STORM WATER MANAGEMENT PLAN

Diesel Cast West, Inc.

8100 NE 14th Place
Portland, Oregon

Prepared for:

Diesel Cast West, Inc.

8100 NE 14th Place
Portland, Oregon

December 17, 2024

EVREN NORTHWEST, INC.
Project No. 947-24001-03

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Table of Contents

List of Figures and Attachments

Figures

Attachments

1.0 Plan Purpose and Overview

This Storm Water Management Plan (Plan) has been prepared to assist Diesel Cast West, Inc. (DCW) with implementing an inspection and maintenance program for their storm water system at their facility located at 8100 NE 14th Place in Portland, Oregon. This program is designed to keep the storm water system operating as designed and incorporates best management practices in accordance with City of Portland Bureau of Environmental Services (BES) and State of Oregon Department of Environmental Quality (ODEQ) guidance and/or manufacturers' recommendations.

This Plan:

- Describes the storm water collection system at the facility.
- Describes best management practices (BMPs) applicable to the storm water system at the site along with an inspection and maintenance plan, record-keeping and employee training requirements, and spill prevention and response procedures.
- Provides documentation forms.

Implementation of the BMPs described in this Plan are intended to keep the storm water system at the property operating efficiently and correctly.

2.0 Assignment of Responsibility and Certification

Regular inspection, maintenance and monitoring of the storm system should be performed at the property and a DCW representative should be identified as responsible for ensuring compliance with this Plan.

Diesel Cast West, Inc.
Responsible for Plan Implementation

Name: **Robert Burbage**

Phone Number: **503-910-3619**

In accordance with 40 CFR §122.22, I certify that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information for knowing violations.

Approved by:

Site Representative:

Robert Burbage: _____ Date: 12-30-24

3.0 Storm Water System Assessment

3.1 Site Description and Activities

Diesel Cast West's facility is located on a roughly rectangular property at the northeast corner of NE Argyle Drive and NE 14th Place in Portland, Oregon (see Figures 1 and 2). An asphalt-paved parking lot is present in the southwest portion of the site and a concrete driveway and loading dock is present on the west side of the building. Additional concrete surfaces are present on the north side of the main building, where an awning was previously present. The remaining surfaces of the property are primarily gravel.

Exterior material storage is predominantly limited to graveled areas on the north and east sides of the onsite building. The southern paved area is utilized for employee and visitor parking.

No hazardous substances are stored in exterior areas that are exposed to precipitation. Potential pollutants in storm water are consistent with paved parking lots and landscaped areas.

3.2 Storm Water System

Figure 2 presents the storm water system at the property. Components include:

- **Roof Drains.** Storm water from the roof of the site building discharges to one of three locations:
  - To ground surface onsite,
  - To ground surface in NE 14th Place,
  - Underground with inferred discharge to two drywells indicated on historic City permit records. These drywells are being registered with the State Underground Injection Control (UIC) program concurrently with the preparation of this Plan.
- **Trench Drain.** One trench drain is present on the west side of the site building near the loading dock. The drain is mostly under cover but is partially exposed to precipitation. Water that enters the trench drain discharges to the onsite treatment system and, ultimately, to the municipal sanitary sewer system.
- **Loading Dock Drain.** One catch basin is present in the bottom of the loading dock on the west side of the site building. Water entering the loading dock drain discharges to the onsite treatment system and, ultimately, to the municipal sanitary sewer system.
- **Sheet Flow.** Storm water that falls onto the paved parking lot in the southwest corner of the site sheet flows to N Argyle Drive and enters the municipal storm water system.

4.0 Best Management Practices

Best management practices (also known as BMPs) means schedules of activities, prohibitions of practices, maintenance procedures, and other physical, structural, and/or managerial practices that prevent or reduce the release of pollutants and other adverse impacts to waters of the State (including ground water). The following BMPs have been tailored for the subject site. The Pollution Prevention Team should identify members responsible for ensuring implementation of the BMPs described below.

4.1 Formation of a Pollution Prevention Team

The DCW representative identified in Section 2 shall be responsible for storm water pollution control at the property. It is recommended that a Pollution Prevention Team be developed and should hold regular meetings to review the overall operation of the BMPs, establish responsibilities for inspections, operation, maintenance, and for emergencies. All team members should be trained in the operation, maintenance, and inspection of BMPs, and reporting procedures.

Use the form included as Attachment A to identify the site's Pollution Prevention Team.

4.2 Good Housekeeping

High housekeeping standards will be maintained at the site. Any equipment used at the site will be maintained in good working order. General operational protocol will include:

1. The Pollution Prevention Team shall be responsible for the operation and condition of the storm water system, and shall maintain a log of inspections performed, housekeeping conditions, and any maintenance activities performed to maintain the site so that no impacts occur to the storm water system.
2. Routinely clean all exposed areas that may contribute pollutants to storm water using such measures as sweeping at regular intervals and litter pick-up.
3. Any identified leaks and spills, including oils, fuels, and dust will be promptly contained and cleaned up (see Section 4.4).
4. Spill response kits will be strategically located to expedite cleanup.
5. Solid waste collection receptacles will be maintained so as to eliminate overflow, fluid leakage, particulate accumulation, and inappropriate disposal, and will be covered to the maximum extent practicable to prevent rain intrusion and protect from wind. No waste materials will be allowed to be set on the pavement outside the receptacles.
6. No storage of industrial materials is conducted in the western exterior of the site.
7. Automobile maintenance will be strictly prohibited on the property.

4.3 Preventative Maintenance

The following preventative maintenance protocols will be implemented at the site:

1. Inspect, maintain and repair all storm water conveyance features to ensure effective operation and in a manner that prevents the discharge of pollution.

a. Ensure litter and debris is routinely picked up.

b. Assess paved surfaces daily and sweep when visual dust/debris is observed in order to prevent accumulated sediment from entering storm water discharge.

c. Trench drains, although not strictly components of the storm water system, are cleaned twice per year to ensure continued function.

2. Facility vehicles and equipment exposed to precipitation will be maintained in good working order.

    a. Use drip pans to collect leaks and spills from commercial equipment such as trucks and other vehicles stored outside (if applicable).

    b. Do not allow forklifts utilized indoors to track oily material to exterior portions of the site.

4.4 Spill Prevention and Cleanup

The following spill prevention and cleanup protocol will be implemented at the site:

1. Install one or more spill prevention kits at clearly labeled, easily accessible locations. Spill prevention kit contents are listed in Attachment B.
2. Stop, contain, and clean up all spills immediately upon discovery.
3. Do not flush or otherwise direct absorbent materials or other spill cleanup materials to a storm drain. Collect the contaminated absorbent material as a solid waste and place in appropriate disposal containers.
4. If the spill has reached or may reach a sanitary or a storm sewer, ground water, or surface water notify the local jurisdiction, ODEQ, and the local sewer authority immediately. Notification must comply with federal spill reporting requirements.

A Spill Prevention and Response Plan for the property is included in Attachment B. It has been developed to be used by anyone at the site and is considered easy to read and implement. The spill kits will be maintained in accessible locations by the Pollution Prevention Team and will consist of, at a minimum, a laminated copy of the Spill Prevention and Response Plan (Attachment B), catch basin plug, and absorbent booms suitable for preventing drainage to catch basin or other storm water infrastructure. The spill kits should be stored in clearly-labeled impervious containers.

Reports on spills of oil or hazardous substances in greater than reportable quantities (Code of Federal Regulations Title 40 Parts 302.4 and 117) must be retained for five years.

4.5 Employee Training

The Pollution Prevention Team will be responsible for ensuring that all employees and contractors that work or have responsibilities pertaining to the exterior areas of the property will be trained to:

- Identify pollutant sources
- Understand pollutant control measures
- Respond to spills

- Handle materials that may impact storm water in a manner that protects storm water (e.g., fuels, pesticides, fertilizer, wash water, etc.)

Additionally, personnel will be made familiar with the location and contents of the spill kits and will be informed of telephone numbers to call in the event of a spill. To support the training procedures, a detailed list of approved procedures will be prepared and made available at the spill kits. "Refresher" training will be conducted on an annual basis. Forms for documenting employee and contractor personnel training are included as Attachment C.

4.6 Inspections

The Pollution Prevention Team will be responsible for conducting routine visual inspections. The **Routine Inspection Form** provided in Attachment D is meant to be used as a template (make a new copy for each inspection). Routine inspections will be conducted annually, at a minimum, but more frequent inspections are encouraged. Complete all portions of the form.

Routinely:

- Team members and maintenance/landscaping personnel should be trained to routinely examine/inspect areas where potential spills may occur, such as parking/drive surfaces. If a spill is identified the procedures of the Spill Prevention and Response Plan should be followed. In general, spills should be cleaned up using dry absorbents while minimizing discharge to the catch basins.
- Team members should ensure housekeeping measures outlined in Section 4.2 are being implemented.

Annual Dry Season Site Inspection: During the dry season at least one annual complete system inspection will be performed using the form provided in Appendix D as a guide. Preventative maintenance activities at a minimum will include:

- Review this Plan for the need to update due to changes in the site or applicable regulations.
- Review work completed by the site's Pollution Prevention Team for the prior year to ensure this Plan is being implemented in its entirety and to identify any necessary modifications to team members.
- Verify annual employee training as required by Section 4.5 has been completed.
- Inspect the spill kit to ensure all supplies are available and have not deteriorated or expired.
- Conduct a thorough inspection of the storm water system to determine the need for cleaning and/or sediment removal. The person or firm completing this inspection should be knowledgeable in the operation and maintenance of storm water systems.

  Note: Any sediment and/or materials removed from the storm water system should be disposed in accordance with applicable laws and regulations.

- Document results of visual inspection and maintenance on the Annual Inspection Form (see Attachment D for template).

  Records of these inspections must be maintained on-site and kept for a minimum of ten years.
  Visual inspections will include:

- ✓ Time and date of the inspection
- ✓ Locations inspected
- ✓ Summary report of any remediation activities required
- ✓ Name and signature of person conducting the inspection

4.7 Lawn Care

The Oregon Department of Environmental Quality's 2013 *Industrial Stormwater Best Management Practices Manual* describes Lawn Care BMPs. This BMP is reproduced in Attachment E. Requirements from this BMP have been incorporated into the Annual Inspection Form in Attachment D.

5.0 Limitations

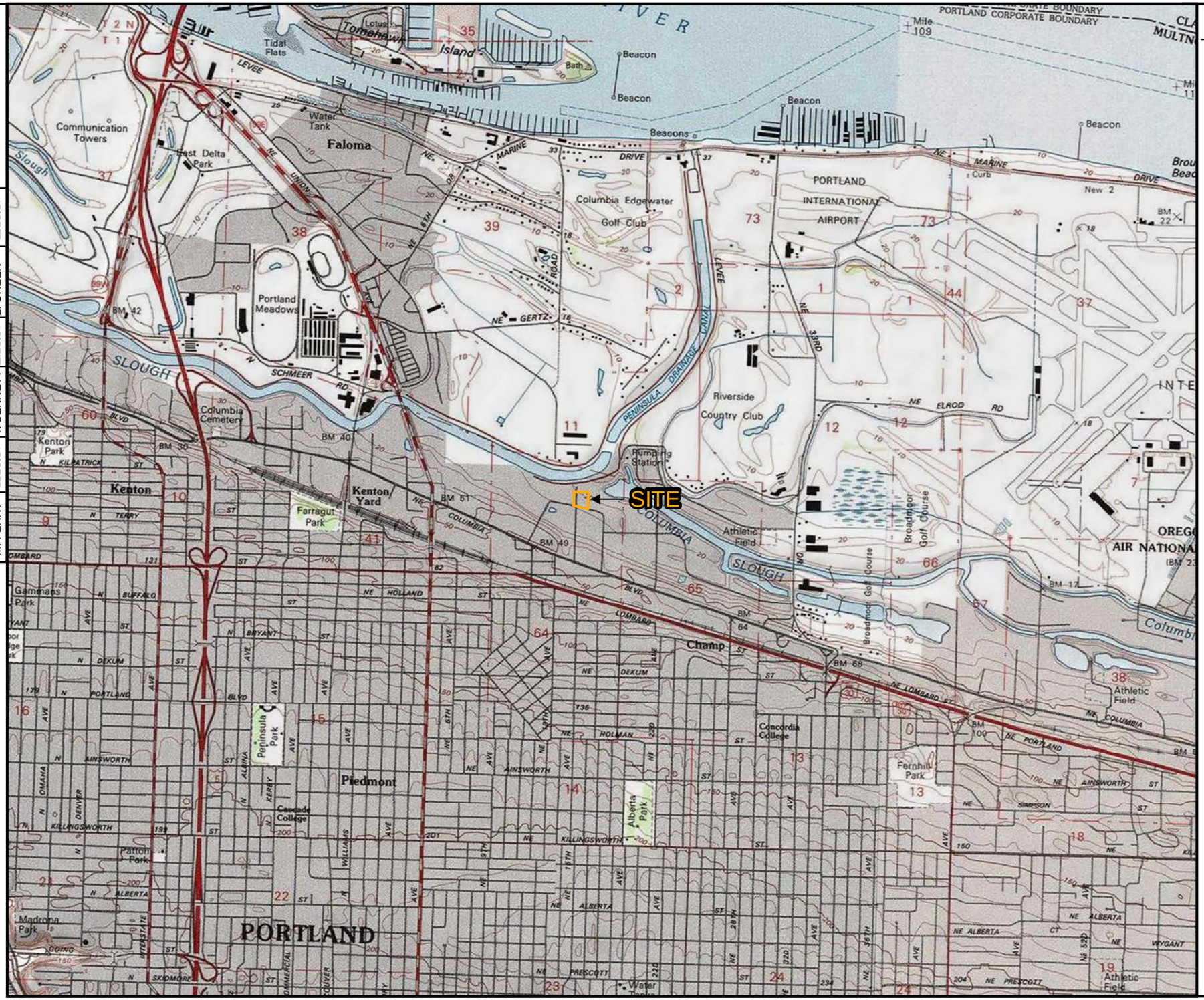
This Storm Water Management Plan (Plan) is reflective of site conditions discovered through site visits and information provided by others for the subject property as of the date published. Required actions described in this plan are consistent with City of Portland rules, regulations, and guidance. The Client is advised that other environmental agency requirements and regulations may also be applicable to the property.

No warranties are expressed, or implied concerning potential contaminants or environmental media not addressed through sampling and analysis. EVREN Northwest, Inc. is not responsible for conditions or consequences arising from relevant information that is concealed or not fully disclosed at the time of Plan preparation. This Plan was prepared in accordance with generally accepted professional practice in the area at this time for the exclusive use of our client and their agents or authorized third parties. No other warranty, either expressed or implied, is made.

We have performed our services for this project in accordance with our agreement and understanding with the client. This document and the information contained herein have been prepared solely for the use of the client.

Figures

DRAWING NUMBER	947-24001(V01)
APPROVED BY	L. GREEN 11/1/2024
CHECKED BY	T. BENNETT 11/1/2024
DRAWN BY	M. FERRY 11/1/2024



LEGEND:

SUBJECT PROPERTY BOUNDARY

NOTES:

1. BASE MAP DEVELOPED BY THE USGS (2013).

0 1,350 2,700 5,400

Feet

N

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environmental natural resource consultants

FIGURE 1

SITE VICINITY MAP

DIESEL CAST WEST
8100 NE 14TH PLACE
PORTLAND, OREGON

DRAWING NUMBER	947-24001(V05)
APPROVED BY	L. GREEN 12/17/2024
CHECKED BY	T. BENNETT 12/17/2024
DRAWN BY	M. FERRY 12/17/2024

LEGEND:

- SUBJECT PROPERTY BOUNDARY
- PROPERTY BUILDING
- GRAVEL
- PAVEMENT
- OIL/WATER SEPARATOR (PLUMBED TO SANITARY)
- STORM WATER CONVEYANCE LINE
- INFERRED STORM WATER CONVEYANCE LINE
- SLOPE
- POSSIBLE DRYWELL (BASED ON CITY PERMIT RECORDS)

ROOFDRAIN

- INFERRED DISCHARGE TO DRYWELL
- DISCHARGE TO GROUND
- DISCHARGE TO STREET

NOTES:

1. BASE MAP DEVELOPED FROM AN AERIAL PHOTOGRAPH MAP DATED 2023 AND ENW FIELD NOTES.
2. ALL BUILDING, STREET, AND FEATURE LOCATIONS ARE APPROXIMATE.
3. SYMBOLS REPRESENT LOCATION AND DO NOT ALWAYS REPRESENT EXACT SHAPE, SIZE, OR ORIENTATION

0 30 60 120
Feet

N

EVREN NORTHWEST INC.
environmental natural resource consultants

FIGURE 1

SITE PLAN AND STORM WATER DIAGRAM

DIESEL CAST WEST
8100 NE 14TH PLACE
PORTLAND, OREGON

Attachment A

Pollution Prevention Team Identification

Diesel Cast West Pollution Prevention Team IDENTIFICATION

Use this form (make copies as needed) to identify the Pollution Prevention Team responsible for storm water pollution prevention at property. It is recommended that a Pollution Prevention Team be developed and should hold regular meetings to review the overall operation of the BMPs, establish responsibilities for inspections, operation, maintenance, monitoring and for emergencies. All team members should be trained in the operation, maintenance, and inspections of BMPs, and reporting procedures. At least one team member should work primarily onsite and be available for spill response.

Date of Preparation: November 2024	*Prepared by: EVREN Northwest, Inc.*

Diesel Cast West, Inc. representative with overall responsibility for implementing Storm Water Management Plan:

Name: Robert Burbage	*Phone: 503-910-3619*
Title: District Sales & Operations Manager	*Email: rburbage@mddistributors.com*

Additional Pollution Prevention Team members (add additional spaces for names if needed):

Name: Sean Leary	*Phone: 952-221-9609*
Title: Consultant, GZA	*Email: Sean.Leary@gza.com*

Name: Evan Bruggeman	*Phone: 503-452-5561*
Title: Consultant, EVREN Northwest, Inc.	*Email: evanb@evren-nw.com*

Name:	*Phone*:
Title:	*Email*:

Name:	*Phone*:
Title:	*Email*:

Attachment B

Spill Prevention and Response Plan

Spill Prevention and Response Plan

Spill prevention is an important factor in the successful operation of a storm water system and protection of vital water resources. The designated Pollution Prevention Team and all facility staff need to know the specifications of this plan so that they are able to respond as needed to any spill or threat of spill. They should be knowledgeable regarding the location of spill response materials, proper notification protocols, and necessary procedures to control and contain the spill of hazardous materials. They should recognize that protection and successful operation of the storm water collection system is essential to the successful operation of the commercial development and protection of essential natural resources. No disposal of waste materials into the storm water collection system will occur. All staff will be made aware of the importance of preventing releases from potential contamination sources and will take preventive measures to prevent a spill occurrence. All staff will review the following page regarding detailed spill response steps. A copy of this Plan will be maintained in the Spill Kits provided for the development.

Spill Kit

Spill kits will be stored in impervious containers at locations selected by the Pollution Prevention Team to be accessible to anticipated spill locations.

Each spill kit will contain, at a minimum:

- Absorbent booms and/or pads.
- A copy of the **Spill Prevention and Response Plan**.

Additionally, the following must be readily available to anyone needing to use the spill kit:

- Polyethylene or equivalent disposal bags
- Safety gloves/clothes/equipment
- Shovels or other material removal equipment

The Pollution Prevention Team is responsible for ensuring the spill kits and associated equipment are maintained and ready for use in an emergency.

WHAT TO DO IN CASE OF A SPILL

1. Assess the nature of the spill. **If it is life-threatening immediately clear the area and dial 911** and then notify the Diesel Cast West contact listed below.
2. If the spill is safe to approach, locate the nearest spill kit which will include a copy of these directions. Spill kits will be available at clearly marked, designated locations.
3. Place a catch basin plug in appropriate position to prevent drainage to the storm water disposal system. Verify that the cover has full contact with the rim of the inlet.
4. Use the absorbent boom and absorbent material to further contain the spill.

   Note: Do NOT use water or other liquids to wash spilled materials from pavement.

5. Notify the following personnel immediately and report the location and nature of the spill.

Diesel Cast West *Multiple contacts may be listed, but first contact should work primarily on site and be a member of the Pollution Prevention Team.*	**EVREN Northwest, Inc.** Evan Bruggeman (Consultant) 503 452.5561

Pollution Prevention Team Members:

- *Stop, contain, and clean up all spills immediately upon discovery.*
- *Do not flush or otherwise direct absorbent materials or other spill cleanup materials to a storm drain. Collect the contaminated absorbent material as a solid and place in appropriate disposal containers.*
- *Conduct any required reporting.*
- *Document spill and cleanup, if appropriate.*

Spill Reporting

The Pollution Prevention Team is also responsible for ensuring appropriate reporting of spills.

- **If the spill is life threatening, immediately dial 911.**
- For petroleum spills in excess of 42 gallons and all petroleum spills that cannot be completely controlled and cleaned up within 24 hours, notify the Oregon Department of Environmental Quality (503-229-5263) of the petroleum release.
- The Oregon Emergency Response System (OERS; 1-800-452-0311) and National Response Center (800-424-8802) should be notified of any non-petroleum release of hazardous substances that may present a potential threat to human health, ground water, surface water quality, or present other potential significant hazard (e.g., explosion or flammability).
- If the spill has reached or may reach a sanitary or a storm sewer, ground water, or surface water notify the local jurisdiction, Oregon Department of Environmental Quality, and the local sewer authority immediately. Notification must comply with federal spill reporting requirements.
    - City of Portland Spill Response Duty Officer: 503-823-7180

Additional Spill Responsibilities

After a spill is contained, disposal of the spill control materials and spilled substances shall be as directed by the designated Pollution Prevention Team, Environmental Consultant, or other Environmental Professional (e.g., Hazmat team supervisor or Fire Department officer). In all cases, the spill control materials and spilled substances shall be placed in appropriate containers (e.g., steel drums) that are inert to the released substances, sealed, and appropriately disposed according to federal, state, and local regulations.

A Pollution Prevention Team member will restore the Spill Kit after a spill and as necessary.

Attachment C

Employee Training/Refresher Documentation Form

Diesel Cast West Annual Employee Training DOCUMENTATION

Use this form (make copies as needed) to document employee training on storm water best management practices as described by the Storm Water Management Plan. All employees performing work in exterior areas of the property require training.

Date	Name	Title/Department	New/Refresher Training?

Attachment D

Site Inspection Forms

ROUTINE SITE INSPECTION FORM

YEAR _____

MONTH _____

Day: **Time:**

Weather:

Inspect ALL areas of the site where activities have the potential to impact storm water and inspect storm water control measures and the storm water system **a minimum of once a year.**

Make copies of this form and use to document compliance. Completed forms must be kept onsite and maintained for a minimum of 5 years.

NAME SIGNATURE

Inspector has received employee training and is familiar with all aspects of the Plan. **(initial)** _____

Describe answers with the potential to impact storm water on the Findings and Corrective Actions Form.

1) Are site personnel keeping litter and debris picked up on a regular basis? **Y / N**
2) Check the spill response kit(s). Are they accessible and all materials present? **Y / N**
3) Any evidence of leaks or spills from vehicles, equipment, or other sources anywhere else onsite? **Y / N**
   - *If yes, where and were they cleaned up?* **Y / N**
4) Any evidence of pollutants (or potential pollutants) entering the drainage system? **Y / N**
   - *If yes, any evidence of pollutants discharging to receiving waters?* **Y / N**
5) Is any automobile maintenance (strictly prohibited) occurring on the property? **Y / N**
6) Inspect for previously unidentified sources of pollutants:
   - *Any new materials being stored outside (e.g., industrial materials, residue, trash) that have the potential to come in contact with and pollute storm water*? **Y / N**
   - *Are any new activities occurring onsite that have the potential to pollute storm water?* **Y / N**
7) Landscaping:
   - *Are all of the Landscaping BMPs in Attachment E of the Plan being implemented?* **Y / N**
   - *Are all fertilizers and pesticides used on site applied according to manufactures directions?* **Y / N**

FINDINGS AND CORRECTIVE ACTIONS FORM

YEAR _____

MONTH _____

Please use this page to:
1) Describe any inspection results that have the potential to impact storm water.
2) Document corrective actions taken.
Make copies of this page as needed.

FINDINGS List item number and describe inspection results	**CORRECTIVE ACTIONS** Please describe – include name and date(s)

ANNUAL SITE INSPECTION FORM

YEAR _____

Complete this form **in addition** to the Routine Inspection Form a minimum of once a year.

MONTH & DAY _____

Make copies of this form and use to document compliance. Completed forms must be kept onsite and maintained for a minimum of 5 years.

NAME SIGNATURE

Inspector has received employee training and is familiar with all aspects of the SWMP. **(initial)** _____

Describe answers with the potential to impact storm water on the Findings and Corrective Actions Form.

1) Review Storm Water Management Plan and current regulations:
   - *Have there been any changes to the facility or storm system?* **Y / N**
   - *Any new activities occurring on site in areas exposed to precipitation?* **Y / N**
   - *Have there been any updates to applicable regulations or guidance documents?* **Y / N**
   - *Does the Storm Water Management Plan need to be updated?* **Y / N**
2) Review work conducted by the site's **Pollution Prevention Team**. This should include a review of the past year's routine inspection forms. Review team members and assigned responsibilities.:
   - *Do team members need to be updated?* **Y / N**
   - *Have any observations requiring action during the routine inspections not been addressed?* **Y / N**
3) Employee Training:
   - *Are all employees who work outside at the facility trained/refreshed in storm water BMPs, the Plan and spill response annually?* **Y / N**

Attachment E

BMPs for Lawn Care

Storm Water Best Management Practices (BMPs) for Lawn Care

From the Oregon Department of Environmental Quality's 2013 *Industrial Stormwater Best Management Practices Manual*.

Typical Pollutants: Fertilizers, pesticides, herbicides, fungicides, phosphorus, nitrogen, zinc, copper, and pH.

Typical Problem: Lawn care entails the application of fertilizers, herbicides, pesticides, and water in order to achieve a rich vibrant lawn. Weeds are quite often controlled through the application of chemicals. Over fertilizing and the over-application of pesticides and herbicides can contaminate storm water. Too much irrigation can wash these chemicals off the site into storm water conveyances, streams, rivers, and lakes. The nutrients, phosphorus, nitrogen, and pH can be detrimental to slow moving water bodies by encouraging algae growth. Herbicides and pesticides can adversely impact human health, fish and other wildlife. All of these pollutants can significantly affect the beneficial uses of water bodies.

BMP: If a landscape contractor is hired to take care of the lawn and other vegetated areas of the site, ensure that they do their part to protect the environment by applying the appropriate amount of chemicals. Encourage them to investigate more environmentally friendly alternatives to the use of chemicals such as a thin layer of compost on top of the lawn in the fall.

A few simple precautions can minimize adverse environmental impacts from lawn care. No matter what chemicals are used, over-watering can move the chemicals in to the storm water conveyance system. Use rain measuring equipment to automatically prevent automatic lawn sprinklers from turning on. In the Northwest, watering to a depth of six inches a couple of times a week is sufficient for a lush green growth. Always water in the morning, between 6 a.m. and noon, or in the evening around sundown so that the water has time to infiltrate before it evaporates.

Fertilization:

For lawn fertilization, 1,000 square feet of lawn requires 0.5 pound of nitrogen per month of active growth (~8 months in Portland area ~ 4 pounds). A good ratio for fertilizer is 3 parts nitrogen to 1-part phosphorus to 2 parts potassium to 1-part sulfur (3:1:2:1). Use a slow release fertilizer such as one containing water insoluble nitrogen (WIN). After determining the amount of fertilizer to use per year based upon the growing season, apply the fertilizer in four equal applications of approximately one pound per 1,000 square feet each application, i.e. 1/4 in early spring, 1/4 in late spring, 1/4 in late summer, and 1/4 in the fall.

Have your site's soil tested to determine if other materials such as iron (for low pH soil < 6.8), boron, chlorine, copper, manganese, molybdenum, nickel, and zinc should be added for a healthy lawn. If soil testing indicates that one or more of the additives above is needed, contact your county Extension Agent, a lawn and garden center, or a master gardener for advice on how much of the additives to apply for optimum growing conditions.

Fertilizer over-use, over watering, and watering at the wrong time of the day set up a good environment for many grass diseases and for invasion by weeds that are very competitive with the grasses in the lawn.

Pest Management

Pest management can be conducted in an environmentally friendly manner through:

- **Knowledge**

  1. knowing the variety of grass in your lawn;
  2. knowing its growth characteristics; and

- **Identification**

  1. identifying the weeds present;
  2. identifying the grass disease present; and/or
  3. identifying the insect pests present
     a). Note where the pest is located on the lawn
     b). Draw a picture of the pest or collect a sample
        i. Research in books for a match of the pest found to a photograph;
        ii. Contact local County Extension office for assistance and advice; or
        iii. Take sample to local home and garden center for identification.

Weed removal is best accomplished by hand-pulling.

Maintain a buffer strip next to waterways. Do not apply fertilizer or pesticides to this strip. It is used to absorb excess fertilizer from the care of the rest of the lawn. It will also retain excess nutrients and sediments.

Healthy Lawn

Step 1: Lawn conversion

Convert lawn areas into groundcover, trees, shrubs, or meadow plantings. For a low input approach, replace the grass underneath mature trees with groundcover. For an even lower input approach, examine your lawn for potential conversion areas and plant groundcovers, trees, shrubs, or perennials in all areas where grass is hard to grow. For the lowest input approach, use turf only where it is the best plant to fulfill a particular function, such as providing children's sports area.

Step 2: Soil building

Provide a strong foundation for the lawn. For a low input lawn, get a soil test to determine the soil's pH and fertility. You may not need to add any lime or fertilizer to your lawn. For a lower input lawn, test for soil compaction. Can you sink a screwdriver into the ground without pounding or is the soil compacted? If the soil is compacted, aerate with a hand corer or mechanical aerator. For the lowest input lawn, examine the soil's texture - neither extremely sandy soils nor extremely heavy clay soils make for good lawns. Next count earthworms - if none can be found in a square foot of soil, there's a problem. A healthy soil community has over 10 per square foot. With this basic understanding of soil acidity, fertility, compaction, texture, and earth-worms, one can build soil that supports dense, healthy turf.

Step 3: Grass selection

Choose the type of grass that will be easiest to grow. For a low input lawn, select hardy grass species adapted to your region's climate. For a lower input lawn, select named grass varieties to meet your specific needs. For the lowest input lawn, try the new low input slow growing or dwarf grass mixes.

Step 4: Mowing and thatch management

Mow to the right height at the right time and recycle clippings. F or a low input lawn, leave clippings on the lawn to provide nutrients and moisture. For a lower input lawn, set mowing height as high as possible. For the lowest input lawn, adjust mowing height and frequency during the growing season and monitor thatch levels.

Step 5: Minimal fertilization

Give the lawn what it needs but don't overfeed. For a low input lawn, recycle clippings and (in the right season) apply commercial fertilizer at half the recommended rate; avoid weed and feed formulations and don't fertilize if rain is imminent. For a lower input lawn, fertilize as above but use encapsulated nitrogen or an organic product instead and fertilize only if soil tests show it's needed. For the lowest input lawn, substitute home generated compost for commercial organic or encapsulated products.

Step 6: Weed control and tolerance

Establish a realistic tolerance level for weeds and use less toxic control methods to maintain it. For a low input lawn use least toxic weed control methods such as: cultivation, solarization, flaming, mowing, or herbicidal soap. For a lower input lawn, grow strong healthy grass and it will crowd out weeds. For the lowest input lawn, broaden your definition of "lawn" to include weeds that perform desirable functions.

Step 7: Integrated pest management

Establish a realistic tolerance level for pests and use least toxic control methods to maintain it. For a low input lawn, use least toxic control methods such as removing or trapping pests, introducing biological control agents, or apply least toxic chemical controls such as insecticidal soaps. For a lower input lawn, grow strong, healthy grass that can resist attack. For the lowest input lawn, use cultural controls to prevent infestation, protect natural predators, and add beneficial soil microbes.

Step 8: Sensible irrigation

Practice water conserving landscaping techniques. For a low input lawn, water infrequently, in the early morning, but soak the lawn well. For a lower input lawn, water only when the lawn definitely needs it, and calibrate sprinklers. For the lowest input lawn, accept that the grass may not be green year-round.

Efficiency/Impact:

Proper maintenance of lawns and vegetative strips can be pleasing to the eye and provide environmental benefits such as reduced pollution to streams, rivers, and lakes, cooler runoff, reduce sediments in the runoff, and in some cases, reduce other pollutants from the site. The degree that this BMP will be effective is directly proportional to the degree of involvement in the care of the lawn or the degree of caution exercised in selecting a lawn care contractor and the degree that the watering system is in tune with the lawn and the weather.