in or on the structure. In an emergency, notify the Environmental Specialist and ODFW.
- Coordinate with Environmental Specialist and ODFW on timing and possible options to the work, if bats are present on structure.
- Refer to Channel Maintenance section for additional BMPs.

3. Drift Removal

This activity involves removing logs, limbs and associated drift from a stream when build-up occurs adjacent to a bridge structure. Removal may be done with an excavator or crane situated on the bridge structure or on the embankment. Drift should be dislodged and turned to float downstream, whenever practical, allowing wood to float free of the bridge and create habitat elsewhere. Cutting drift into pieces may be required.

When drift cannot be cut and turned, care must be taken to not disturb vegetated stream-banks. This work is typically necessary during winter months when high-water events create drift build-up potential. Drift removal that does not present an imminent hazard to a bridge structure should be coordinated with the Environmental Specialist.

Portland Fire Department handles drift removal work on the Willamette River Bridges.

BMPs:

- Turn drift to allow it to flow through and under the bridge structure, when this would not endanger any downstream crossing structures or other facilities. Cut drift when necessary.
- Repair and restore riparian areas temporarily impacted during drift removal.
- Long-term access for drift removal will be coordinated with ODFW.
- Do not disturb vegetated stream banks, if possible. Repair or restore riparian areas temporarily impacted by equipment during activity.

I. In-water Work

	<i>Maintenance Activity</i>	
1	Fish habitat restoration	
2	Fish passage improvement	
3	Instream culvert maintenance	
4	Beaver dam removal	
5	Temporary water management	
6	Channel maintenance	

Road Maintenance and the County Environmental Specialist will consult with NOAA Fisheries, ODFW, DSL and other appropriate regulatory agencies at the earliest possible time of an activity that may impact fish habitat and streams. During emergency events, Road Maintenance will make a reasonable effort to consult with those agencies as necessary to facilitate a timely response prior to beginning any work activity within fish-bearing waters.

Project conditions will vary greatly from location to location, requiring the professional judgment of County employees to make those determinations, closely coordinated with NOAA Fisheries, ODFW and other appropriate regulatory organizations. Almost all in-water work is handled by contractors through capital projects lead by the Engineering staff. Appropriate permits and coordination with regulatory agencies will ensure that in-water projects are planned and implemented to avoid risk and harm to fish and their habitat. Projects handled by Road Maintenance will be coordinated by the Environmental Specialist and the appropriate regulatory agencies.

Safety concerns: In-water work, whether conducted by County staff or contractors, imparts higher safety concerns as a result of unstable work areas, flooding, or flashy stream flows.

Environmental concerns: During in-water work, such as culvert or bridge repair, or in the event of emergency response, fish and fish habitat may be impacted. Impacts to riparian vegetation and sediment loading can occur during work in a riparian area.

1. Fish Habitat restoration

This activity may involve planting vegetation along a stream corridor to facilitate slope stabilization and/or the re-establishment of vegetation that has been removed. Also included is any work activity that incorporates bio-engineering into existing rip-rap placements or any work that modifies an existing drainage ditch for better water quality control, where no major construction is involved.

BMPs:

- Coordinate with Environmental Specialist or Engineering staff when planning work. This activity may require a permit from the Corps and/or DSL, temporary water management or fish salvage.
- Install erosion control devices, such as check dams, silt mats and other erosion control measures. in a timely manner, including seeding and mulching specific areas with non-invasive species. Install silt fences and other devices as appropriate.
- Consider use of bio-engineering solutions where practicable. Bio-engineered solutions are not restricted to an all or nothing approach. Some solutions may be completely bio-engineered; others may include an engineered solution that incorporates vegetation.
- Follow ODFW in-water work periods for the particular waterway.
- Look for opportunities to plant vegetation on failing banks to prevent further deterioration of the roadbed and reduce sediment and pollutants from reaching nearby waterbodies.
- Dispose of removed material above OHWL and not in any waterway, wetland, greenway, park, riparian area, floodplain, or regulated area. If directed by ODFW or NOAA Fisheries, material may be incorporated into fish habitat or fish passage structure. If required local, state, or federal permits will be obtained.

2. Fish habitat and passage improvement

Activities include improvements, betterments, opportunities, or repairs to fish passage or fish habitat. Typical fish betterments may include installation and removal of culverts, installation, removal, and repairs of baffles, weirs, or other systems within and adjacent to culverts for fish passage. In addition, this may include the placement of large wood and other methods of improving fish passage.

BMPs:

- Coordinate with the Environmental Specialist or Engineering staff when planning work. This activity may require a permit, temporary water management, fish salvage, fish passage, or coordination with NOAA.
- Install erosion control devices prior to culvert work when there is flowing or stagnant water in the culvert.
- Complete any work performed in flowing water connected to waters of the state during ODFW in-water work period for that system, or as negotiated with ODFW.
- Coordinate with ODFW on the removal of material from culverts when work is performed in stream reaches that ODFW has determined support sensitive fish species, or where there are habitat limitations for species.
- Place excess material above the OHWL where there is no opportunity for the material to reach waters of the state or impact a wetland, and it can be stabilized in a timely manner. Stabilization of material may include spreading and top seeding, covering with matting, straw, etc. Haul the material away and dispose of appropriately if unable to stabilize on site.

3. Instream Culvert Maintenance

Activity involves removing debris from instream culverts to restore functions of the culvert to pass permanent or intermittent stream flow, allow fish passage, and reduce the risks of flooding. Debris may include small and large woody debris, and trash or other man-made material.

For cleaning out culverts, no permit or authorization is needed from either the Corps or DSL for removal of sediment or debris inside the culvert or within 20 feet of the ends of the culvert. For repairing and reattaching the end, no permit is needed if the length of the culvert is not changed and the road prism is not disturbed.

Fish passage requirements kick in when the repair/replacement work affects more than 50% of the culvert length. Culvert cleaning can occur at any time it is necessary, so the in-water work window is not an issue for that work.

BMPs:

- Coordinate with Environmental Specialist on the removal of material from culverts when work is performed in stream reaches that ODFW, NOAA or DSL has determined support sensitive fish species, or where there are habitat limitations for species. Refer to regulatory agency fish mapping and County environmental data.
- Follow Drift Removal BMPs (Bridge Maintenance section), if applicable.
- Perform work at low flow, and divert flow to minimize turbidity, when and where possible.
- Limit disturbance to vegetated stream banks, and restore as appropriate when activity is completed.
- Repair any damage to the culvert that may have occurred such as bent ends, disconnected joints, etc, and other modifications that may impact fish passage (i.e. jumps height). Fish passage barriers are identified on the County GIS system and capital improvement plan.
- When cleaning trash racks, ensure that the stream elevation on either side of the trash rack mimics the natural stream slope, where fish passage may be impacted.

4. Beaver Dam Removal

Beavers are a natural component of a properly functioning ecosystem, however, some beaver dams may be problematic if they interfere or inhibit the function of road infrastructure or threaten private property. Beaver dam removal must be considered carefully based on the benefits to fish habitat and the risks to infrastructure.

BMPs:

- Consider use of beaver deterrent structures and other devices in coordination with ODFW, to reduce the potential of flood hazards.

- Beaver dam material and debris should be removed off-site or at least to the outside of the riparian area to keep beaver from reusing the material for another dam.
- Coordinate the dam removal and beaver relocation with ODFW and the Environmental Specialist.

5. Temporary Water Management

Temporary water management techniques to isolate the work area are used during in-water work, work within the ordinary high water mark (OHW), and if the project involves either significant channel disturbance or the use of equipment within the wetted channel. Methods of achieving this may include working within a cofferdam (constructed of sandbags, sheet piling or other approved materials) or similar structure to minimize the potential for sediment delivery.

Temporary water management and associated fish salvage will be conducted under the appropriate permit. Any project requiring temporary water management will be lead by Engineering staff and qualified contractors and biologists will implement the project.

BMPs:

- Coordinate with the Environmental Specialist or Engineering staff while planning work to discuss temporary water management, fish salvage, and fish passage. This activity may require permits from the Corps, and DSL. Plan ahead to allow time to secure permits.
- Coordinate work with ODFW through the Environmental Specialist or Engineering staff.
- During significant in-water work, the work area will be isolated from the active stream.
- Fish trapped in the isolation area will be removed by a permitted ODFW biologist before de-watering.
- Work will be done during the in-water work window (July 1 to September 30) unless otherwise negotiated with ODFW.
- Obtain temporary water right to pull directly from source or de-chlorinate the water, where required.
- Use appropriate fish screens (do not exceed 3/32" openings) on any intake pump per NOAA Fisheries screening criteria during operation.
- Project operations will temporarily cease under high flow conditions that may result in inundation of the project area, except for those efforts taken to avoid or minimize resource damage.

6. Channel Maintenance

Activity includes cleaning and repairing existing channels that transport natural stream or wetland flow, to maintain the integrity of the channel structure, improve flow, ensure fish

passage, and minimize impacts to downstream water quality and habitat. This activity differs from ditch maintenance, which are conveyances of only drainage water (when it rains). Vegetation may be removed during this activity, and the grade and line of the channel may be restored with rip-rap.

BMPs:

- Coordinate the work with the Environmental Specialist and follow all BMPs for in-water work (fish habitat improvement, fish passage improvement, debris removal, and temporary water management), as appropriate.
- Plan well ahead to secure permits and coordination with ODFW.
- Attempt to utilize bioengineering solutions and planting to maintain the structure of the channel where possible and appropriate, and is not cost prohibitive.
- Remove any excess material associated with the maintenance activity and deposit above the ordinary high water line or in appropriate locations off site.
- Use appropriate rock sources to maximize safety, operation, and habitat function as guided by ODFW. Consider the following:
 - Use riprap large enough to prevent it from being dislodged in high water events.
 - Use open grade rock below OHWL.
 - When practicable, place riprap by hand, from the top of the bank.
 - If possible, eliminate use of riprap above OHWL; however, if needed, mix with soil to encourage plant growth.

Appendix A. Road waste chart

Appendix B.

Multnomah County Snow and Ice Plan

Multnomah County jurisdictional roads consist of approximately 300 center line miles and are divided into four Road Maintenance Districts. Roads are designated as (A) priority or (B)priority. The (A) priority roads are the arterial system roads where schools, fire stations, hospitals and other emergency services are located and are the most highly traveled roads. These roads will receive the first and most plowing, sanding and anti icing during a snow and ice event. The priority (B) roads are secondary roads and will be plowed/sanded only when resources become available and (A) priority roads are deemed safe for travel, this can be two or three days into an event depending on severity of the present storm conditions. Multnomah County also maintains 50 center line miles of arterial roads within the City of Gresham.

Various shift assignments will be made to address the level of response needed. During the late fall and winter (November-March) we keep 20% of our snow and ice response equipment installed and ready for short notice deployment in all maintenance districts.

Upon an emergency declaration Road Maintenance crews will begin a 24 hr. shift operation with staff working 12 hour shifts from 12 am-12pm and from 12pm-12am.

Multnomah County Transportation works with ODOT, TriMet and local Cities to respond to conditions.

October of each season:

Snow equipment is inspected, installed and given a trial run to ensure that any needed maintenance is performed and the equipment is ready for use. Chain installation exercise is scheduled and trucks and equipment are kept in good repair until needed.

Stockpiles are replenished with ¼ -10 sanding rock at the following locations:

- Dist#1 shop (NW Quarry Rd.)
- Dist#5 shop (Springdale/Corbett)
- Vance Pit (Gresham)

Road Treatments:

Anti-icing: (CMA Tank) is stocked with material for applications as necessary and appropriate. Multnomah County uses Calcium Magnesium Acetate as an anti icing chemical because it is the most environmentally friendly product available and helps us to maintain healthy rivers and streams. Multnomah County refers to Road Maintenance Operations Manual and follows Best Management Practices when using this product. Applications are made when and where appropriate.

Sanding: Sanding rock (1/4-10) is applied using spreader sanders mounted on Pick up trucks and Dump trucks on steep grades, intersections and corners as needed to help improve traction.

Weather reports are monitored closely to assure that we are prepared for storm events as far in advance as possible to allow for efficient scheduling and most effective response.

Road Maintenance employees are designated as essential employees and will be assigned as needed to respond to storm related events and may be assigned to 12 hour shifts during an emergency declaration or **as needed**.

Road Maintenance Manager and District Supervisors or MS Sr. will monitor current conditions and extended forecasts and will make assignments that address the current situation. Maintenance Districts are divided into four zones (A),(B),(C),(D). Once assigned, a zone within a district all of the roads listed as priority (A) will be plowed/sanded as needed and are shown **in red** on the district snow and ice map. Once these roads are deemed safe (**or at the direction of Supervisor or MS Sr.**) then plowing/sanding can begin on the priority (B) roads. Operators will monitor County radio and keep Supervisor briefed on current road conditions as needed **or for reassignment**. Operator will perform ongoing maintenance as needed on equipment during and before ending shift and **inform Supervisor** of maintenance condition of equipment. For CDL vehicles DVIR (Driver Vehicle Inspection Reports) must be kept current.

Equipment Checklist:

- Tire chains, snow plow bits, snow plow condition, sander condition, and fuel. CDL checklist etc. CDL Pre-Trip required.
- DVIR (properly filled out) and Truck Permits (must be in truck at all times)
- Chainsaw w/accessories, shovel.
- County radio working properly.
- Appropriate PPE's and personal items (clothing,lunch etc.)

Bill Whitson
Road Maintenance Operations Manager
November 19, 2010