INDUSTRIAL ACTIVITIES STORM WATER POLLUTION PREVENTION PLAN

for

San Pasqual Union School District

Waste Discharger Identification Number:
9 37I017954

Facility Address:
San Pasqual Union School District
15305 Rockwood Road
Escondido, California 92027

Facility Phone Number:
(530) 677-5286

Compliance Group:
San Diego County Office of Education Industrial Compliance Group

Storm Water Pollution Prevention Plan (SWPPP) Prepared by:
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SWPPP Preparation Date
May 30, 2019

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Acronyms and Abbreviations

Acronym/Abbreviation	Definition
Annual Evaluation	Annual Comprehensive Facility Compliance Evaluation
BMP	Best Management Practice
CASQA	California Stormwater Quality Association
CGL	Compliance Group Leader
ERA	Exceedance Response Action
General Permit	National Pollutant Discharge Elimination System (NPDES) General Permit for Storm Water Discharges Associated with Industrial Activities (State Water Resources Control Board Order No. 2014-0057-DWQ; NPDES Order No. CAS000001)
LRP	Legally Responsible Person
MIP	Monitoring Implementation Plan
MS4	Municipal Separate Storm Sewer System
NOT	Notice of Termination
NSWD	Non-Storm Water Discharge
PRD	Permit Registration Document
QA/QC	Quality Assurance/Quality Control
QISP	Qualified Industrial Storm Water Practitioner
QSE	Qualifying Storm Event
Regional Water Board	Regional Water Quality Control Board, San Diego Region
SMARTS	Storm Water Multiple Application and Report Tracking System
State Water Board	State Water Resources Control Board
SWPPP	Storm Water Pollution Prevention Plan
TMDL	Total Maximum Daily Load
U.S. EPA	United States Environmental Protection Agency
WDID	Waste Discharger Identification Number

Section 1 SWPPP Requirements

1.1 INTRODUCTION

The San Pasqual Union School District (SPUSD) bus maintenance facility comprises approximately 0.5 acre and is located at 15305 Rockwood Road in Escondido, California. The facility location is shown on the Site Map in Appendix A.

This Storm Water Pollution Prevention Plan (SWPPP) is designed to comply with California's National Pollutant Discharge Elimination System (NPDES) General Permit for Storm Water Discharges Associated with Industrial Activities Order No. 2014-0057-DWQ; NPDES No. CAS000001 (General Permit), issued by the State Water Resources Control Board (State Water Board). This SWPPP has been prepared following the SWPPP Template provided on the California Stormwater Quality Association (CASQA) *Stormwater Best Management Practice Handbook Portal: Industrial and Commercial* (CASQA, 2014). In accordance with the General Permit, Section X.A, this SWPPP contains the following required elements:

- Facility Name and Contact Information;
- Site Map;
- List of Significant Industrial Materials;
- Description of Potential Pollution Sources;
- Assessment of Potential Pollutant Sources;
- Minimum Best Management Practices (BMPs);
- Advanced BMPs, if applicable;
- Monitoring Implementation Plan (MIP);
- Annual Comprehensive Facility Compliance Evaluation (Annual Evaluation); and
- Date that SWPPP was Initially Prepared and the Date of Each SWPPP Amendment, if Applicable.

1.2 PERMIT REGISTRATION DOCUMENTS

Required Permit Registration Documents (PRDs) were submitted to the State Water Board via the Storm Water Multiple Application and Report Tracking System (SMARTS) by the Legally Responsible Person (LRP), or authorized personnel (i.e., Approved Signatory) under the direction of the LRP. The project-specific PRDs include:

- Notice of Intent;
- Signed Certification Statement (LRP Certification is provided electronically with SMARTS PRD submittal);
- Site Map(s);
- SWPPP; and
- Annual Fee.

The Site Map can be found in Appendix A. Copies of the submitted PRDs are also kept in Appendix B of the SWPPP along with the Waste Discharger Identification Number (WDID) confirmation. The SWPPP uploaded into SMARTS does not include a copy of the General Permit. In the event of future significant changes to the facility layout, the Discharger will certify and submit new PRDs via SMARTS.

1.3 SWPPP AVAILABILITY AND IMPLEMENTATION

The SWPPP is available on-site to all employees during all hours of operation (see Section 2.5 for the Operations Schedule), and will be made available upon request by a State or regional inspector. The SWPPP will be implemented by July 1, 2015.

1.4 POLLUTION PREVENTION TEAM

Bus maintenance facility staff designated as Pollution Prevention Team members are listed in Appendix C, along with their responsibilities and duties. This includes alternate team members, who will perform SWPPP activities when the primary Pollution Prevention Team members are absent or unavailable. This appendix will be updated as needed when there are changes to staff and staff responsibilities. All team members will be trained to perform the duties assigned to them. Employee training logs are provided in Appendix D. Any Duly Authorized Representatives responsible for any component of SWPPP implementation and authorized by the facility LRP are listed in Appendix C.

In the event that the facility enters Level 1 status, a Qualified Industrial Storm Water Practitioner (QISP) will have primary responsibility for providing training to the appropriate team members assigned to perform the activities required in this SWPPP, and will be identified in Appendix C.

1.5 DULY AUTHORIZED REPRESENTATIVES

Duly Authorized Representatives, where utilized, may be assigned some responsibility for SWPPP implementation, and have authority to sign PRDs. Duly Authorized Representatives for this facility have been identified in Appendix C.

1.6 PERMITS AND GOVERNING DOCUMENTS

In addition to the General Permit, the following documents have been taken into account while preparing this SWPPP:

- Regional Water Quality Control Board, San Diego Region (Regional Water Board) requirements;
- Basin Plan requirements;
- Total Maximum Daily Load (TMDL) Requirements;
- Spill Prevention Control and Countermeasures Plan;
- Hazardous Material Business Plan;
- Hazardous Waste Regulations and Permits;
- Air Quality Regulations and Permits; and
- Clean Water Act Section 401 Water Quality Certifications and 404 Permits.

1.7 SWPPP AMENDMENTS

This SWPPP will be amended or revised as needed. A list of amendments (Amendment Log) is included in the front of this SWPPP, and amendment certifications are included in Appendix E. The Amendment Log will include the date of initial preparation and the date of each amendment. The SWPPP should be revised when:

- There is a General Permit violation;
- There is a reduction or increase in the total industrial area exposed to storm water;

- BMPs do not meet the objectives of reducing or eliminating pollutants in storm water discharges;
- There is a change in industrial operations which may affect the discharge of pollutants to surface waters, groundwater, or a municipal separate storm sewer system (MS4);
- There is a change to the parties responsible for implementing the SWPPP; or
- Otherwise deemed necessary by the QISP.

The following items will be included in each amendment:

- The location of proposed change;
- A summary of the proposed changes; and
- The person who prepared the amendment.

Amendments will be logged at the front of the SWPPP and certification kept in Appendix E. The SWPPP text will be revised replaced, and/or hand annotated as necessary to properly convey the amendment. SWPPP amendments must be certified and submitted by the LRP or their designated Duly Authorized Representative via SMARTS within 30 days whenever the SWPPP contains significant revisions. With the exception of significant revisions, SWPPP changes will be certified and uploaded to SMARTS once every three (3) months in the reporting year.

1.8 RETENTION OF RECORDS

Paper or electronic records of documents required by this SWPPP will be retained for a minimum of five (5) years from the date generated or date submitted, whichever is later, for the following items:

- Employee Training Records;
- BMP Implementation Records;
- Spill and Clean-up Related Records;
- Records of Sampling and Analysis Information
    - The date, exact location, and time of sampling or measurement;
    - The date(s) analyses were performed;
    - The individual(s) that performed the analyses;
    - The analytical techniques or methods used; and
    - The results of such analyses;
- Records of Visual Observations
    - The date;
    - The industrial areas/drainage areas of the facility observed during the inspection (Location);
    - The approximate time of the observation;
    - Presence and probable source of observed pollutants; and
    - Name of the individual(s) that conducted the observations;
- Response to the observations including identification of SWPPP revisions if needed;
- Level 1 Exceedance Response Action (ERA) Reports;
- Level 2 ERA Action Plan;
- Level 2 ERA Technical Report; and
- Annual Reports from SMARTS (checklist and any explanations).

Copies of these records will be available for review by State and Regional Water Board staff at the San Pasqual Union School District bus maintenance facility during scheduled facility operating hours. Upon written request by the United States Environmental Protection Agency (U.S. EPA) or the local MS4 owner, the San Pasqual School District will provide paper or electronic copies of requested records to the State and Regional Water Boards, U.S. EPA, or local MS4 owner within ten (10) working days from receipt of the request.

1.9 EXCEEDANCE RESPONSE ACTIONS

If a General Permit Numeric Action Level exceedance occurs in a given reporting year, a Level 1 ERA Evaluation and a Level 1 ERA Report will be required in the following year, or, if in a subsequent year, a Level 2 ERA Action Plan and a Level 2 ERA Report will be required in accordance with the General Permit. The results of either of the ERA reports may require that the SWPPP be amended.

1.10 ANNUAL EVALUATION

An Annual Evaluation will be conducted by the Compliance Group Leader (CGL), and appropriate San Pasqual Union School District bus maintenance facility Pollution Prevention Team member(s) once during each reporting year (July 1 to June 30), in accordance with Section XV of the General Permit. Annual Evaluations will be conducted at least eight (8) months and not more than sixteen (16) months after the previous Annual Evaluation. The planned window for conducting the Annual Evaluation is between November and May of each year. The SWPPP will be revised, as appropriate, based on the results of the Annual Evaluation, and the revisions will be implemented within 90 days of the Annual Evaluation.

At a minimum, Annual Evaluations will consist of:

- A review of all sampling, visual observation, and inspection and monitoring records and sampling and analysis results conducted during the previous reporting year;
- A visual inspection of all areas of industrial activity and associated potential pollutant sources for evidence of, or the potential for, pollutants entering the storm water conveyance system;
- A visual inspection of all drainage areas previously identified as having no exposure to industrial activities and materials in accordance with the definitions in Section XVII;
- A visual inspection of equipment needed to implement the BMPs;
- A visual inspection of any BMPs;
- A review and effectiveness assessment of all BMPs for each area of industrial activity and associated potential pollutant sources to determine if the BMPs are properly designed, implemented, and are effective in reducing and preventing pollutants in industrial storm water discharges and authorized non-storm water discharges (NSWDs);
- And, an assessment of any other factors needed to comply with the Annual Reporting requirements in General Permit Section XVI.B.

1.11 ANNUAL REPORT

The Annual Report will be prepared, certified, and electronically submitted no later than July 15th following each reporting year using the standardized format and checklists in SMARTS based on the reporting requirements identified in Section XVI of the General Permit. Annual

reports will be submitted in SMARTS and in accordance with information required by the on-line forms.

1.12 TERMINATION AND CHANGES TO GENERAL PERMIT COVERAGE

When any of the following conditions occur, termination of coverage under the General Permit will be requested by certifying and submitting a Notice of Termination (NOT) via SMARTS:

- Operation of the facility has been transferred to another entity;
- The facility has ceased operations, completed closure activities, and removed all industrial related pollutant generating sources; or
- The facility's operations have changed and are no longer subject to the General Permit.

The SWPPP and all of the provisions of the General Permit will be complied with until a valid NOT is received and accepted by the Board. If ownership changes, the new owner of the facility will be notified of the General Permit and regulatory requirements for permit coverage.

Section 2 Facility Information

2.1 FACILITY DESCRIPTION

2.1.1 Facility Location

The San Pasqual Union School District (SPUSD) Bus Maintenance Facility site is located at 15305 Rockwood Road in Escondido, California. The facility is located in San Diego County. The entrance to the facility is located at Latitude 33.111072 degrees and Longitude –117.009286 degrees and is identified on the Site Map in Appendix A.

The property is owned and operated by SPUSD. Average annual precipitation is approximately 13 inches in the facility vicinity. The wettest months are November through March.

The facility is directly tributary to Santa Ysabel Creek. The most recent 303(d) list for the San Diego Region is presented in the 2010 Integrated Report (Clean Water Act Section 303(d) List/ 305(b) Report). The 2010 Integrated Report does not indicate that Santa Ysabel is water quality impaired.

2.1.2 Facility Operations

The San Pasqual Union School District provides pupil transportation services primarily to and from school. This activity is assigned the Standard Industrial Classification code of 4151, in the category of transportation facilities. Transportation facilities are subject to the General Permit when conducting industrial activities, which include vehicle maintenance, fueling, and washing, onsite. Operations at the San Pasqual Union School District bus maintenance facility include the following industrial activities in support of school bus transportation:

- Engine Servicing
- Transmission Servicing
- Brake Maintenance
- Tire Maintenance
- Fluid Changes
- Body Repair
- Bus Fueling
- Bus Washing

This bus maintenance facility serves approximately 3 school buses, although this number can fluctuate in accordance with District needs.

2.1.3 Existing Conditions

The San Pasqual Union School District bus maintenance facility site contains indoor bus maintenance facilities, a covered fueling station, an enclosed bus wash barn, enclosed material storage areas, and outdoor bus parking, where bus washing occurs. The facility drainage area is entirely paved. Bus washing and fueling areas are exposed to precipitation and storm water runoff at the facility. Existing BMPs to reduce or eliminate pollutant exposure at this facility are described in Section 3.

There are no known historic sources of contamination at the site.

2.1.4 Description of Drainage Areas and Existing Drainage

The San Pasqual Union School District bus maintenance facility contains three drainage areas, A, B, and C. All exposed industrial activities occur in areas A and C. As shown on the Site Map in Appendix A, these areas drain to the south end of the facility. The Site Map shows the area layout, including the general site topography, storm drainage system, drainage inlet, drainage area, and discharge location. Table 2.1, below, provides additional detail regarding drainage areas at the facility.

Table 2.1 Facility Drainage Areas and Locations

Drainage Area	Discharge Location	Drainage Area Description
A	001	Drainage area A discharges to point 001, and includes the enclosed bus servicing garage and covered fueling station.
B	002	Drainage area B discharges to point 002, and includes bus parking areas.
C	003	Drainage area C discharges to point 003, and includes the pervious bus washing area.

The Site Map shows the general site topography, direction of runoff flow, drainage inlets, and the discharge locations. The entire site is relatively level and slopes toward the south. The elevation of the site is approximately 410 feet above mean sea level (msl). Stormwater is conveyed as surface runoff across the site towards two drainage inlets in the adjacent pavement.

2.1.5 Storm Water Run-On from Offsite Areas

The storm water runoff discharged from the site does not include any runoff from off-site areas.

2.2 OPERATIONS SCHEDULE

The San Pasqual Union School District bus maintenance facility operates Monday through Friday from approximately 7:00 am to 4:00 pm [AK1]with the exception of scheduled holidays. Industrial activities during this time period include all activities listed in Section 2.1.2 as needed.

This SWPPP will be implemented, and a copy made available to all bus maintenance facility staff at all times. A copy will be available to regulatory agency personnel upon request.

If industrial activities are temporarily suspended for ten (10) or more consecutive calendar days during a reporting year, BMPs that are necessary to achieve compliance with this General Permit during the temporary suspension of the industrial activity will be identified and incorporated into the SWPPP.

2.3 POLLUTANT SOURCE ASSESSMENT

This section presents a list of all industrial materials and potential pollutant sources at the San Pasqual Union School District bus maintenance facility. It identifies specific pollutants associated with these sources and pollutant sources that are most susceptible to storm water exposure. A summary of significant spills and leaks that have occurred onsite is also provided.

2.3.1 Description of Potential Pollutant Sources

Table 2.2 includes a list of industrial activities and associated materials that are anticipated to be used onsite. These activities and associated materials could potentially contribute pollutants to storm water runoff. The industrial activities, potential for exposure, and the associated pollutants provided in Table 2.2 are the basis for selecting the BMPs for the bus maintenance facility as described in Section 3. Materials stored onsite, including quantity, physical characteristics, and location are provided in Table 2.3. Locations of all material storage areas, industrial activities, and other site features are shown on the Site Map in Appendix A.

The facility is directly tributary to Santa Ysabel Creek. The 2010 Integrated Report does not indicate that Santa Ysabel is water quality impaired.

2.3.2 Significant Spills and Leaks

No significant spills have occurred at this site within the last five years.

Table 2.3 includes a list of industrial materials, and includes material characteristics, quantities, locations, and associated pollutants. All materials in this table listed as having liquid characteristics have the potential for spills and leaks to occur. Spills and leaks are prevented by implementing the BMPs described in Section 3.

Table 2.2 Industrial Activities and Associated Materials

Industrial Activity[AK2]	Associated Industrial Materials	Storm Water Exposure Pathway
Engine Servicing	Oil and grease, Antifreeze, Residual Heavy Metals (Cadmium, Copper, Lead, Nickel, Zinc)	Industrial materials associated with this activity are unlikely to be present in industrial storm water discharges, as the activity itself, and the storage of related waste materials, occurs within the enclosed garage or lube room, where pollutants are not exposed.
Transmission Servicing	Transmission Fluid, Residual Heavy Metals (Cadmium, Copper, Lead, Nickel, Zinc)	Industrial materials associated with this activity are unlikely to be present in industrial storm water discharges, as the activity itself, and the storage of related waste materials, occurs within the enclosed garage or lube room, where pollutants are not exposed.
Brake Maintenance	Heavy Metals (Copper)	Industrial materials associated with this activity are unlikely to be present in industrial storm water discharges, as the activity itself, and the storage of related waste materials, occurs within the enclosed garage, where pollutants are not exposed.
Tire Maintenance	Heavy Metals (Zinc, Copper)	There is a low likelihood that industrial materials associated with this activity will be present in industrial storm water discharges. This activity occurs outdoors, where buses are parked, by a mobile contractor. Paved areas of the site are cleaned every other week using a "billy goat" vacuum sweeper. Runoff from the outdoor work areas also passs through a six-stage separator prior to discharge to the storm drain system. Only residual pollutants not completely removed through this process may be mobilized by storm water. This activity does not occur during storm events, and all site runoff is directed through a multi-stage clarifier.
Fluid Changes	Oil and grease, Antifreeze, Residual Heavy Metals (Cadmium, Copper, Lead, Nickel, Zinc)	Industrial materials associated with this activity are unlikely to be present in industrial storm water discharges, as the activity itself, and the storage of related waste materials, occurs within the enclosed garage or lube room, where pollutants are not exposed.
Body Repair	Paint, Residual Heavy Metals (Cadmium, Copper, Lead, Nickel, Zinc)	Industrial materials associated with this activity are unlikely to be present in industrial storm water discharges, as the activity itself, and the storage of related waste materials, occurs within the enclosed garage, where pollutants are not exposed.
Fueling	Gasoline, Diesel	There is a low likelihood that industrial materials associated with this activity will be present in industrial storm water discharges. Fuel tanks are belowground, stations are under permanent cover, and fuel hoses are checked daily during operating hours for any sign of current or potential leaks. Spill response materials are located in close proximity to the fuel hoses for immediate response in the event of a spill, and all site runoff is directed through a multi-stage clarifier.
Bus Washing	Soap, Residual Heavy Metals (Cadmium, Copper, Lead, Nickel, Zinc), Sediment	There is a low likelihood that industrial materials associated with this activity will be present in industrial storm water discharges. Bus washing is conducted occassionally in an enclosed bus wash, which drains to a clarifier and then to the sanitary sewer, or in the parking areas by a mobile detailer, who deploys containment devices prior to washing, and collects all washwater for disposal to the sanitary sewer. Only residual pollutants not completely removed through this process may be mobilized by storm water. This activity does not occur during storm events, and all site runoff is directed through a multi-stage clarifier.
Parts Cleaning	Solvent, Residual Heavy Metals (Cadmium, Copper, Lead, Nickel, Zinc), Residual Oil	Industrial materials associated with this activity are unlikely to be present in industrial storm water discharges, as the activity itself, and the storage of related waste materials, occurs within the enclosed garage, where pollutants are not exposed.

Table 2.3 Industrial Material Quantity and Location

Industrial Material	Material Physical Characteristics	Material Quantity[AK3]	Material Location	Associated Pollutants
Motor Oil (New)	Fluid	___ gallons	Enclosed garage	Oil
Oil (Used)	Fluid	55 gallons	Enclosed garage	Copper, Lead, Nickel, Oil, Grease, and Zinc
Antifreeze (New)	Fluid	___ gallons	Enclosed garage	Ethylene Glycol
Antifreeze (Used)	Fluid	___ gallons	Enclosed garage	Copper, Lead, Nickel, and Zinc
Transmission Fluid (New)	Fluid	___ gallons	Enclosed garage	Oil
Hydraulic Oil	Fluid	5 gallons	Enclosed garage	Oil
Gasoline	Fluid	___ gallons	Outdoors, above ground tank within 24 inch concrete containment wall	Copper, Lead, and Nickel
Diesel	Fluid	550 gallons	Outdoors, above ground tank within 24 inch concrete containment wall	Copper, Lead, and Nickel
Solvent (Ozzy Juice)	Fluid	___ gallons	Enclosed garage	Surfactants
Tires	Solid	<10	Enclosed garage	Cadmium, Copper, and Zinc
Batteries	Fluid	<5	Enclosed garage	Copper, Lead, Zinc, and acid
Soap	Fluid	1 gallon	Enclosed garage	Surfactants

2.4 IDENTIFICATION OF NSWDS

NSWDs consist of discharges that do not originate from precipitation events. The General Permit provides allowances for specified NSWDs provided they do not cause erosion, carry other pollutants, are not prohibited by the local MS4, and do not require a separate NPDES Permit from the Regional Water Board. NSWDs into storm drainage systems or waterways, which are not authorized under the General Permit and listed in the SWPPP, or authorized under a separate NPDES permit, are prohibited.

Monthly visual observations will be conducted according to the General Permit (Section XI.A.1) for NSWDs and sources to ensure adequate BMP implementation and effectiveness. Monthly visual observations include observations for evidence of unauthorized NSWDs.

Activities at this site that may result in unauthorized NSWDs include:

- Engine Servicing
- Transmission Servicing
- Fluid Changes
- Bus Washing
- Fueling
- Parts Cleaning

No NSWDs have occurred at the San Pasqual Union School District bus maintenance facility in the past 5 years, and none are anticipated to occur. Steps have been taken, including the implementation of appropriate BMPs as defined in Section 3, to ensure that unauthorized NSWDs do not occur. In the event that a NSWD is identified, appropriate BMPs will be implemented, or updated as necessary to eliminate current and subsequent discharge.

2.5 REQUIRED SITE MAP INFORMATION

The bus maintenance facility's Site Map is provided in Appendix A, and includes all information required by the General Permit. The map includes information regarding the facility boundary and storm water drainage areas, nearby water bodies, locations of storm water collection and conveyance systems including outfalls, locations and descriptions of all industrial activities and materials, and locations and descriptions of all structural control measures, as applicable.

A summary of all information provided in the Site Map(s) is provided in Table 2.4 below.

Table 2.4 Required Site Map(s) Information Checklist

Included on Site Map? (Yes/No/ NA)	**Required Element**
Yes	The facility boundary
Yes	Storm water drainage areas within the facility boundary
N/A	Portions of any drainage area impacted by discharges from surrounding areas
Yes	Flow direction of each drainage area
N/A	On-facility surface water bodies
N/A	Areas of soil erosion
Yes	Location(s) of nearby water bodies (such as rivers, lakes, wetlands, etc.)
N/A	Location(s) of municipal storm drain inlets that may receive the facility's industrial storm water discharges and authorized NSWDs
Yes	Locations of storm water collection and conveyance systems and associated points of discharge, and direction of flow
Yes	Any structural control measures (that affect industrial storm water discharges, authorized NSWDs, and run-on)
Yes	All impervious areas of the facility, including paved areas, buildings, covered storage areas, or other roofed structures
N/A	Locations where materials are directly exposed to precipitation
N/A	Locations where significant spills or leaks (Section X.G.1.d of the General Permit) have occurred
Yes	Areas of industrial activity subject to the General Permit
Yes	All storage areas and storage tanks
N/A	Shipping and receiving areas
Yes	Fueling areas
Yes	Vehicle and equipment storage/maintenance areas
N/A	Material handling and processing areas
Yes	Waste treatment and disposal areas
Yes	Dust or particulate generating areas
Yes	Cleaning and material reuse areas
Yes	Any other areas of industrial activity which may have potential pollutant sources

Section 3 Best Management Practices

3.1 MINIMUM BMPs

All minimum BMPs that are required by the General Permit and necessary to meet the facility conditions will be implemented. Guidance for BMP implementation is provided in the CASQA Stormwater BMP Handbook Portal: Industrial and Commercial Fact Sheets and the relevant fact sheets are included in Appendix F. Sections 3.1.1 through 3.1.5 list the requirements for each of these minimum BMPs, in addition to some facility-specific implementation detail. Minimum BMPs will be implemented for additional targeted industrial activities, equipment, and materials as necessary. If any of the required minimum BMPs are applicable but cannot be implemented, an explanation and alternative approach will be provided in the following sections.

Table 3.1 provides a list of the five minimum General Permit BMP elements that are included in the relevant BMP fact sheets and indicates which BMPs are implemented at the bus maintenance facility. Employee Training, described in Section 3.1.6, and Quality Assurance and Record Keeping, described in Section 3.1.7, are additional minimum BMPs that will be implemented.

As required by the General Permit, a summary of all implemented BMPs is included in Section 3.3. The schedule for BMP implementation and the requirements for inspection and maintenance are contained in Section 4.

Table 3.1 Minimum BMPs

CASQA Fact Sheet Number	CASQA BMP Fact Sheet Name	Minimum General Permit BMP Requirements Addressed					BMP Implemented? (Yes/No/N/A)
		Good Housekeeping	Preventative Maintenance	Spill and Leak Prevention and Response	Material Handling and Waste Management	Erosion and Sediment Control	
SC-10	Non-Storm Water Discharges	✓		✓			Yes
SC-11	Spill Prevention, Control, and Cleanup			✓			Yes
SC-20	Vehicle and Equipment Fueling	✓	✓	✓	✓		Yes
SC-21	Vehicle and Equipment Cleaning	✓	✓	✓	✓		Yes
SC-22	Vehicle and Equipment Maintenance and Repair	✓	✓	✓	✓		Yes
SC-30	Outdoor Loading and Unloading	✓		✓	✓		N/A
SC-31	Outdoor Liquid Container Storage	✓	✓	✓	✓		N/A
SC-32	Outdoor Equipment Operations	✓	✓	✓	✓		Yes
SC-33	Outdoor Storage of Raw Materials	✓	✓	✓		✓	N/A
SC-34	Waste Handling and Disposal	✓	✓	✓	✓		Yes
SC-35	Safer Alternative Products						Yes
SC-40	Contaminated or Erodible Surfaces					✓	Yes
SC-41	Building and Grounds Maintenance	✓		✓	✓		Yes
SC-42	Building Repair, Remodeling, and Construction	✓		✓	✓	✓	Yes
SC-43	Parking Area Maintenance	✓	✓	✓			Yes
SC-44	Drainage System Maintenance	✓	✓	✓			Yes

3.1.1 Good Housekeeping

The following good housekeeping measures will be implemented in accordance with the General Permit (Section X.H.1.a):

- All outdoor areas associated with industrial activity, including storm water discharge locations, drainage areas, conveyance systems, waste handling/disposal areas, and perimeter areas impacted by off-facility materials or storm water run-on, are regularly observed to determine housekeeping effectiveness. Observations are recorded formally on monthly observation forms, found in MIP Attachment 3. Housekeeping efforts, methods, and/or frequencies are updated in response to observed conditions. Any identified debris, waste, spills, tracked materials, or leaked materials will be cleaned promptly and disposed of properly;
- Every other week, the outdoor areas and storm water conveyances are cleaned by sweeping, blowing, or use of a "billy goat" vacuum sweeper;
- Municipal areas of the site are cleaned weekly;
- Material tracking is minimized through prompt spill cleanup, sweeping, and/or mopping, as appropriate;
- Dust generated from industrial materials or activities is minimized and prevented from leaving the site via aerial or storm water transport by completing dust generating activities, such as brake maintenance or metal grinding, in indoor areas. Additionally, brake cleaner may be used to prevent brake dust from being generated during maintenance;
- All facility areas where washing or rinsing occur are monitored for overspray, spills, or residue, and cleaned as soon as possible;
- All stored industrial materials that can be readily mobilized by contact with storm water are covered and/or contained typically at all times when not actively in use, but at a minimum, prior to and during storm events;
- No non-solid industrial materials or wastes (e.g., particulates, powders, etc.) that can be transported or dispersed via wind or contact with storm water are stored at the bus maintenance facility;
- Rinse/wash waters or industrial materials are disposed of to the sanitary sewer, or an authorized waste hauler, and never to the storm water conveyance system;
- Storm water discharges from non-industrial areas, that would otherwise contact industrial areas of the facility, are minimized through flow diversion where feasible; and
- No NSWDs have been authorized for the bus maintenance facility.

BMPs to be implemented are summarized in Table 3.1 and the BMP fact sheets are included in Appendix F.

3.1.2 Preventative Maintenance

The following preventative maintenance measures will be implemented in accordance with the General Permit (Section X.H.1.b):

- All equipment and systems used outdoors with the potential to spill or leak pollutants have been identified, and include school buses, fueling stations, and municipal vehicles and equipment;

- Bus maintenance occurs every 3,000 miles or 45 days, whichever occurs first, in accordance with Title 13 of the California Code of Regulations;
- Fuel hoses are checked daily for any sign of current or potential leaks or failures;
- Municipal vehicles and equipment stored on site are serviced regularly, and monitored for leaks;
- Hydraulic lift hoses and systems are installed indoors, and visually inspected prior to each use for any sign of current or potential leaks or failures; and
- Bus drivers complete pre and post-trip checks to visually observe that the bus is in working order and free of any fluid leaks. Should leaks or other conditions that require maintenance be observed, the driver reports the condition to their supervisor or directly to the lead mechanic so that maintenance and repair can be performed promptly and leaked materials cleaned.

Specific preventative maintenance BMPs to be implemented at the facility are provided in Table 3.1 and the BMP fact sheets are included in Appendix F.

3.1.3 Spill and Leak Prevention and Response

The following spill and leak prevention and response measures will be implemented in accordance with the General Permit (Section X.H.1.c):

- Procedures and/or controls to minimize spills and leaks have been established and are being implemented as necessary, including the placement of drip pans beneath vehicles as needed, storage of liquids within containment areas, and regular vehicle maintenance every 3,000 miles or 45 days (whichever occurs first, in accordance with Title 13 of the California Code of Regulations);
- Spill and leak response procedures have been developed and are currently being implemented to prevent industrial materials from discharging through the storm water conveyance system. Spilled or leaked industrial materials are cleaned promptly utilizing on-site absorbent materials, and disposed of properly, utilizing a hazardous waste hauler where necessary;
- All spill and leak response materials and equipment are located in close proximity to areas where liquids are stored and/or handled;
- Spill or leak response equipment maintenance procedures are clearly described in training materials; and
- Facility personnel responsible for spill and leak response are provided with formal training a minimum of once per year.

Specific spill and leak prevention and response BMPs to be implemented at the San Pasqual Union School District bus maintenance facility are provided in Table 3.1 and the BMP fact sheets are included in Appendix F.

3.1.4 Material Handling and Waste Management

The following material handling and waste management measures will be implemented in accordance with the General Permit (Section X.H.1.d):

- Industrial materials or wastes that can be readily mobilized by contact with storm water are covered and/or contained, at minimum, prior to and during storm events, and activities that may result in the exposure of these materials are not conducted during storm events wherever possible;
- No non-solid industrial materials or wastes (e.g., particulates, powders, etc.) that can be transported or dispersed via wind or contact with storm water are stored at the bus maintenance facility;
- Industrial waste disposal containers and industrial material storage containers that contain industrial materials are covered during storm events and when not in use, and/or contained within structures that do not receive rainfall or run-on, have the capacity to contain all stored liquid in addition to all precipitation, or drain to the sanitary sewer;
- Material stockpiles stored in the municipal operations areas are covered with tarps and secured with gravel or sandbags at minimum prior to forecast rain events;
- All spills of industrial materials or wastes that occur during handling are promptly cleaned in accordance with the spill response procedures (Section X.H.1.c); and
- Any outdoor material or waste handling equipment or containers that can be contaminated by contact with industrial materials or wastes are observed regularly, and cleaned or covered as necessary to prevent storm water contact with pollutants.

Specific material handling and waste management BMPs to be implemented at the San Pasqual Union School District bus maintenance facility are provided in Table 3.1 and the BMP fact sheets are included in Appendix F.

3.1.5 Erosion and Sediment Controls

The following erosion and sediment control measures will be implemented in accordance with the General Permit (Section X.H.1.e):

- The entire bus maintenance facility drainage area is impervious;
- Adjacent drainage areas that include pervious areas have been stabilized through landscaping; and
- All entrances and exits are paved, and no traffic patterns go through pervious areas, so potential for sediment tracking or transport by other means has been minimized.

Specific erosion and sediment control BMPs to be implemented at the San Pasqual Union School District bus maintenance facility are provided in Table 3.1 and the BMP fact sheets are included in Appendix F.

3.1.6 Employee Training Program

An employee training program will be implemented in accordance with the following requirements in the General Permit (Section X.H.1.f):

- All personnel implementing the various compliance activities of this SWPPP are properly trained in topics including but not limited to: BMP implementation, BMP effectiveness evaluations, visual observations, and monitoring activities;
- Training materials are updated annually, with hard copies provided to personnel during training and electronic copies available year-round;

- Personnel designated as Pollution Prevention Team members are made aware of their specific responsibilities, and trained annually on the performance of designated tasks;
- Formal training is provided once per year for all applicable personnel;
- Informal guidance is provided by the CGL as needed where questions may arise; and
- Documentation of all completed training, and the personnel that received training, are retained in the SWPPP, see Appendix C.

Task specific training for all employees engaged in activities that have the potential to cause storm water pollution will be conducted when new employees are hired, and refresher training is provided annually.

This facility is currently at the Baseline ERA compliance level. In the event that the facility enters Level 1 ERA status, a QISP will have primary responsibility for providing training to the appropriate team members assigned to perform the activities required in this SWPPP. The QISP will be responsible for providing information during training sessions and subsequently completing the training logs shown in Appendix C, which identifies the site-specific storm water topics covered as well as the names of site personnel who attended the meeting. Each team member will be trained in the specific role they are responsible to undertake.

3.1.7 Quality Assurance and Record Keeping

The following quality assurance and record keeping activities will be performed in accordance with the requirements in the General Permit (Section X.H.1.g):

- The LRP regularly checks in with Pollution Prevention Team members to ensure that all elements of the SWPPP are being implemented in a timely manner, including the MIP (SWPPP Section 5);
- The CGL provides periodic reminders and guidance;
- Annual Evaluations are conducted by the CGL, during which time the implementation of all SWPPP components is verified;
- BMPs identified in the SWPPP are tracked and recorded on the monthly observation forms;
- Paper or electronic records of documents required by this SWPPP will be retained for a minimum of five (5) years from the date generated or date submitted, whichever is later, as required in the General Permit (Section XXI.J.4) for the following items:
    - Employee Training Records;
    - BMP Implementation Records;
    - Spill and Clean-up Related Records;
    - Records of Monitoring Information
        - The date, exact location, and time of sampling or measurement;
        - The date(s) analyses were performed;
        - The individual(s) that performed the analyses;
        - The analytical techniques or methods used; and
        - The results of such analyses;
    - Level 1 ERA Reports;
    - Level 2 ERA Action Plan;
    - Level 2 ERA Technical Report; and
    - Annual Reports;

- BMPs will be implemented according to the schedule and procedures presented in SWPPP Section 4. BMPs will be implemented by properly trained team members as documented in Appendix C; and
- Visual observations will be performed monthly as described in SWPPP Section 5.5. Potential pollutant sources and BMPs will be inspected during visual observations, and new BMPs will be implemented as needed.

3.2 ADVANCED BMPs

3.2.1 Exposure Minimization BMPs

Storm resistant shelters are installed onsite to prevent the contact of storm water with industrial activities and material. The locations of these shelters and associated industrial activities and materials are presented in Table 3.2.

Table 3.2 Exposure Minimization BMPs

Shelter Location/Description	Associated Industrial Activity/Material
Enclosed Service Bay	• Engine Servicing • Transmission Servicing • Brake Maintenance • Tire Maintenance • Fluid Changes • Parts Cleaning
Covered Fuel Island	• Bus fueling

The only industrial activities not conducted entirely within a storm-resistant shelter are routine bus washing, and bus fueling. Bus washing is completed on an as-needed basis on pervious ground, where wash water infiltrates without causing runoff.

3.2.2 Storm Water Containment and Discharge Reduction BMPs

Storm water containment and discharge reduction BMPs include BMPs that divert, reuse, contain, or reduce the volume of storm water runoff. No storm water containment and discharge reduction BMPs are implemented at the San Pasqual Union School District bus maintenance facility.

3.2.3 Treatment Control BMPs

Treatment control BMPs include one or more mechanical, chemical, biologic, physical, or any other treatment process technology and is sized to meet the treatment control design storm standard. No treatment control BMPs are implemented at the San Pasqual Unified School District bus maintenance facility.

3.2.4 Other Advanced BMPs

No additional advanced BMPs are implemented at the San Pasqual Union School District bus maintenance facility.

3.3 BMP SUMMARY TABLE

Table 3.3 summarizes the industrial activities, materials, pollutant sources, potential pollutants, and BMPs being implemented to prevent discharge of pollutants in storm water runoff. Descriptions of the specific BMPs being implemented were provided in previous subsections. Implementation and maintenance of BMPs is described in Section 4.

Table 3.4 BMP Summary Table

Industrial Activity	Pollutant Sources	Potential Pollutants	BMPs Implemented	CASQA BMP Fact Sheet Number(s)	Required Equipment and Tools
Engine Servicing	Engine dust; Automotive fluids; Batteries	Cadmium Copper Lead Nickel Zinc Oil & Grease pH effects	• Engine servicing occurs within service bays, where pollutants are not exposed to storm water. • Materials are prevented from tracking outside of service bays through prompt spill cleanup, regular sweeping and/or mopping of service bay floors and aprons. • Preventative bus maintenance occurs every 3,000 miles or 45 days, whichever occurs first. • Hydraulic lift hoses and systems are serviced annually, and visually inspected prior to each use for any sign of current or potential leaks or failures.[AK4] • Bus drivers complete pre and post-trip checks to visually observe that the bus is in working order and free of any fluid leaks. Should leaks or other conditions that require maintenance be observed, the driver reports the condition to their supervisor or directly to the lead mechanic so that maintenance and repair can be performed promptly and leaked materials cleaned. • Drip pans are placed under buses that are leaking or undergoing repair, to collect automotive fluids. • Drainage within the enclosed garage passes through a clarifier prior to discharge to the sanitary sewer system. The clarifier is serviced annually.[AK5]	SC-10 SC-11 SC-22 SC-31 SC-34 SC-41 SC-43 SC-44	Broom; Mop; Drip pans

Industrial Activity	Pollutant Sources	Potential Pollutants	BMPs Implemented	CASQA BMP Fact Sheet Number(s)	Required Equipment and Tools
Fluid Changes	Automotive fluids	Cadmium Copper Lead Nickel Zinc Oil & Grease	• Fluid changes occur within service bays, where pollutants are not exposed to storm water. • Materials are prevented from tracking outside of service bays through prompt spill cleanup, regular sweeping and/or mopping of service bay floors and aprons. • Preventative bus maintenance occurs every 3,000 miles or 45 days, whichever occurs first. • Hydraulic lift hoses and systems are serviced annually, and visually inspected prior to each use for any sign of current or potential leaks or failures. • Bus drivers complete pre and post-trip checks to visually observe that the bus is in working order and free of any fluid leaks. Should leaks or other conditions that require maintenance be observed, the driver reports the condition to their supervisor or directly to the lead mechanic so that maintenance and repair can be performed promptly and leaked materials cleaned. • Drip pans are placed under buses to collect automotive fluids during fluid changes. • Drainage within the enclosed garage passes through a clarifier prior to discharge to the sanitary sewer system. The clarifier is serviced annually.	SC-10 SC-11 SC-22 SC-31 SC-34 SC-41 SC-43 SC-44	Broom; Mop; Drip pans

Industrial Activity	Pollutant Sources	Potential Pollutants	BMPs Implemented	CASQA BMP Fact Sheet Number(s)	Required Equipment and Tools
Transmission Servicing	Automotive fluids	Cadmium Copper Lead Nickel Zinc Oil & Grease	• Transmission servicing occurs within service bays, where pollutants are not exposed to storm water. • Materials are prevented from tracking outside of service bays through prompt spill cleanup, regular sweeping and/or mopping of service bay floors and aprons. • Preventative bus maintenance occurs every 3,000 miles or 45 days, whichever occurs first. • Hydraulic lift hoses and systems are serviced annually, and visually inspected prior to each use for any sign of current or potential leaks or failures. • Bus drivers complete pre and post-trip checks to visually observe that the bus is in working order and free of any fluid leaks. Should leaks or other conditions that require maintenance be observed, the driver reports the condition to their supervisor or directly to the lead mechanic so that maintenance and repair can be performed promptly and leaked materials cleaned. • Drip pans are placed under buses that are leaking or undergoing repair, to collect automotive fluids. • Drainage within the enclosed garage passes through a clarifier prior to discharge to the sanitary sewer system. The clarifier is serviced annually.	SC-10 SC-11 SC-22 SC-31 SC-34 SC-41 SC-43 SC-44	Broom; Mop; Drip pans
Brake Maintenance	Brake dust	Copper	• Brake maintenance occurs within service bays, where pollutants are not exposed to storm water. • Materials are prevented from tracking outside of service bays through prompt spill cleanup, regular sweeping and/or mopping of service bay floors and aprons. • Brakes are sprayed down with brake cleaner prior to removal, to reduce dust generation. • Brake maintenance is not conducted in areas where wind may transport brake dust, when conditions are windy. • Drainage within the enclosed garage passes through a clarifier prior to discharge to the sanitary sewer system. The clarifier is serviced annually.	SC-43 SC-44	Brake cleaner; Broom; Mop

Industrial Activity	Pollutant Sources	Potential Pollutants	BMPs Implemented	CASQA BMP Fact Sheet Number(s)	Required Equipment and Tools
Tire Maintenance	Used tires	Copper Zinc	• Tire maintenance occurs within service bays, where pollutants are not exposed to storm water. • Materials are prevented from tracking outside of service bays through prompt spill cleanup, regular sweeping and/or mopping of service bay floors and aprons.	SC-43 SC-44	Wet/dry vacuum; Mop; Broom
Body Repair	Sanding dust; Paint[AK6]	Zinc; Suspended solids	• Body repair occurs within service bays, where pollutants are not exposed to storm water. • Materials are prevented from tracking outside of service bays through prompt spill cleanup, regular sweeping and/or mopping of service bay floors and aprons. • Body repair is not conducted in areas where wind may transport sanding dust, when conditions are windy.	SC-11	Broom; Mop
Fueling	Diesel Gasoline [AK7]	Diesel Gasoline	• Fuel tanks are double-walled and located within a 24 inch-high containment wall. • Fueling hoses and nozzles are visually inspected daily for any sign of current or potential leaks or failures. • Oil absorbent is located in close proximity to the fueling area.	SC-10 SC-11 SC-20 SC-31	Mop; Broom
Bus Washing	Wash water	Detergents Cadmium Copper Lead Nickel Zinc Oil & Grease	• Bus washing is conducted occassionally in an enclosed bus wash, which drains to a clarifier and then to the sanitary sewer. The clarifier is serviced annually. • Routine bus washing occurs in the pervious lot at the southwest corner of the facility. All runoff infiltrates into the ground and does not result in runoff. • Bus washing does not occur during rain events.	SC-10 SC-11 SC-21	Wet/dry vacuum; Mop; Broom
Parts Cleaning	Cleaning solution reservoir	Detergents Cadmium Copper Lead Nickel Zinc Oil & Grease	• Parts cleaning occurs within service bays, where pollutants are not exposed to storm water. • Drainage within the enclosed garage passes through a clarifier prior to discharge to the sanitary sewer system. The clarifier is serviced annually.[AK8]	SC-10 SC-11 SC-21	Parts washer

Section 4 BMP Implementation

4.1 BMP IMPLEMENTATION SCHEDULE

The schedule for implementing all minimum and advanced BMPs is presented in Table 4.1. BMPs will be implemented as necessary to reduce or prevent transport of industrial pollutants in storm water runoff. Slight modifications to this schedule may be necessary to achieve this goal.

Table 4.1 BMP Implementation Schedule

Industrial Activity and Location	BMP Description	Person Responsible for Implementing BMP(s)	Date and Time of Implementation	Implementation Duration
Engine Servicing	See Table 3.3	Staff Mechanic	Daily when activity is conducted	Throughout activity
Transmission Servicing	See Table 3.3	Staff Mechanic	Daily when activity is conducted	Throughout activity
Brake Maintenance	See Table 3.3	Staff Mechanic	Daily when activity is conducted	Throughout activity
Tire Maintenance	See Table 3.3	Staff Mechanic	Daily when activity is conducted	Throughout activity
Fluid Changes	See Table 3.3	Staff Mechanic	Daily when activity is conducted	Throughout activity
Body Repair	See Table 3.3	Staff Mechanic	Daily when activity is conducted	Throughout activity
Fueling	See Table 3.3	Staff Mechanic, Bus Drivers	Daily when activity is conducted	Throughout activity
Bus Washing	See Table 3.3	Bus Drivers	Daily when activity is conducted	Throughout activity
Parts Cleaning	See Table 3.3	Staff Mechanic	Daily when activity is conducted	Throughout activity

4.2 BMP INSPECTION AND MAINTENANCE

The General Permit requires, at a minimum, monthly observations of BMPs, along with inspections during sampling events. Monthly observations will be conducted during daylight hours of scheduled facility operating hours and on days without precipitation. A BMP observation checklist must be filled out for and maintained on-site with the SWPPP. The observation checklist includes the necessary information as discussed in Section 5.5. A blank observation checklist can be found in MIP Attachment 3, and completed checklists will be kept in MIP Attachment 2 along with any records of additional BMP implementation.

BMPs will be maintained regularly to ensure proper and effective functionality. If necessary, corrective actions will be implemented immediately where possible, with a goal of completion within 72 hours of identification of the deficiency. Any associated amendments to the SWPPP will be prepared and documented.

Specific guidance for maintenance, observation, and repair of advanced BMPs can be found in the BMP fact sheets in Appendix F.

Section 5 Monitoring Implementation Plan

5.1 PURPOSE

This MIP was developed to address the following objectives:

1. Identify the monitoring team;
2. Describe weather and rain event tracking procedures;
3. Describe discharge locations, visual observations procedures;
4. Describe visual observation response procedures;
5. Describe sample collection and handling procedures;
6. Describe field instrumentation calibration instructions and intervals;
7. Provide justification for alternative discharge locations, Representative Sample Reduction, and Qualified Combined Samples, as applicable; and
8. Provide an example Chain of Custody (CoC) form to be used when handling and shipping water quality samples to the laboratory.

5.2. WEATHER AND RAIN EVENT TRACKING

Storm water sampling and visual observations will be conducted during Qualifying Storm Events (QSEs). A QSE is defined as any precipitation event that produces a discharge for at least one drainage area and is preceded by 48 hours with no discharge from any drainage area. Weather and precipitation forecasts will be tracked to identify potential QSEs.

The following online resources may be used to track precipitation events:

http://www.srh.noaa.gov/

http://www.wunderground.com/

When targeting a QSE for storm water sampling, the appropriate team member or designated alternate will weekly consult the National Oceanographic and Atmospheric Administration for weather forecasts. If weekly forecasts indicate potential for significant precipitation, the weather forecast will be closely monitored during the 48 hours preceding the event. Weather reports with precipitation data will be saved digitally, or printed and maintained with the SWPPP in MIP Attachment 1 “Weather Reports” to document precipitation totals and antecedent conditions.

5.3 MONITORING LOCATIONS

Monitoring locations are shown on the Site Map in Appendix A. Monitoring locations are described in Section 5.6.

Whenever changes in facility operations might affect the appropriateness of sampling locations, the sampling locations will be revised accordingly. All such revisions will be implemented as soon as feasible and the SWPPP amended.

5.4 SAMPLE COLLECTION AND VISUAL OBSERVATION EXCEPTIONS

Safety practices for sample collection will be in accordance with the District's internal health and safety guidelines. A summary of the safety requirements that apply to sampling personnel is provided below.

- Sampling shall not be conducted in the event that electrical storms, rapid waters, high winds, or other dangerous weather conditions pose an immediate threat to the safety of sampling personnel;
- Gloves shall be worn at all times when obtaining a water sample, and when handling sample bottles, both when empty and when full; and
- Precaution shall be taken before, during, and after a sampling event to prevent slipping on wet surfaces, which may include wearing slip-resistant footwear.

The collection of samples or conducting visual observations are not required under the following conditions:

- During dangerous weather conditions.
- Outside of scheduled site business hours.

Scheduled site business hours are presented in Section 2.2.

If monitoring, including visual observations and/or sample collection, of the facility is unsafe because of the dangerous conditions noted above then the appropriate team member will document the conditions for why an exception to performing the monitoring was necessary. The exception documentation will be filed in MIP Attachment 2, "Monitoring Records".

5.5 VISUAL OBSERVATION PROCEDURES

Visual monitoring includes observations of drainage areas, BMPs, and discharge locations.

- Observations of BMPs are required to identify and record BMPs that need maintenance to operate effectively, that have failed, or that could fail to operate as intended.
- Observations of the drainage areas are required to identify any spills, leaks, uncontrolled pollutant sources, and NSWDs.
- Observations of discharge locations are required to identify the presence of visible pollutants in storm water discharged from the facility.

Visual observations will be performed at least once every calendar month during dry conditions. Visual observations will also be performed during storm water sampling events when discharge is occurring.

5.5.1 Monthly Visual Observations

Monthly visual observations are necessary to document the presence, and identify the source, of any pollutants and non-storm water flows. These should consist of observations of the outdoor facility operations, BMPs, and NSWD observations.

In the event that monthly visual observations are not performed, an explanation shall be recorded by the responsible team member, and reported in the annual report.

5.5.1.1 Outdoor Facility Operations Observations

Observe potential sources of industrial pollutants including industrial equipment and storage areas, and outdoor industrial activities. Record observations of:

- Spills or leaks; and
- Uncontrolled pollutant sources.

5.5.1.2 BMP Observations

Observe BMPs to identify and record:

- BMPs that are properly implemented;
- BMPs that need maintenance to operate effectively;
- BMPs that have failed; or
- BMPs that could fail to operate as intended.

5.5.1.3 NSWD Observations

Observe each drainage area for the presence of or indications of prior unauthorized and authorized NSWDs. Record:

- Presence or evidence of any NSWD (authorized or unauthorized);
- Pollutant characteristics (floating and suspended material, sheen, discoloration, turbidity, odor, etc.); and
- Source of discharge.

5.5.2 Sampling Event Visual Observations

Sampling event visual observations evaluate the general appearance of the storm water as an indicator of potential pollutants. These observations will be conducted at the same time sampling occurs at the discharge locations identified in Section 5.6.2. At each discharge location where a sample is obtained, record observations of:

- Floating and suspended materials;
- Oil and grease;
- Discoloration;
- Turbidity;
- Odors; and
- Trash.

When pollutants are observed in the discharged storm water, follow-up observations of the drainage area will be conducted to identify the probable source of the pollutants.

In the event that a discharge location is not visually observed during the sampling event, the location of the discharge and reasoning for not obtaining observations must be recorded.

5.5.3 Visual Monitoring Procedures

Visual monitoring will be conducted by trained team members. The names of the site visual monitoring personnel are provided in Appendix C.

Visual observations will be documented on the *Visual Observation Log* (see MIP Attachment 3 "Example Forms"). Visual observations will be supplemented with a site-specific BMP inspection checklist. Photographs used to document observations will be referenced on the *Visual Observation Log* and maintained with the Monitoring Records in Attachment 2.

The completed logs and checklists will be kept in MIP Attachment 2 "Monitoring Records".

5.5.4 Visual Monitoring Follow-Up and Reporting

Correction of deficiencies identified by the observations, including required repairs or maintenance of BMPs, will be initiated and completed as soon as possible. Response actions will include the following:

- Report observations to the Pollution Prevention Team Leader or designated individual;
- Identify and implement appropriate response actions;
- Determine if SWPPP update is needed;
- Verify completion of response actions; and
- Document response actions.

If identified deficiencies require design changes, including additional BMPs, the implementation of changes will completed as soon as possible, and the SWPPP will be amended to reflect the changes.

BMP deficiencies identified in site observation reports and correction of deficiencies will be tracked on the *BMP Observation Checklist* and will be retained in MIP Attachment 3 "Example Forms". Results of visual monitoring must be summarized and reported in the Annual Report.

5.5.5 Visual Monitoring Locations

The observations identified in Sections 5.5.1 and 5.5.2 will be conducted at the locations identified in this section. There are two drainage areas in which all exposed industrial activities occur. This areas drain to discharge points 001 and 002, which are included as monitoring locations, as shown on the Site Map in Appendix A, and identified in Table 5.1.

Table 5.1 Visual Monitoring Locations

Drainage Area	Discharge Location	Visual Monitoring Location Description
A	001	Discharge point 001 is an inlet located on the south end of the facility, adjacent to the enclosded buildings.
C	003	Discharge point 003 is located in the southwest corner of the facility, immidiately before the property boundary. This location receives sheetflow across a pervious surface and has no structural conveyance.

5.6 SAMPLING AND ANALYSIS PROCEDURES

This section describes the methods and procedures that will be followed for storm water sampling and analysis. It contains information for sampling schedule, sampling locations, monitoring preparation, analytical constituents, sample collection, sample analysis, and data evaluation and reporting.

5.6.1 Sampling Schedule

Pursuant to General Permit requirements for Compliance Group Participants, storm water samples at each discharge location will be collected and analyzed from one (1) QSE within the first half of each reporting year (July 1 to December 31), and one (1) QSE within the second half of each reporting year (January 1 to June 30).

A QSE is a precipitation event that:

- Produces a discharge for at least one drainage area; and
- Is preceded by 48 hours with no discharge from any drainage area.

5.6.2 Sampling Locations

Sampling locations include all locations where storm water is discharged from industrial drainage areas. Discharge locations are shown on the Site Map in Appendix A, and are described in Table 5.2.

One discharge location has been identified on the project site for the collection of storm water runoff samples.

Table 5.2 Sample Locations

Sample Location Number	**Sample Location Description**	**Sample Location Latitude and Longitude** (Decimal Degrees)
001	Discharge point 001 is located at a storm drain inlet behind the enclosed garage. Samples will be taken where runoff enters the inlet.	33.11052, -117.009195
003	Discharge point 003 is located near the southwest corner of the facility. Samples will be taken from surface flow where it concentrates as it leaves the facility flowing south.	33.110530, -117.009509

5.6.3 Monitoring Preparation

Samples on the project site will be collected by designated sampling personnel.

An adequate stock of monitoring supplies and equipment for sampling will be available onsite prior to a sampling event. Monitoring supplies and equipment will be stored in a cool temperature environment that will not come into contact with rain or direct sunlight. Sampling personnel will be available to collect samples in accordance with the sampling schedule. Supplies maintained at the San Pasqual Union School District bus maintenance facility will include, but are not limited to: clean powder-free nitrile gloves; sample collection equipment; coolers; appropriate number and volume of sample containers; identification labels; re-sealing

storage bags; paper towels; personal rain gear; and *Sampling Field Log Sheets* and CoC forms, which are provided in MIP Attachment 3 "Example Forms". Ice will be obtained prior to sample collection, either onsite or at an outside retailer.

5.6.4 Analytical Constituents

Table 5.3 lists the constituents identified for sampling and analysis.

Table 5.3 Analytical Constituents

Constituent	Reason
pH	Basic required constituent
Oil and grease	Basic required constituent
Total Suspended Solids	Basic required constituent
Cadmium	Pollutant Source Assessment constituent
Copper	Pollutant Source Assessment constituent
Lead	Pollutant Source Assessment constituent
Nickel	Pollutant Source Assessment constituent
Zinc	Pollutant Source Assessment constituent
Gasoline[AK9]	Pollutant Source Assessment constituent
Diesel	Pollutant Source Assessment constituent
Methylene Blue Active Substances	Pollutant Source Assessment constituent

5.6.5 Sample Collection

Samples of discharge will be collected at the designated sampling locations shown on the Site Map in Appendix A. Samples from each discharge location will be collected within four (4) hours of:

- The start of the discharge; or
- The start of bus maintenance facility operations, if the QSE begins within the previous 12 hour period.

Sample collection is required during scheduled bus maintenance facility operating hours and when sampling conditions are safe.

Grab samples will be collected and preserved in accordance with the methods identified in Table 5.4, "Sample Collection, Preservation and Analysis for Water Quality Samples" provided in Section 5.6.6. Only team members properly trained in water quality sampling will collect samples.

The bus maintenance facility is not subject to Subchapter N Effluent Limitation Guidelines and New Performance Standards mandating pH analysis, and has not entered Level 1 Status for pH. Grab samples will be collected and analyzed for pH using wide range litmus paper. The pH analysis will be performed as soon as practicable, but no later than 15 minutes after sample collection.

Samples from different discharge locations will not be combined or composited prior to shipment to the analytical laboratory. Sample collection and handling requirements are described in Section 5.8.

5.6.6 Sample Analysis

Samples will be analyzed using the analytical methods identified in the Table 5.4.

Samples will be analyzed by:

Enviromatrix Analytical
4340 Viewridge Avenue,
San Diego, CA 92123

(858) 560-7717

Environmental Laboratory Accreditation Program Certification Number: 2564

Samples will be delivered to the laboratory by facility personnel.

Table 5.4 Sample Collection, Preservation and Analysis for Water Quality Samples

Constituent	Analytical Method	Sample Location(s)	Minimum Sample Volume	Sample Containers	Sample Preservation	Reporting Limit	Maximum Holding Time
pH	Litmus paper	001	N/A	N/A	N/A	0-14	15 minutes
Total Suspended Solids	SM 2540-D	001	100 ml	1- 250 ml polycarbonate	Unpreserved	20 mg/L	7 days
Oil and Grease	EPA 1664A	001	1 L	1- 1 L Amber glass jar	HCl to pH < 2	5 mg/L	28 days
Total Petroleum Hydrocarbons - Diesel	EPA 8015 B	001	40 ml	2- 40 ml VOA glass vials	HCl to pH < 2	500 µg/L	14 days
Total Petroleum Hydrocarbons - Gasoline[AK10]	EPA 8015 B	001	40 ml	2- 40 ml VOA glass vials	HCl to pH < 2	500 µg/L	14 days
Cadmium, Total	EPA 200.8	001	500 ml	1- 500 ml polycarbonate	HNO3 to pH < 2	0.001 mg/L	6 months
Copper, Total	EPA 200.8	001	500 ml	1- 500 ml polycarbonate	HNO3 to pH < 2	0.033 mg/L	6 months
Lead, Total	EPA 200.8	001	500 ml	1- 500 ml polycarbonate	HNO3 to pH < 2	0.016 mg/L	6 months
Nickel, Total	EPA 200.8	001	500 ml	1- 500 ml polycarbonate	HNO3 to pH < 2	0.007 mg/L	6 months
Zinc, Total	EPA 200.8	001	500 ml	1- 500 ml polycarbonate	HNO3 to pH < 2	0.456 mg/L	6 months
Methylene Blue Active Substances	5540 C-2000	001	200 ml	1- 250 ml polycarbonate	Unpreserved	0.5 mg/L	48 hours

Notes: ml = milliliter; mg = milligram; L = Liter; µg = microgram

5.6.7 Data Evaluation and Reporting

The designated member of the Pollution Prevention Team will complete an evaluation of the water quality sample analytical results.

All sampling and analytical results for all individual samples will be submitted via SMARTS within 30 days of obtaining all results for each sampling event.

The method detection limit will be provided when an analytical result from samples taken is reported by the laboratory as a "non-detect" or less than the method detection limit. A value of zero will not be reported.

Analytical results that are reported by the laboratory as below the minimum level (often referred to as the reporting limit) but above the method detection limit will be provided.

Reported analytical results will be averaged automatically by SMARTS at the end of the reporting year. For any calculations required by the General Permit, a value of zero shall be used for all effluent sampling analytical results that are reported by the laboratory as "non-detect" or less than the Method Detection Limit.

5.7 TRAINING OF SAMPLING PERSONNEL

Sampling personnel will be trained to collect, maintain, and ship samples in accordance with the General Permit and this SWPPP. Training records of designated sampling personnel are provided in Appendix D.

The primary and alternate storm water sampler receive storm water sampling training annually during the training session performed by the CGL.

5.8 SAMPLE COLLECTION AND HANDLING

5.8.1 Sample Collection

Samples will be collected at the designated monitoring locations shown on the Site Map and listed in the preceding sections. Samples will be collected, maintained and shipped in accordance with the requirements in the following sections.

Grab samples will be collected and preserved in accordance with the methods identified in preceding sections.

To maintain sample integrity and prevent cross-contamination, sample collection personnel will follow the protocols below.

- Collect samples (for laboratory analysis) only in analytical laboratory-provided sample containers;
- Wear clean, powder-free nitrile gloves when collecting samples;
- Change gloves whenever something not known to be clean has been touched;
- Change gloves between sample collection sites;
- Utilize uncontaminated sample bottles that are free of preservatives as the sample collection container;
- Do not smoke during sampling events;
- Never sample near a running vehicle;

- Do not park vehicles in the immediate sample collection area (even non-running vehicles);
- Do not eat or drink during sample collection; and
- Do not breathe, sneeze, or cough in the direction of an open sample container.

The most important aspect of grab sampling is to collect a sample that represents the entire runoff stream. Typically, samples are collected by dipping the collection container in the runoff flow paths and streams as noted below.

- For small streams and flow paths, simply dip the bottle facing upstream until full.
- For larger stream that can be safely accessed, collect a sample in the middle of the flow stream by directly dipping the mouth of the bottle. Once again making sure that the opening of the bottle is facing upstream as to avoid any contamination by the sampler.
- Avoid collecting samples from ponded, sluggish or stagnant water.
- Do not stand upstream of the sampling point within the flow path.

Note that, depending upon the specific analytical test, some containers may contain preservatives. These containers should never be dipped into the stream, but filled indirectly from a clean collection container.

5.8.2 Sample Handling

Field pH measurements must be conducted immediately using litmus paper, by placing a new, dry strip of litmus paper directly into the flow path, and immediately evaluating the color of the moistened strip against the comparator scale on the litmus paper case. Do not store pH samples for later measurement.

Samples for laboratory analysis must be handled as follows. Immediately following sample collection:

- Cap sample containers;
- Complete sample container labels;
- Place containers in a re-sealable storage bag;
- Place sample containers into an ice-chilled cooler;
- Document sample information on the Visual Observation Log for Sampling Events; and
- Complete the CoC.

All samples for laboratory analysis must be maintained between 0-6 degrees Celsius during delivery to the laboratory. Samples must be kept on ice from sample collection through delivery to the laboratory. Place samples inside coolers with ice. Make sure the sample bottles are well packaged to prevent breakage during transport, and secure cooler lids.

Transport samples that will be laboratory analyzed to the analytical laboratory right away. Hold times are measured from the time the sample is collected to the time the sample is analyzed. The General Permit requires that samples be received by the analytical laboratory within 48 hours of the physical sampling (unless required sooner by the analytical laboratory).

5.8.3 Sample Documentation Procedures

All original data documented on sample bottle identification labels, *Sampling Log*, and CoCs will be recorded using waterproof ink. If an error is made on a document, sampling personnel

will make corrections by lining through the error and entering the correct information. The erroneous information will not be obliterated. All corrections will be initialed and dated.

Sample documentation procedures include the following:

Sample Bottle Identification Labels: Sampling personnel will attach an identification label to each sample bottle. Sample identification will uniquely identify each sample location.

Field Log Sheets: Sampling personnel will complete the *Effluent Sampling Field Log Sheet* and *Receiving Water Sampling Field Log Sheet* for each sampling event, as appropriate.

Chain of Custody: Sampling personnel will complete the CoC for each sampling event for which samples are collected for laboratory analysis. The sampler will sign the CoC when the samples are turned over to the testing laboratory or courier.

5.9 QUALITY ASSURANCE AND QUALITY CONTROL

An effective Quality Assurance and Quality Control (QA/QC) plan will be implemented as part of the MIP to ensure that analytical data can be used with confidence. QA/QC procedures to be initiated include the following:

- Field logs;
- Clean sampling techniques;
- CoCs;
- QA/QC Samples; and
- Data verification.

Each of these procedures is discussed in more detail in the following sections.

5.9.1 Field Logs

The purpose of field logs is to record sampling information and field observations during monitoring that may explain any uncharacteristic analytical results. Sampling information to be included in the field log include the date and time of water quality sample collection, sampling personnel, and sample point identification numbers. Field observations should be noted in the field log for any abnormalities at the sampling location (color, odor, BMPs, etc.). Field measurements for pH should also be recorded in the field log. Observations are recorded on the Visual Observation Log for Sampling Events, included in MIP Attachment 3 “Example Forms”.

5.9.2 Clean Sampling Techniques

Clean sampling techniques involve the use of certified clean containers for sample collection and clean powder-free nitrile gloves during sample collection and handling. As discussed in Section 5.8, adoption of a clean sampling approach will minimize the chance of field contamination and questionable data results.

5.9.3 Chain of Custody

The sample CoC is an important documentation step that tracks samples from collection through analysis to ensure the validity of the sample. Sample CoC procedures include the following:

- Proper labeling of samples;
- Use of CoC forms for all samples; and

- Prompt sample delivery to the analytical laboratory.

Analytical laboratories usually provide CoC forms to be filled out for sample containers. An example CoC is included in MIP Attachment 3 "Example Forms".

5.9.4 Data Verification

After results are received from the analytical laboratory, the discharger will verify the data to ensure that it is complete, accurate, and the appropriate QA/QC requirements were met. Data must be verified as soon as the data reports are received. Data verification will include:

- Check the CoC and laboratory reports.
  Make sure all requested analyses were performed and all samples are accounted for in the reports.
- Check laboratory reports to make sure hold times were met and that the reporting levels meet or are lower than the reporting levels agreed to in the contract.
- Check data for outlier values and follow up with the laboratory.
  Occasionally typographical errors, unit reporting errors, or incomplete results are reported and should be easily detected. These errors need to be identified, clarified, and corrected quickly by the laboratory. Especially note data that is an order of magnitude or more different than similar locations, or is inconsistent with previous data from the same location.
- Check laboratory QA/QC results.
  The U.S. EPA establishes QA/QC checks and acceptable criteria for laboratory analyses. These data are typically reported along with the sample results. Evaluate the reported QA/QC data to check for contamination (method, field, and equipment blanks), precision (laboratory matrix spike duplicates), and accuracy (matrix spikes and laboratory control samples). When QA/QC checks are outside acceptable ranges, the laboratory must flag the data, and usually provides an explanation of the potential impact to the sample results.
- Check the data set for outlier values and accordingly, confirm results and re-analyze samples where appropriate.
  Sample re-analysis should only be undertaken when it appears that some part of the QA/QC resulted in a value out of the accepted range. Sample results may not be discounted unless the analytical laboratory identifies the required QA/QC criteria were not met and confirms this in writing.

Field data including pH measurements and visual observations must be verified as soon as the Visual Observation and Sampling Logs are received, typically at the end of the monitoring event. Field data verification will include:

- Check logs to make sure all required measurements were completed and appropriately documented;
- Check reported values that appear out of the typical range or inconsistent;
  Follow-up immediately to identify potential reporting or equipment problems, if appropriate, recalibrate equipment after sampling;
- Verify equipment calibrations;
- Review observations noted on the logs; and

- Review notations of any errors and actions taken to correct the equipment or recording errors.

5.10 RECORDS RETENTION

Records of storm water monitoring information and copies of reports (including Annual Reports) must be retained for a period of at least five (5) years from date of submittal or longer if required by the Regional Water Board.

Results of visual observations, field measurements, and laboratory analyses must be kept in the SWPPP along with CoCs, and other documentation related to the monitoring.

Records to be retained include:

- The date, place, and time of inspections, sampling, visual observations, and/or measurements, including precipitation;
- The individual(s) who performed the inspections, sampling, visual observation, and/or field measurements;
- The date and approximate time of field measurements and laboratory analyses;
- The individual(s) who performed the laboratory analyses;
- A summary of all analytical results, the method detection limits and reporting limits, and the analytical techniques or methods used;
- Weather reports;
- QA/QC records and results;
- Calibration records;
- Visual observation and sample collection exception records; and
- The records of any corrective actions and follow-up activities that resulted from analytical results, visual observations, or inspections.

MIP Attachment 1: Weather Reports

MIP Attachment 2: Monitoring Records

MIP Attachment 3: Example Forms

Visual Observation Log – Sampling Event
San Pasqual Union School District Bus Maintenance Facility

15305 Rockwood Road. Escondido, California 92027

Date of Observation: **Observer Name:**

Weather

Confirm Qualifying Storm Event (QSE; all must be true):

☐ No precipitation in the 48 hours prior to start of current storm

☐ Current storm began within the prior 12 hours.

Date and time storm began: ____/____/_____ ____:____ AM / PM *(circle one)*

☐ It is within the first 4 hours of the start of runoff **OR** the start of operational hours

Sampling Event Observations

Discharge Point 001

Floating Material	☐ No ☐ Yes	**Sample Time:**	
Suspended Material	☐ No ☐ Yes	**Record pH (Between 6-9):**	
Oil/Grease Sheen	☐ No ☐ Yes	*If "Yes" for any materials observed, or pH is less than 6 or more than 9, identify location, probable source, and action taken:*	
Discolorations	☐ No ☐ Yes		
Turbidity	☐ No ☐ Yes		
Odors	☐ No ☐ Yes		
Trash/Debris	☐ No ☐ Yes		
Other:_____	☐ No ☐ Yes		

Discharge Point 003

Floating Material	☐ No ☐ Yes	**Sample Time:**	
Suspended Material	☐ No ☐ Yes	**Record pH (Between 6-9):**	
Oil/Grease Sheen	☐ No ☐ Yes	*If "Yes" for any materials observed, or pH is less than 6 or more than 9, identify location, probable source, and action taken:*	
Discolorations	☐ No ☐ Yes		
Turbidity	☐ No ☐ Yes		
Odors	☐ No ☐ Yes		
Trash/Debris	☐ No ☐ Yes		
Other:_____	☐ No ☐ Yes		

Exception Documentation (explanation required if observation could not be conducted).

Visual Observation Log – Monthly
San Pasqual Union School District Bus Maintenance Facility

15305 Rockwood Road. Escondido, California 92027

Date of Observation:	**Observer Name:**
Weather	
Antecedent Conditions (last 48 hours): No precipitation	Current Weather: No precipitation

Outdoor Industrial Equipment and Storage Area Observations

BMPs	N/A	Adequate	Not Adequate	Comments *(note any deficiency and action taken)*
Good Housekeeping				
Site free of trash, debris, and accumulated sediment				
Paved areas free of materials tracked from industrial areas				
Dust-generating activities conducted in contained area(s)				
Discharge points free of trash, debris, & sediment				
Discharge points free of non-storm water discharges, or evidence thereof				
Wash water disposal procedures implemented				
Preventative Maintenance				
Bus maintenance and inspection schedules implemented				
Fuel hoses inspected every business day				
Hydraulic lift hoses and systems inspected prior to use				
Spill and Leak Prevention and Response				
Site free of spills and leaks				
Drip pans in use where needed				
Spill kit materials stocked and located near areas where spills may occur				
Material Handling and Waste Management				
Waste receptacles covered				
Cover provided for stored materials or equipment				
Liquid storage within intact containment				
Erosion and Sediment Controls				
Entrances/Exits/Perimeter of site stabilized				
Erosion control applications (e.g. fiber rolls, sandbags) are intact and in place				
Training , Quality Assurance, and Record Keeping				
Employee training up to date and documented				
Facility records up to date				
Other:				

CHAIN-OF-CUSTODY RECORD

– EnviroMatrix Analytical, Inc. ——

4340 Viewridge Ave., Ste. A - San Diego, CA 92123 - Phone (858) 560-7717 - Fax (858) 560-7763

EMA LOG #:

Client: San Diego County Office of Education

Attn: Joanne Branch

Samplers(s):

Address: 6401 Linda Vista Rd .

San Diego, CA 92111

Phone: (619)292-3833 Fax:

Email: jbranch@sdcoe.net; adorman@dmaxinc.com; jquenzer@dmaxinc.com

Billing Address: Same as above

Project ID: IGP Storm Water Monitoring

Project #: San Pasqual USD PO #:

Requested Analysis

ID #	Client Sample ID	Sample Date	Sample Time	Sample Matrix	Container # / Type	Oil & Grease ☐ 413.1 ☐ 413.2 ☒ 1664	8015 (TPH) ☒ Gas ☒ Diesel ☒ Ext	624/8260 (VOC) Full BTXE MTBE Oxy Nap	625 / 8270 (SVOC) ☐ PAH only	608 / 8081 (Organochlorine Pesticides)	608 / 8082 (Polychlorinated Biphenyls)	8141 (Organophosphorus Pesticides)	TBT (Organotin Compounds)	☐ pH ☐ EC ☒ TSS ☐ TDS	☐ Nitrate ☐ Nitrite ☐ TKN ☐ NH3	CAC Title 22/CAM17 Metals ☐ TTLC ☐ STLC	TCLP (RCRA) ☐ Metals ☐ Organics	(Cd) Cr (Cu) (Pb) (Ni) Ag (Zn) EPA 200.8	Coliform, ☐ Total (MTF) ☐ Fecal (MTF)	Colilert, T+E.Coli ☐ P/A ☐ Enumeration	Enterococcus, ☐ MTF ☐ Enterolert	Heterotrophic Plate Count (HPC)	☐ BOD ☐ COD ☐ Cyanide	MBAS				
1	001					X	X							X				X											
2	003					X								X				X						X					
3																													
4																													
5																													
6																													
7																													
8																													
9																													
10																													

Matrix Codes: A = Air, DW = Drinking Water, GW = Groundwater, SW = Storm Water
WW = Wastewater, S = Soil, SED = Sediment, SD = Solid, T = Tissue, O = Oil, L = Liquid

Shipped By: ☐ Courier ☐ UPS ☐ FedEx ☐ USPS ☐ Client Drop Off ☐ Other

[1]**Turn-Around-Time:** ☐ Same Day ☐ 1 day ☐ 2 day ☐ 3 day ☐ 4 day ☐ 5 day ☐ STD (7 day)

[1]**Reporting Requirements:** ☐ Fax ☐ PDF ☐ Excel ☐ Geotracker/EDF ☐ Hard Copy ☐ EDT

[1]**Sample Disposal:** ☐ By Laboratory ☐ [2]Return to Client: P/U or Delivery ☐ Archive

Sample Integrity

Correct Containers: Yes No N/A | Containers Properly Preseved: Yes No N/A

Custody Seals Intact: Yes No N/A | Temp @ Receipt:_____

COC/Labels Agree: Yes No N/A | Sampled By: Client EMA Autosampler

RELINQUISHED BY	DATE/TIME	RECEIVED BY
Signature		Signature
Print		Print
Company:		Company:
Signature		Signature
Print		Print
Company:		Company:
Signature		Signature
Print		Print
Company:		Company:

Project/Sample Comments:

[1]Additional costs may apply. Please note there is a $35 minimum charge for all clients.

[2]EMA reserves the right to return any samples that do not match our waste profile.

NOTE: By relinquishing samples to EMA, Inc., client agrees to pay for the services requested on this COC form and any additional analyses performed on this project. Payment for services is due within 30 days from date of invoice. Samples will be disposed of 7 days after report has been finalized unless otherwise noted. All work is subject to EMA's terms and conditions.

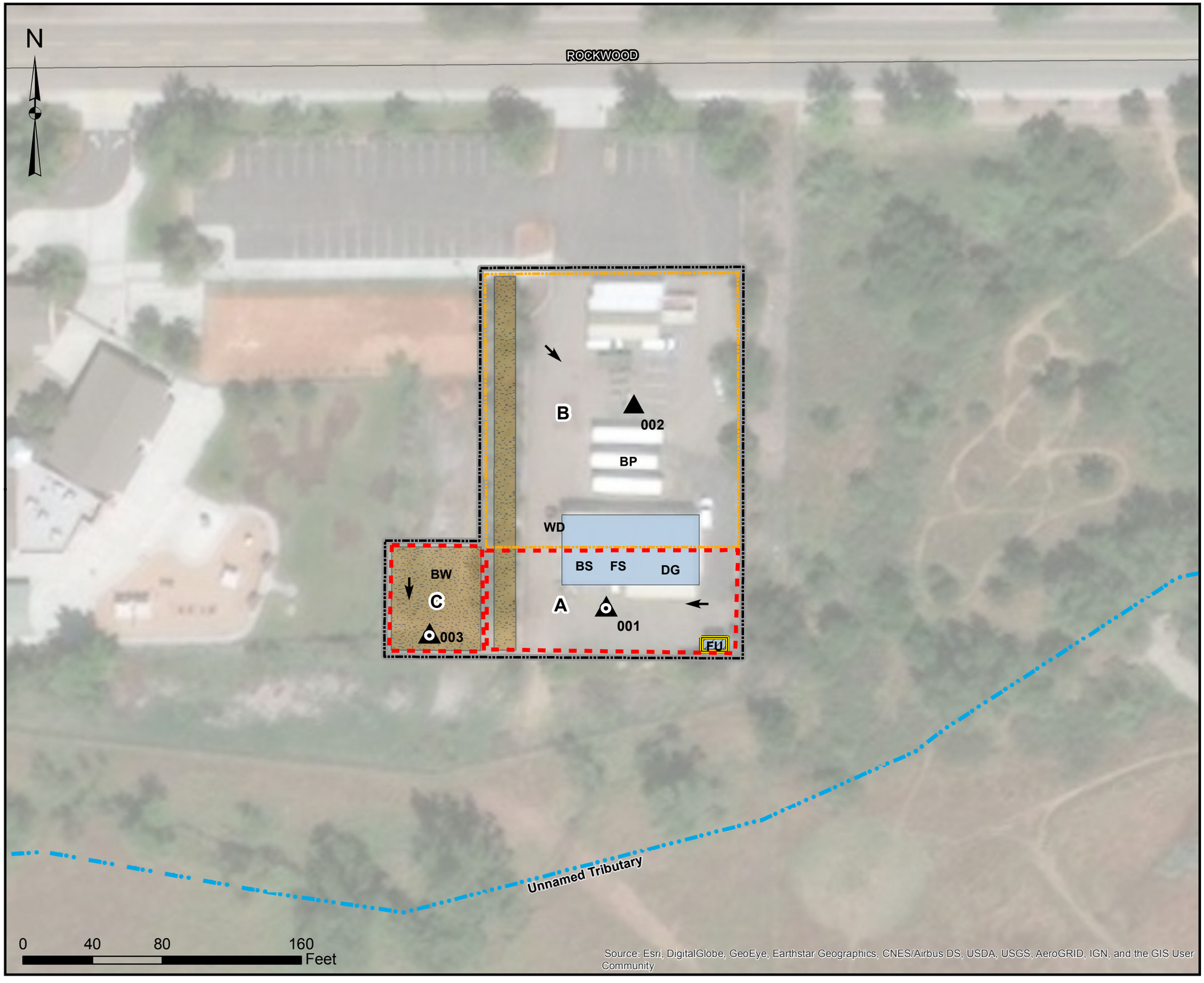
MIP Attachment 4: Other Regulatory Documents

Section 6 References

State Water Resources Control Board, 2014. State Water Resources Control Board Order No. 2014-0057-DWQ; National Pollutant Discharges Elimination System (NPDES) Order No. CAS000001: *NPDES General Permit for Storm Water Discharge Associated with Industrial Activities.* Available on-line at: http://www.waterboards.ca.gov/water_issues/programs/stormwater/industrial.shtml.

CASQA, 2014. *Stormwater Best Management Practice Handbook Portal: Industrial Commercial*, August 2014, www.casqa.org

Appendix A: Site Map



SAN PASQUAL UNIFIED SCHOOL DISTRICT

SCHOOL BUS MAINTENANCE FACILITY
SITE MAP

Legend

- Direction of Flow
- Monitoring Location
- Discharge Point
- Industrial Drainage Area
- Non-Industrial Drainage Area
- Facility Boundary
- Berm
- Covered Structure
- Enclosed Building/Structure
- Pervious Area
- Streams and Channels
- Roads
- BP — Bus Parking
- BS — Bus Servicing
- BW — Bus Washing
- DG — Dust Generating
- FS — Fluid Storage
- FU — Bus Fueling
- WD — Waste Dumpster

NOTE: All areas within the facility boundary are impervious, unless otherwise indicated.

DMAX ENGINEERING, INC.

Reference Scale: 1:400
Date: 5/28/2019
Revised By: KNR
Checked By: AMD

Appendix A

Appendix B: Permit Registration Documents

Permit Registration Documents included in this Appendix

Y/N	Permit Registration Document
Yes	Notice of Intent
Yes	Certification
Yes	Copy of Annual Fee Receipt
Yes	Site Map, see Appendix A

Appendix C: Responsible Parties

Pollution Prevention Team

San Pasqual Union School District

Task	Name, Title
Overall SWPPP Implementation Coordination	Ray Sifuentes, Director of Facilities and Maintenance
Visual Observations	Ray Sifuentes, Director of Facilities and Maintenance
Weather Tracking	Ray Sifuentes, Director of Facilities and Maintenance
Sample Collection	Ray Sifuentes, Director of Facilities and Maintenance
Annual Comprehensive Site Compliance Evaluation	Annika Dorman, Compliance Group Leader
Monitoring Implementation Alternate(s)	Steve Bostrom, Director of Operations
Training	Annika Dorman, Compliance Group Leader; Ray Sifuentes, Director of Facilities and Maintenance
Duly Authorized Representative(s)	Ray Sifuentes, Director of Facilities and Maintenance
Legally Responsible Person(s)	Rhonda Brown, Director of Finance

Identification of QISP

San Pasqual Union School District

The following QISP has been designated for this facility:

Annika Dorman, CPSWQ

D-Max Engineering, Inc.
7220 Trade St. Ste.119
San Diego, CA 92121

QISP Certification Number: 063
Certification Date: July 1, 2015

Certified Professional in Storm Water Quality, #0934
Certification Date: May 13, 2013

The following California Licensed Professional Engineer will be consulted as needed for certain aspects of any Technical Reports that may be necessary to comply with the General Permit:

Arsalan Dadkhah, Ph.D., PE, QSD/QSP, QISP

D-Max Engineering, Inc.
7220 Trade St. Ste.119
San Diego, CA 92121

QISP Certification Number: 025
Certification Date: July 1, 2015

Appendix D: Training Records

Trained Team Member Log

Storm Water Management Training Log and Documentation

San Pasqual Union School District

Storm Water Management Topic: (check as appropriate)

- ☐ Good Housekeeping
- ☐ Preventative Maintenance
- ☐ Spill and Leak Prevention and Response
- ☐ Material Handling and Waste Management
- ☐ Erosion and Sediment Controls
- ☐ Quality Assurance and Record Keeping
- ☐ Advanced BMPs
- ☐ Visual Monitoring
- ☐ Storm Water Sampling and Analysis

Specific Training Objective: _____

Location: _____ Date: ____/____/_____

Instructor Name:_____ Signature: _____

Course Length (hours): _____

Attendee Roster (Attach additional forms if necessary)

Name, title	Signature

As needed, add proof of external training (e.g., course completion certificates, credentials).

Appendix E: SWPPP Certifications

Legally Responsible Person

Approval and Certification of the Storm Water Pollution Prevention Plan.

San Pasqual Union School District

Waste Discharger Identification Number (WDID): 9 3 7 I 0 1 7 9 5 4

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

Legally Responsible Person Signature

Date

Legally Responsible Person Name

Amendment Log

Initial SWPPP Preparation Date: 5/30/2019

No.	Date	Page Nos.	Brief Description	Prepared By

SWPPP Amendment No. ____

Legally Responsible Person's Certification of the

Storm Water Pollution Prevention Plan Amendment

"This Storm Water Pollution Prevention Plan and attachments were prepared under my direction to meet the requirements of the National Pollutant Discharge Elimination System (NPDES) General Permit for Storm Water Discharges Associated with Industrial Activities (State Water Resources Control Board Order No. 2014-0057-DWQ; NPDES Order No. CAS000001)."

Legally Responsible Person Signature	Date

Legally Responsible Person Name

Appendix F:CASQA Stormwater BMP Handbook Portal: Industrial and Commercial Fact Sheets

Infiltration Trench TC-10

General Description

An infiltration trench is a gravel-filled trench that receives stormwater runoff. Runoff is stored in the void space between the stones and infiltrates through the bottom and sides of the trench into the soil matrix. Infiltration trenches promote stormwater infiltration, reduce discharge of stormwater to receiving waters and provide pollutant removal. Pretreatment using buffer strips, swales, or detention basins is important for limiting amounts of sediment, oil & grease, and trash and debris entering the trench which can clog and render the trench ineffective.

Inspection/Maintenance Considerations

Frequency of clogging is dependent on effectiveness of pretreatment, such as vegetated buffer strips (see TC-31), vegetated swales (see TC-30), and detention basins (see TC-22) at removing sediments. Generally, clogging is occurring if the trench shows signs of long surface ponding. Clogging often occurs within the surface layer and removing and replacing the top 2-3 inches of the surface media may improve performance. If the clogging is subsurface, as determined by observing an inspection well, then completely removing the media and rehabbing the trench is needed. Clogged infiltration trenches with surface standing water can become a nuisance due to mosquito breeding. Maintenance efforts associated with infiltration trenches should include frequent inspections to ensure that water infiltrates into the subsurface completely at a recommended infiltration rate of 96 hours or less to prevent creating mosquito and other vector habitats.

Advanced BMPs Covered

Maintenance Concerns

- *Accumulation of metals*
- *Clogged soil or outlet structures*
- *Vegetation/landscape maintenance*

Targeted Constituents

Sediment	■✱
Nutrients	■
Trash	■✱
Metals	■
Bacteria	■
Oil and Grease	■✱
Organics	■

Legend ***(Removal Effectiveness)***

● Low ■ High ▲ Medium
✱ Requires Pretreatment

Note: The removal effectiveness ratings shown in the table are for properly designed, sited, and maintained BMPs; some configurations will have variations in pollutant effectiveness.

CASQA
CALIFORNIA STORMWATER QUALITY ASSOCIATION®

Inspection Activities	Suggested Frequency
☐ Inspect after major storms for the first few months to ensure proper functioning. Drain times should be observed to confirm that the designed drain time has been achieved. ☐ Inspect for upslope or adjacent contributing sediment sources and ensure that pretreatment systems are in place.	After construction and semi-annually (beginning and end of rainy season)
☐ Inspect facility for signs of wetness or damage to structures, signs of petroleum hydrocarbon contamination, standing water, trash and debris, sediment accumulation, slope stability, standing water, and material buildup. ☐ Check for standing water or, if available, check observation wells following 3 days of dry weather to ensure proper drain time. ☐ Inspect pretreatment devices and diversion structures for damage, sediment buildup, and structural damage.	Semi-annual and after major storm events
☐ Trenches with filter fabric should be inspected for sediment deposits by removing a small section of the top layer. If inspection indicates that the trench is partially or completely clogged, it should be restored to its design condition.	Annual
Maintenance Activities	**Suggested Frequency**
☐ Repair undercut and eroded areas at inflow and outflow structures. ☐ Remove sediment, debris, and oil/grease from pretreatment devices, forebays, inlet/outlet structures, overflow spillway, and trenches as necessary.	Standard maintenance (as needed)
☐ Remove trash, debris, grass clippings, trees, and other large vegetation from the trench perimeter and dispose of properly. ☐ Mow and trim vegetation to prevent establishment of woody vegetation, and for aesthetic and vector reasons.	Semi-annual, more often as needed
☐ Remove accumulated sediment from the surface of the trench. Replace first layer of aggregate and filter fabric if clogging appears only to be at the surface. ☐ Clean trench when loss of infiltrative capacity is observed. If drawdown time is observed to have increased significantly over the design drawdown time, removal of sediment may be necessary. This is an expensive maintenance activity and the need for it can be minimized through prevention of upstream erosion.	Annual
☐ Monitor ongoing effectiveness and determine if another BMP type or additional pretreatment could improve long-term performance. A qualified designer with knowledge of local soils and BMP design should be consulted in order to make this determination.	Every 5 years

☐ Total rehabilitation of the trench should be conducted to maintain storage capacity within 2/3 of the design treatment volume and 96-hour exfiltration rate limit. ☐ Rehabilitation of the trench should be performed under the direction of a qualified designer with knowledge of local soils and BMP design. General steps for trench rehabilitation include: ✓ Trench walls should be excavated to expose clean soil. ✓ All of the stone aggregate must be removed. Filter fabric may need to be removed from the sides and bottom ✓ Accumulated sediment should be stripped from the trench bottom. At this point the bottom may be scarified or tilled to help induce infiltration. New fabric and clean stone aggregate should be refilled.	Upon reaching target thresholds

Most of the maintenance should be concentrated on the pretreatment practices, such as buffer strips and swales upstream of the trench to limit the amount of sediment that reaches the infiltration trench. Regular inspection should determine if the sediment removal structures require routine maintenance. Infiltration trenches should not be put into operation until the upstream tributary area is stabilized.

Additional Information

Infiltration practices have historically had a high rate of failure compared to other stormwater management practices. One study conducted in Prince George's County, Maryland (Galli, 1992), revealed that less than half of the infiltration trenches investigated (of about 50) were still functioning properly, and less than one-third still functioned properly after 5 years. Many of these practices, however, did not incorporate advanced pretreatment. By carefully selecting the location and improving the design features of infiltration practices, their performance should improve.

It is absolutely critical that settleable particles and floatable materials be removed from runoff water before it enters the infiltration trench. The trench will clog and become nonfunctional if excessive particulate matter is allowed to enter the trench.

Special considerations are required for infiltration trenches to be effective in cold climates – refer to the Stormwater Managers Resource Center for more information.

References

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Infiltration Basin TC-11

General Description

An infiltration basin is a shallow impoundment that is designed to infiltrate stormwater. Infiltration basins store stormwater runoff until it gradually exfiltrates into the underlying soil. Pollutant removal occurs through the infiltration of runoff and the adsorption of pollutants into the soil and vegetation. Additional benefits include:

- Reduced runoff volume and attenuation of peak flows, and
- Facilitated groundwater recharge thus helping to maintain low flows in stream systems.

Inspection/Maintenance Considerations

The use and regular maintenance of pretreatment BMPs will significantly minimize maintenance requirements for the basin. Installing vegetated swales or a sediment forebay upstream from the infiltration basin can provide effective pretreatment and reduce maintenance.

Spill response procedures and controls should be implemented to prevent spills from reaching the infiltration system. This BMP may require groundwater monitoring, and basins cannot be put into operation until the upstream tributary area is stabilized.

Advanced BMPs Covered

Maintenance Concerns

- *Vector Control*
- *Clogged soil or outlet structures*
- *Vegetation/Landscape Maintenance*
- *Groundwater contamination*
- *Accumulation of metals*
- *Aesthetics*

Targeted Constituents

Sediment	■
Nutrients	■
Trash	■
Metals	■
Bacteria	■
Oil and Grease	■
Organics	■

Legend (Removal Effectiveness)

● Low ▲ Medium ■ High

✱ Requires Pretreatment

Note: The removal effectiveness ratings shown in the table are for properly designed, sited, and maintained BMPs; some configurations will have variations in pollutant effectiveness.

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Inspection Activities	Suggested Frequency
☐ Observe drain time for a storm after completion or modification of the facility to confirm that the desired drain time has been obtained. ☐ Newly established vegetation should be inspected several times to determine if any landscape maintenance (reseeding, irrigation, etc.) is necessary. ☐ Inspect for upslope or adjacent contributing sediment sources and ensure that pretreatment systems are in place.	Post construction and semi-annually (beginning and end of rainy season)
☐ Inspect for the following issues: differential accumulation of sediment, signs of wetness or damage to structures, erosion of the basin floor, dead or dying grass on the bottom, condition of riprap, drain time, signs of petroleum hydrocarbon contamination, standing water, trash and debris, sediment accumulation, slope stability, pretreatment device condition	Semi-annually and after extreme events
Maintenance Activities	**Suggested Frequency**
☐ Factors responsible for clogging should be repaired immediately.	Immediately
☐ Remove invasive weeds once monthly during the first two growing seasons.	Monthly during growing season
☐ Stabilize eroded banks with erosion control mat or mulch and revegetate. ☐ Repair undercut and eroded areas at inflow and outflow structures. ☐ Maintain access to the basin for regular maintenance activities. ☐ Mow as appropriate for vegetative cover species. ☐ Monitor health of vegetation and replace as necessary. ☐ Control mosquitoes as necessary. ☐ Remove litter and debris from infiltration basin area as required. ☐ Trim vegetation to prevent establishment of woody vegetation that decreases storage volume.	Standard maintenance (as needed)
☐ Mow and remove grass clippings, litter, and debris. ☐ Replant eroded or barren spots to prevent erosion and accumulation of sediment.	Semi-annual
☐ Scrape bottom and remove sediment when accumulated sediment reduces original infiltration rate by 25-50%. Restore original cross-section and infiltration rate. Properly dispose of sediment. ☐ Seed or sod to restore ground cover. ☐ Disc or otherwise aerate bottom. ☐ Dethatch basin bottom.	3-5 year maintenance

If there are actual signs of clogging or significant loss of infiltrative capacity the following maintenance activities should be considered:

- ☐ Mechanically de-thatching and/or aerating the top soils along the sides and bottom of the basin.
- ☐ Tilling or dicing to scarify the bottom of the basin

These activities should be on an "as-needed" rather than on a routine basis. Always remove deposited sediments before scarification, and use a hand-guided rotary tiller, if possible, or a disc harrow pulled by a light tractor.

Clogged infiltration basins with surface standing water can become a breeding area for mosquitoes and midges. Maintenance efforts associated with infiltration basins should include frequent inspections to ensure that water infiltrates into the subsurface completely (recommended infiltration rate of 96 hours or less) and that vegetation is carefully managed to prevent creating mosquito and other vector habitats.

Additional Information

In most cases, surface sediment removed from an infiltration basin during periodic maintenance to restore capacity does not contain toxic materials (e/g metals, oil and grease, or organics) at levels posing a hazardous concern. Studies to date indicate that pond sediments are generally below toxicity limits and can be safely landfilled or disposed onsite. Onsite sediment disposal is always preferable (if local authorities permit) as long as the sediments are deposited away from the perimeter to prevent their reentry into the basin. Sediments should be tested for toxic materials in compliance with current landfill requirements and disposed of properly.

Maintenance activities should use lightweight equipment (e.g. bobcat), which will not compact the underlying soil to remove the top layer of sediment. The remaining soil should be tilled and revegetated as soon as possible.

Sediment removal within the basin should be performed when the sediment is dry enough so that it is cracked and readily separates from the basin floor. This minimizes intermixing of the finer sediment with underlying coarser material on the basin floor.

Special maintenance considerations are required maintain infiltration basins effectiveness in cold climates. Treating runoff containing salt-based deicers in an infiltration basin may reduce soil fertility cause vegetation to fail. Incorporating mulch into the soil can help to mitigate this problem. Infiltration basins should not be used to store snow plowed from highways or parking lots. The sand in this snow can clog the basin. In addition, the chlorides and other pollutants can contaminate the groundwater.

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Harvest and Reuse TC-12

General Description

Harvest and reuse refers to the capture of stormwater runoff in a holding pond or vault and subsequent use of the captured volume for irrigation of landscape or natural pervious areas. This technology is very effective as a stormwater quality practice in that, for the captured water quality volume, it provides virtually no discharge to receiving waters thereby greatly reducing pollutant loads from industrial sources.

This technology mimics natural undeveloped watershed conditions wherein the vast majority of the rainfall volume during smaller rainfall events is infiltrated through the soil profile. Their main advantage over other infiltration technologies is the use of an irrigation system to spread the runoff over a larger area for infiltration and/or to satisfy evapotranspiration demands of vegetation including ornamental vegetation on the site. This allows them to be used in areas with low permeability soils.

Stormwater harvesting typically utilizes rain barrels or cisterns.

- Rain barrels are small containers, typically ranging from 50 to 100 gallons installed adjacent to individual downspouts to capture rainwater runoff from roofs. The stored water can be used for irrigation, vehicle washing, or other non-potable applications. Rain barrels are inexpensive, easy to install and maintain, and well suited to small-scale sites.
- Cisterns are typically much larger than rain barrels, ranging from 1,000 gallons for small installations to millions of gallons beneath large facilities. They can be installed above or below ground, or even on the roof, depending upon site conditions.

Advanced BMPs Covered

Maintenance Concerns

- *Sediment Accumulation*
- *Mechanical malfunction*
- *Vector Control*

Targeted Constituents

Sediment	■✱
Nutrients	■✱
Trash	■✱
Metals	■✱
Bacteria	■✱
Oil and Grease	■✱
Organics	■✱

Legend (Removal Effectiveness)

● Low ■ High ▲ Medium

✱ Requires Pretreatment

Note: The removal effectiveness ratings shown in the table are for properly designed, sited, and maintained BMPs; some configurations will have variations in pollutant effectiveness.

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The use of harvested rainwater for irrigation may utilize a simple gravity system for small systems or use pumps for larger systems. The pump and wet well should be automated with a rainfall sensor to provide irrigation only during periods when required infiltration rates can be realized.

Inspection Activities	Suggested Frequency
☐ The irrigation system should be inspected and tested (or observed while in operation) to verify proper operation regularly during periods of use. ☐ Any leaks, broken spray heads, or other malfunctions with the irrigation system should be repaired immediately.	Frequently (3-6 times per year)
☐ Inspect gutter systems, pipes, and storage facilities for accumulated sediment and debris and remove as necessary. ☐ Inspect rain barrels, cisterns, and other water storage containers to ensure they remain mosquito-proof. Repair damaged or missing screens or other mosquito-preventive measures. Contact the local mosquito and vector control agency if mosquito breeding is observed or suspected.	Semi-annually (beginning and end of rainy season)
Maintenance Activities	**Suggested Frequency**
☐ The upper stage, side slopes, and bottom of a retention basin should be mowed regularly to control weeds and discourage woody growth that reduces storage volumes.	Standard maintenance (as needed)
☐ Sediment must be removed from inlet structure/sediment forebay, and from around the sump area at least 2 times annually or when depth reaches 3 inches. When sediment in other areas of the basin fills the volume allocated for sediment accumulation, all sediment should be removed and disposed of properly. ☐ Grass areas in and around basins must be mowed at least twice annually to limit vegetation height to 18 inches. More frequent mowing to maintain aesthetic appeal may be necessary in landscaped areas. When mowing is performed, a mulching mower should be used, or grass clippings should be caught and removed. ☐ Debris and litter will accumulate near the basin pump and should be removed during regular mowing operations and inspections. Particular attention should be paid to floating debris that can eventually clog the irrigation system. ☐ For underground cisterns, ensure that manhole is accessible, operational, and secure.	Semi-annual
☐ The pond side slopes and embankment may periodically suffer from slumping and erosion, although this should not occur often if the soils are properly compacted during construction. Re-grading and re-vegetation may be required to correct the problems.	Infrequently

Inspection/Maintenance Considerations

Pollutant removal rates are estimated to be nearly 100% for all pollutants in the captured and irrigated stormwater volume. However, relatively frequent inspection and maintenance is necessary to verify proper operation of these facilities and to prevent accumulated sediment and debris from clogging conveyance lines. Some maintenance concerns are specific to the type of irrigation system or practice used.

Additional Information

Rain barrels, cisterns, sumps, and vaults that store water can become a nuisance due to mosquito and other vector breeding. Preventing mosquito access to standing water in rain barrels and above-ground cisterns can often be achieved by sealing openings with stainless steel wire mesh (1/16" openings or less). Sealing below-ground storage systems against mosquitoes can be more difficult depending on the design and the number of potential entry points. Open storage structures such as ponds and retention basins (see appropriate fact sheets) will require routine preventative maintenance plans to minimize mosquito production. Certain systems may require routine inspection and treatment by local mosquito and vector control agencies.

Special considerations are required for harvest and reuse to be effective in cold climates. Underground or indoor systems are more appropriate for year-round use, but these systems are more difficult to design, construct, and maintain.

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Wet Pond TC-20

General Description

Wet ponds (a.k.a. stormwater ponds, retention ponds, extended detention wet ponds) are constructed basins that have a permanent pool of water throughout the year (or at least throughout the wet season). The primary pollutant removal mechanism is settling while stormwater is retained in the wet pool. The basin supports plant species that provide pollutant removal by biological processes. This vegetation may also help reduce erosion of side slopes and trap sediments. Wet ponds differ from constructed wetlands primarily in having a greater average depth.

Wet ponds are an effective BMP in locations that have near-continuous inflows. While there are several different versions of the wet pond design, the most common modification is the extended detention wet pond, where storage is provided above the permanent pool in order to detain stormwater runoff and promote settling.

Inspection/Maintenance Considerations

In order to maintain the pond's design capacity, sediment must be removed occasionally and adequate resources must be committed to properly maintain peripheral aquatic vegetation, control vector production, and to maintain effective pool volume. Wet ponds can become a nuisance due to mosquito and midge breeding unless carefully designed and maintained. A proactive and routine preventative maintenance plan (which can vary according to location) is crucial to minimizing vector habitat. A vegetated buffer should be preserved around the pond to protect the banks from erosion and provide some pollutant removal before runoff enters the pond by overland flow.

Advanced BMPs Covered

Maintenance Concerns

- *Vegetation/Landscape Maintenance*
- *Endangered Species Habitat Creation*
- *Sediment and Trash Removal*
- *Bank Erosion*
- *Clogging of the Outlet*
- *Invasive/exotic Plant Species*
- *Vector Control*

Targeted Constituents

Sediment	■✱
Nutrients	▲
Trash	■✱
Metals	■
Bacteria	■
Oil and Grease	■✱
Organics	■

Legend (Removal Effectiveness)

● Low ▲ Medium ■ High

✱ Requires Pretreatment

Note: The removal effectiveness ratings shown in the table are for properly designed, sited, and maintained BMPs; some configurations will have variations in pollutant effectiveness.

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Inspection Activities	Suggested Frequency
☐ Inspect after several storm events to confirm that the drainage system functions and bank stability and vegetation growth are sufficient.	Post construction
☐ Inspect for invasive vegetation, trash and debris, clogging of inlet/outlet structures, excessive erosion, sediment buildup in basin or outlet, cracking or settling of the dam, bank stability, tree growth on dam or embankment, vigor and density of the grass turf on the basin side slopes and floor, differential settlement, leakage, subsidence, damage to the emergency spillway, mechanical component condition, and graffiti.	Semi-annual, after significant storms, or more frequent as needed
☐ Inspect condition of inlet and outlet structures, pipes, sediment forebays, basin, and upstream and downstream channel conditions. Monitor drain times, and check for algal growth, signs of pollution such as oil sheens, discolored water, or unpleasant odors, and signs of flooding. ☐ During inspections, note changes to the wet pond or the contributing watershed as these may affect basin performance.	Annual inspection
Maintenance Activities	**Suggested Frequency**
☐ Where permitted by the Department of Fish and Wildlife or other agency regulations, stock wet ponds regularly with mosquito fish (*Gambusia* spp.) to enhance natural mosquito and midge control and regularly maintain emergent and shoreline vegetation to provide access for vector inspectors and facilitate vector control if needed.	Post construction
☐ Coordinate with the local mosquito and vector control agency to control mosquitos and midges, if necessary. ☐ Remove sediment from outlet structure. Dispose of properly. ☐ Remove accumulated trash and debris in the basin, inlet/outlet structures, side slopes, and collection system as required. ☐ Repair undercut areas and erosion to banks and basin.	Semi-annual, after significant storm events
☐ Maintain protected vegetated buffer around pond. Maintain vegetation in and around basin to prevent any erosion or aesthetic problems. Minimize use of fertilizers and pesticides. Reseed if necessary. ☐ Manage and harvest wetland plants. ☐ Perform structural repair or replacement, as needed.	Annual maintenance (if needed)
☐ Remove sediment from the forebay and regrade when the accumulated sediment volume exceeds 10-20% of the forebay volume. Clean in early spring so vegetation damaged during cleaning has time to re-establish.	5- to 7-year maintenance
☐ Remove sediment when the permanent pool volume has become reduced significantly (sediment accumulation exceeds 25% of design depth), resuspension is observed, or the pond becomes eutrophic.	>5 year maintenance

Additional Information

In most cases, surface sediment removed from a wet pond during periodic maintenance to restore capacity does not contain toxic materials (e/g metals, oil and grease, or organics) at levels posing a hazardous concern. Studies to date indicate that pond sediments are generally below toxicity limits and can be safely landfilled or disposed onsite. Onsite sediment disposal is always preferable (if local authorities permit) as long

as the sediments are deposited away from the perimeter to prevent their reentry into the basin. Sediments should be tested for toxic materials in compliance with current landfill disposal requirements. Sediments containing high levels of pollutants should be disposed of properly.

Light equipment, which will not compact the underlying soil, should be used to remove the top layer of sediment. The remaining soil should be tilled and revegetated as soon as possible.

Wet ponds require a regular source of base flow if water levels are to be maintained. If base flow is insufficient during summer months, supplemental water may be necessary to maintain water levels.

Special considerations are required for wet ponds to be effective in cold climates – refer to the Stormwater Managers Resource Center for more information.

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Constructed Wetland TC-21

General Description

Constructed wetlands are constructed basins that have a permanent pool of water throughout the year (or at least throughout the wet season) and differ from wet ponds primarily in being shallower and having greater vegetation coverage. Stormwater runoff is stored in shallow vegetated pools with saturated soils that are designed to provide the necessary depth, frequency, and duration of inundation in order to support wetland vegetation.

Constructed wetlands are among the most effective stormwater practices in terms of pollutant removal and they also offer aesthetic value. However, they are highly specialized, and sites implementing this BMP should consult the designer for operations and maintenance guidance.

As stormwater runoff flows through the wetland, pollutant removal is achieved through microbial transformation, plant uptake, settling, and adsorption. Pretreatment is critical to the function of constructed wetlands. In addition to a forebay, other BMPs such as vegetated swales or buffer strips (see applicable fact sheets) will help filter stormwater before it enters a stormwater wetland. This can reduce overall maintenance needs of the wetland itself.

A distinction should be made between using a constructed wetland for stormwater management and diverting stormwater into a natural wetland. The latter practice is prohibited and in all circumstances, natural wetlands should be protected from the adverse effects of development, including impacts from increased storm water runoff. This is especially important because natural wetlands provide storm water and flood control benefits on a regional scale.

Advanced BMPs Covered

Maintenance Concerns

- *Vegetation/Landscape Maintenance*
- *Endangered Species Habitat Creation*
- *Sediment and Trash Removal*
- *Bank Erosion*
- *Clogging of the Outlet*
- *Invasive/exotic Plant Species*
- *Vector Control*
- *Pollutant Release Potential*

Targeted Constituents

Sediment	■✱
Nutrients	▲
Trash	■✱
Metals	■
Bacteria	■
Oil and Grease	■✱
Organics	■

Legend (Removal Effectiveness)

● Low ▲ Medium ■ High

✱ Requires Pretreatment

Note: The removal effectiveness ratings shown in the table are for properly designed, sited, and maintained BMPs; some configurations will have variations in pollutant effectiveness.

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Inspection/Maintenance Considerations

Wetlands need a continuous base flow to maintain aquatic plants. Salts and scum can accumulate in wetlands and, unless properly designed and managed, can be flushed out during larger storms. Wetlands can also release nutrients during the non-growing season. Wetlands can become a breeding area for mosquitoes and midges unless carefully designed and maintained. A proactive and routine preventative maintenance plan (which can vary according to location) is crucial to minimizing vector habitat.

To maximize wetland removal of pollutants, the vegetation must be harvested frequently. Harvesting is particularly important with respect to the removal of phosphorus and metals, and less so for removal of nitrogen. Harvesting should occur by mid-summer before the plants begin to transfer phosphorus from the aboveground foliage to subsurface roots, or begin to lose metals that desorb during plant die off. It is also desirable that every few years the entire plant mass including roots be harvested. This is because the belowground biomass constitutes a significant reservoir of the nutrients and metals that are removed from the stormwater by plants.

Wetlands should incorporate design features to make sediment cleanout of both the forebay and the main body of the wetland easier. Wetlands should have direct maintenance access to the forebay for sediment removal, and the main body of the wetland should have a drain so that it can be drawn down for infrequent dredging and vegetation harvesting.

Closely monitor the wetland plant community, both during the growing season and, if needed, during the dry season, to assure healthy growth of desired plants. Remove exotic or nuisance species as soon as they appear to limit their establishment and areal extent. Thin or transplant plants from areas where they are growing densely and use them to further establishment or growth in areas with less vigorous plant growth.

Inspection Activities	Suggested Frequency
☐ Inspect after several storm events for bank stability, vegetation growth, drainage system functioning, and structural damage.	After construction
☐ Inspect for invasive vegetation, differential settlement, cracking; erosion, leakage, or tree growth on the embankment; the condition of the riprap in the inlet, outlet, and pilot channels; sediment accumulation in the basin; clogging of outlet; and the vigor and density of the vegetation on the basin side slopes and floor. Correct observed problems as necessary.	Semi-annual inspection
☐ Inspect for damage to the embankment and inlet/outlet structures. Repair as necessary. ☐ Note signs of hydrocarbon buildup such as floating oil on water surface. ☐ Monitor for sediment accumulation in the facility and forebay. ☐ Examine inlet and outlet devices to ensure they are free of debris and are operational.	Annual inspection
Maintenance Activities	**Suggested Frequency**
☐ Replace wetland vegetation to maintain at least 50% surface area coverage in wetland plants after the second growing season.	One-time
☐ Repair undercut areas, erosion to banks, and bottom as required. ☐ Where permitted by the Department of Fish and Wildlife or other agency regulations, stock constructed wetlands regularly with mosquito fish (*Gambusia* spp.) to enhance natural mosquito and midge control and regularly maintain emergent and shoreline vegetation to provide access for vector inspections and facilitate vector control if needed. ☐ Coordinate with the local mosquito and vector control agency to control mosquitos and midges, if necessary.	As needed maintenance
☐ Clean and remove debris from inlet and outlet structures. ☐ Remove litter and debris from banks, basin bottom, trash racks, outlet structures, and valves as required.	Frequent (3-4 times/year) maintenance
☐ Supplement wetland plants if a significant portion have not established (at least 50% of the surface area). ☐ Remove nuisance plant species.	Annual maintenance (if needed)
☐ Clean forebay to avoid accumulation in main wetland area to minimize when the main wetland area needs to be cleaned.	5- to 7-year maintenance
☐ Harvest plant species if vegetation becomes too thick causing flow backup and flooding. More frequent plant harvesting may be required by local vector control agencies.	5- to 7-year maintenance (or more frequently as required)
☐ Monitor sediment accumulations, and remove sediment when the accumulated sediment volume exceeds 10-20% of the basin volume, plants are "choked" with sediment, or the wetland becomes eutrophic. It is suggested that the main area be cleaned one half at a time with at least one growing season in between cleanings. This will help to preserve the vegetation and enable the wetland to recover more quickly from the cleaning.	As needed maintenance (20- to 50-years)

Additional Information

Proper maintenance is of primary importance for constructed wetlands to continue to function as originally designed. The designer of the constructed wetland must be consulted to develop a site-specific maintenance plan outlining the schedule and scope of required maintenance operations.

Special considerations are required for constructed wetlands to be effective in cold climates – refer to the Stormwater Managers Resource Center for more information.

References

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Extended Detention Basin TC-22

General Description

Dry extended detention ponds (a.k.a. dry ponds, extended detention basins, detention ponds, extended detention ponds) are basins whose outlets have been designed to draw down the stormwater runoff from a water quality design storm for some minimum time (e.g., 48 hours) to allow particles and associated pollutants to settle. Unlike wet ponds, these facilities do not have a large permanent pool. They can also be used to provide flood control by including additional flood detention storage. Considerable stormwater volume reduction can also occur, depending on the infiltration capacity of the subsoil.

Inspection/Maintenance Considerations

Inspections should be conducted semi-annually and after significant storm events to identify potential problems early. Most maintenance efforts will need to be directed toward vegetation management and vector control, which may focus on basic housekeeping practices such as removal of debris accumulations and vegetation management to ensure that the basin dewaters completely (recommended 48 hour residence time or less) to prevent creating mosquito and other vector habitats.

If infiltration is desired for stormwater reduction, the following additional maintenance may be required to maintain infiltrative capacity:

- Mechanically de-thatching and/or aerating the top soils along the sides and bottom of the basin;
- Tilling or dicing to scarify the bottom of the basin; and
- Maintaining adequate vegetative cover.

Advanced BMPs Covered

Maintenance Concerns

- *Accumulation of Metals and Toxics*
- *Clogged Soil Outlet Structures*
- *Vegetation/Landscape Maintenance*
- *Erosion*
- *Vector Control*

Targeted Constituents

Sediment	▲
Nutrients	●
Trash	■
Metals	▲
Bacteria	▲
Oil and Grease	▲
Organics	▲

Legend (Removal Effectiveness)

● Low ■ High ▲ Medium

✱ Requires Pretreatment

Note: The removal effectiveness ratings shown in the table are for properly designed, sited, and maintained BMPs; some configurations will have variations in pollutant effectiveness.

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Extended Detention Basin TC-22

Refer to TC-11 Infiltration Basin for further information.

Inspection Activities	Suggested Frequency
☐ Inspect after several storm events for bank stability, vegetation growth, and to determine if the desired residence time has been achieved. ☐ Inspect outlet structure for evidence of clogging or outflow release velocities that are greater than design flow.	Post construction
☐ Inspect for the following issues: differential settlement, cracking, erosion of pond banks or bottom, leakage, tree growth on the embankment, the condition of the riprap in the inlet, clogging of outlet and pilot channels, standing water, slope stability, presence of burrows, sediment accumulation in the basin, forebay, and outlet structures, trash and debris, and the vigor and density of vegetation on the basin side slopes and floor.	Semi-annual, after significant storms, or more frequent
☐ Inspect for the following issues: subsidence, damage to the emergency spillway, inadequacy of the inlet/outlet channel erosion control measures, changes in the condition of the pilot channel, accumulated sediment volume, and semi-annual inspection items.	Annual
☐ During inspections, changes to the extended storage pond or the contributing watershed should be noted, as these may affect basin performance.	Annual inspection
Maintenance Activities	**Suggested Frequency**
☐ If necessary, modify the outlet orifice to achieve design values if inspection indicates modifications are necessary. ☐ Repair undercut or eroded areas. ☐ Mow side slopes for aesthetics and to remove woody debris that reduces storage volume. ☐ Maintain vegetation in and around basin to prevent any erosion and minimize aesthetic concerns. Minimize use of fertilizers and pesticides. Reseed if necessary. ☐ Remove litter and debris. ☐ Make structural changes or repairs as needed to eliminate pools of water that stand longer than 96 hrs to prevent mosquito production, particularly during the warmer months of the year. Identify and eliminate sources of non-stormwater runoff that feed standing water pools. Coordinate with the local mosquito and vector control agency to control mosquitoes, if necessary.	Standard Maintenance (As needed)
☐ Remove accumulated trash and debris from the basin, around the riser pipe, side slopes, embankment, emergency spillway, and outflow trash racks. The frequency of this activity may be altered to meet specific site conditions. ☐ Trim vegetation at the beginning and end of the wet season to prevent establishment of woody vegetation and for aesthetic and vector reasons.	Semi-annual, or more frequent, as needed
☐ Seed or sod to restore dead or damaged ground cover. ☐ Repair erosion to banks and bottom as required.	Annual maintenance (as needed)
☐ Supplement vegetation if a significant portion have not been established (at least 50% of the surface area). ☐ Remove nuisance plant species.	Annual maintenance (if needed)
☐ Remove sediment from the forebay to reduce frequency of main basin cleaning.	3- to 5-year

☐ Remove sediment from the basin bottom and thatch, aerate, or scarify soils to maintain infiltrative capacity.	maintenance
☐ Monitor sediment accumulation and remove accumulated sediment and regrade about every 10 years or when the accumulated sediment volume exceeds 10-20% of the basin volume, or when accumulation reaches 6 inches or if resuspension is observed. Clean in early spring so vegetation damaged during cleaning has time to re-establish.	Every 10-25 years

Additional Information

In most cases, surface sediment removed from an extended detention basin during periodic maintenance to restore capacity does not contain toxic materials (e/g metals, oil and grease, or organics) at levels posing a hazardous concern. Studies to date indicate that pond sediments are generally below toxicity limits and can be safely landfilled or disposed onsite. Onsite sediment disposal is always preferable (if local authorities permit) as long as the sediments are deposited away from the perimeter to prevent their reentry into the basin. Sediments should be tested for toxic materials in compliance with current landfill requirements and disposed of properly.

Special considerations are required for extended detention basins to be effective in cold climates. Refer to the Stormwater Managers Resource Center for more information.

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Vegetated Swale TC-30

General Description

Vegetated swales (also referred to as bioswales, biofiltration swales, or landscaped swales) are open, shallow channels with vegetation covering the side slopes and bottom that collect and slowly convey runoff flow to downstream discharge points. They are designed to treat runoff through filtering by the vegetation in the channel, filtering through a subsoil matrix, and/or infiltration into the underlying soils. Swales can be natural or manmade. They trap particulate pollutants (suspended solids and trace metals), promote infiltration, reduce flow velocity, and increase time of concentration of stormwater runoff. Vegetated swales can be implemented to provide effective pretreatment for detention and infiltration stormwater BMPs.

Vegetated swales can serve as part of a stormwater drainage system and can replace curbs, gutters and storm sewer systems. Therefore, swales are best suited for small landscaped portions of industrial or commercial facilities with low peak flow rates. They are not well suited to treat stormwater runoff from industrial areas that have insufficient source control BMPs.

Inspection/Maintenance Considerations

A thick vegetative cover is needed for vegetated swales to function properly. Usually, swales require little more than normal landscape maintenance activities such as irrigation and mowing to maintain pollutant removal efficiency. Swales can become a nuisance due to mosquito breeding in standing water if obstructions develop (e.g., debris accumulation, invasive vegetation) and/or if proper drainage slopes are not implemented and maintained. The application of fertilizers and pesticides should be minimized.

Advanced BMPs Covered

Maintenance Concerns

- *Channelization*
- *Vegetation/Landscape Maintenance*
- *Vector Control*
- *Aesthetics*
- *Flow Obstructions*

Targeted Constituents

Sediment	▲
Nutrients	●
Trash	●
Metals	▲
Bacteria	●
Oil and Grease	▲
Organics	▲

Legend (Removal Effectiveness)

● Low ■High ▲ Medium

✱ Requires Pretreatment

Note: The removal effectiveness ratings shown in the table are for properly designed, sited, and maintained BMPs; some configurations will have variations in pollutant effectiveness.

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Inspection Activities	Suggested Frequency
☐ Inspect after seeding and after first major storms for any damages.	Post construction
☐ Inspect for signs of erosion, damage to vegetation, channelization of flow, debris and litter, and areas of sediment accumulation. Perform inspections at the beginning and end of the wet season. Additional inspections after periods of heavy runoff are desirable.	Semi-annual
☐ Inspect level spreader for clogging, grass alongside slopes for erosion and formation of rills or gullies, and sand/soil bed for erosion problems.	Annual
Maintenance Activities	**Suggested Frequency**
☐ Mow grass to maintain a height of 3–4 inches, for safety, aesthetic, or other purposes. Litter should always be removed prior to mowing. Clippings should be composted. ☐ Irrigate swale during dry season (April through October) or when necessary to maintain the vegetation. ☐ Provide weed control, if necessary to control invasive species.	As needed (frequent, seasonally)
☐ Remove litter, branches, rocks blockages, and other debris and dispose of properly. ☐ Maintain inlet flow spreader (if applicable). ☐ Repair any damaged areas within a channel identified during inspections. Erosion rills or gullies should be corrected as needed. Bare areas should be replanted as necessary.	Semi-annual
☐ Declog the pea gravel diaphragm, if necessary. ☐ Correct erosion problems in the sand/soil bed of dry swales. ☐ Plant an alternative grass species if the original grass cover has not been successfully established. Reseed and apply mulch to damaged areas.	Annual (as needed)
☐ Remove all accumulated sediment that may obstruct flow through the swale. Sediment accumulating near culverts and in channels should be removed when it builds up to 3 in. at any spot, or covers vegetation, or once it has accumulated to 10% of the original design volume. Replace the grass areas damaged in the process. ☐ Rototill or cultivate the surface of the sand/soil bed of dry swales if the swale does not draw down within 48 hours.	As needed (infrequent)

Additional Information

Research (Colwell et al., 2000) indicates that grass height and mowing frequency have little impact on pollutant removal. Consequently, mowing may only be necessary once or twice a year for safety or aesthetics or to suppress weeds and woody vegetation.

The swale bottom and side slopes should be covered with dense vegetative cover to filter pollutants out of runoff and helps reduce flow velocities and protect the swale from erosion. Fine, close-growing grasses are ideal because increasing the surface area of the vegetation exposed to runoff improves the effectiveness of the swale. Drought tolerant vegetation than can tolerate sediment and debris accumulations are best-suited for swales.

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Vegetated Buffer Strip TC-31

General Description

Vegetated buffer strips (vegetated filter strips, biostrips, filter strips, and grassed filters) are vegetated surfaces that are designed to treat sheet flow from adjacent surfaces. They are an effective, easy to implement BMP that often go unrecognized at industrial and commercial facilities.

Vegetated buffer strips function by slowing runoff velocities and allowing sediment and other pollutants to settle and by providing some infiltration into underlying soils. They are well-suited to treating runoff from roads, roof downspouts, small parking lots, and pervious surfaces. They can be implemented to provide effective pretreatment for detention and infiltration stormwater BMPs.

Vegetated buffer strips can serve as part of a stormwater drainage system and can replace curbs, gutters and storm sewer systems. Therefore, they are best suited for small landscaped portions of industrial or commercial facilities with low peak flow rates. They are not well suited to treat stormwater runoff from industrial areas that have insufficient source control BMPs.

Inspection/Maintenance Considerations

Vegetated buffer strips require frequent landscape maintenance. In many cases, vegetated buffer strips initially require intense maintenance, but less maintenance is needed over time. Maintenance tasks may be conducted by a landscaping contractor. Maintenance requirements typically include grass or shrub-growing activities such as irrigation, mowing, trimming, removal of invasive species, and replanting when necessary. Buffer strips require more attention as the volume of sediment increases. Vegetated buffer strips can become a nuisance due to mosquito breeding in level spreaders (unless

Advanced BMPs Covered

Maintenance Concerns

- *Vector Control*
- *Invasive Species Management*
- *Vegetation/Landscape Maintenance*
- *Erosion*
- *Channelization of Flow*
- *Aesthetics*

Targeted Constituents

Sediment	■
Nutrients	●
Trash	▲
Metals	■
Bacteria	●
Oil and Grease	■
Organics	▲

Legend (Removal Effectiveness)

● Low ■ High ▲ Medium

✱ Requires Pretreatment

Note: The removal effectiveness ratings shown in the table are for properly designed, sited, and maintained BMPs; some configurations will have variations in pollutant effectiveness.

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designed to dewater completely in 96 hours or less) and/or if proper drainage slopes are not maintained.

Inspection Activities	Suggested Frequency
☐ Once the vegetated buffer strip is established, inspect at least three times per year. Repair all damage immediately. ☐ Inspect buffer strips after seeding and repair as needed.	Post construction
☐ Inspect buffer strip and repair all damage immediately. ☐ Inspect soil and repair eroded areas.	After major storms
☐ Inspect for erosion or damage to vegetation, preferably at the end of the wet season to schedule summer maintenance and before major fall runoff to be sure the strips are ready for winter. However, additional inspection after periods of heavy runoff is desirable. ☐ Inspect pea-gravel diaphragm/level spreader for clogging and effectiveness and remove built-up sediment. ☐ Inspect for rolls and gullies. Immediately fill with topsoil, install erosion control blanket and seed or sod. ☐ Inspect to ensure vegetation is well established. If not, either prepare soil and reseed or replace with alternative species. Install erosion control blanket. ☐ Check for debris and litter, and areas of sediment accumulation.	Semi-annual
Maintenance Activities	**Suggested Frequency**
☐ Water plants daily for 2 weeks after construction.	Post construction
☐ Mow regularly to maintain vegetation height between 2 - 4 inches, and to promote thick, dense vegetative growth. Cut only when soil is dry to prevent tracking damage to vegetation, soil compaction and flow concentrations. Clippings are to be removed immediately after mowing. ☐ Remove all litter, branches, rocks, or other debris. Damaged areas of the filter strip should be repaired immediately by reseeding and applying mulch. ☐ Regularly maintain inlet flow spreader. ☐ Irrigate during dry season (April through October) when necessary to maintain the vegetation.	Frequently, as needed
☐ Remulch void areas. ☐ Treat diseased trees and shrubs, remove dead vegetation.	Semi-annual
☐ Remove sediment and replant in areas of buildup. Sediment accumulating near culverts and in channels should be removed when it builds up to 3 in. at any spot, or covers vegetation. ☐ Limit fertilizer applications based on plant vigor and soil test results. ☐ Rework or replant buffer strip if concentrated flow erodes a channel through the strip.	Annual

Additional Information

Research (Colwell et al., 2000) indicates that grass height and mowing frequency have little impact on pollutant removal. Consequently, mowing may only be necessary once or twice a year for safety or aesthetics or to suppress weeds and woody vegetation.

Trash tends to accumulate in swale areas, particularly along highways. The need for litter removal is determined through periodic inspection, but litter should always be removed prior to mowing.

The buffer strip should be covered with dense vegetative cover to filter pollutants out of runoff and helps reduce flow velocities and protect the strip from erosion. Fine, close-growing grasses are ideal because increasing the surface area of the vegetation exposed to runoff improves the effectiveness of the swale. Drought tolerant vegetation that can tolerate sediment and debris accumulations is best-suited for vegetated buffer strips.

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Bioretention TC-32

General Description

The bioretention best management practice (BMP) functions as a soil and plant-based filtration device that removes pollutants through a variety of physical, biological, and chemical treatment processes. These facilities normally consist of a grass buffer strip, sand bed, ponding area, organic layer or mulch layer, planting soil, and plants. The runoff's velocity is reduced by passing over or through a sand bed and is subsequently distributed evenly along a ponding area. Exfiltration of the stored water in the bioretention area planting soil into the underlying soils occurs over a period of days.

Inspection/Maintenance Considerations

Bioretention requires monthly landscaping maintenance, including measures to ensure that the area is functioning properly and irrigation during dry periods. In many cases, bioretention areas initially require intense maintenance, but less maintenance is needed over time. Maintenance tasks may be conducted by a landscaping contractor, who may already be hired at the site.

Sediment may enter the bioretention cell and form a crust on the soil surface, limiting the porosity of the soil. Raking of the mulch and soil surface may be needed to maintain high infiltration rates. In cold climates the soil may freeze, preventing runoff from infiltrating into the planting soil.

Bioretention systems can become a nuisance due to mosquito and midge breeding. Maintaining soil porosity and basic housekeeping practices such as removal of debris accumulations and vegetation management are necessary to ensure that the system dewaters completely (recommended 72 hour residence time or less) to prevent creating mosquito and other vector habitats.

Advanced BMPs Covered

Maintenance Concerns

- *Clogged Soil or Outlet Structures*
- *Sediment Accumulation*
- *Invasive Species Management*
- *Vegetation/Landscape Maintenance*
- *Erosion*
- *Channelization of Flow*
- *Vector Control*
- *Aesthetics*

Targeted Constituents

Sediment	■
Nutrients	▲
Trash	■
Metals	■
Bacteria	■
Oil and Grease	■
Organics	■

Legend (Removal Effectiveness)

● Low ■ High ▲ Medium

✱ Requires Pretreatment

Note: The removal effectiveness ratings shown in the table are for properly designed, sited, and maintained BMPs; some configurations will have variations in pollutant effectiveness.

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Inspection Activities	Suggested Frequency
☐ Inspect soil and repair eroded areas.	Monthly
☐ Inspect for erosion or damage to vegetation, preferably at the end of the wet season to schedule summer maintenance and before major fall runoff to be sure the strips are ready for winter. However, additional inspection after periods of heavy runoff is desirable.	Semi-annual inspection
☐ Inspect to ensure vegetation is well established. If not, either prepare soil and reseed or replace with alternative species. Install erosion control blanket. ☐ Check for debris and litter, and areas of sediment accumulation. ☐ Inspect health of trees and shrubs.	
Maintenance Activities	**Suggested Frequency**
☐ Water plants daily for 2 weeks.	At project completion
☐ Remove litter and debris.	Monthly
☐ Remove sediment. ☐ Remulch void areas. ☐ Irrigate during dry periods. ☐ Treat diseased trees and shrubs. ☐ Mow turf areas. ☐ Repair erosion at inflow points. ☐ Repair outflow structures. ☐ Unclog underdrain. ☐ Regulate soil pH. ☐ Make structural changes or repairs as needed to eliminate pools of water that stand longer than 96 hrs to prevent mosquito production, particularly during the warmer months of the year. Identify and eliminate sources of non-stormwater runoff that feed standing water pools. Coordinate with the local mosquito and vector control agency to control mosquitoes, if necessary.	As needed
☐ Remove and replace dead and diseased vegetation.	Semi-annual
☐ Add mulch. ☐ Replace tree stakes and wires.	Annual
☐ Mulch should be replaced every 2 to 3 years or when bare spots appear or infiltration rates are reduced. Remulch prior to the wet season.	Every 2-3 years, or as needed

Additional Information

Landscaping is critical to the function and aesthetic value of bioretention areas. It is preferable to plant the area with native vegetation, or plants that provide habitat value, where possible. Another important design feature is to select species that can withstand the hydrologic regime they will experience. At the bottom of the bioretention facility, plants that tolerate both wet and dry conditions are preferable. At the edges, which will remain primarily dry, upland species will be the most resilient. It is best to select a combination of trees, shrubs, and herbaceous materials.

For areas with low permeability native soils or steep slopes, bioretention areas can be designed with an underdrain system that routes the treated runoff to the storm drain system rather than depending entirely on infiltration.

Special considerations are required for bioretention to be effective in cold climates – see the Stormwater Managers Resource Center for more information.

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Media Filter TC-40

General Description

Stormwater media filters are typically two-chambered including a pretreatment settling basin and a filter bed filled with sand or other adsorptive filtering media. As stormwater flows into the first chamber, large particles settle out, and then finer particles and other pollutants are removed as stormwater flows through the filtering media in the second chamber. There are a number of design variations including the Austin sand filter, Delaware sand filter, and multi-chambered treatment train (MCTT).

Inspection/Maintenance Considerations

Media filters may exhibit decreased effectiveness after a few years of operation, depending on the activities occurring in the drainage area. Media filters clog easily when subjected to high sediment loads. Sediment reducing pretreatment practices, such as vegetated buffer strips or vegetated swales, placed upstream of the filter, should be maintained properly to reduce sediment loads into filter.

Media filters can become a nuisance due to mosquito or midge breeding if not properly designed and maintained. Installations should dewater completely (recommended 96 hour or less residence time) to prevent creating mosquito and other vector habitats.

Maintenance efforts will need to focus on basic housekeeping practices such as removal of debris accumulations and vegetation management (in filter media) to prevent clogs and/or pools of standing water. To minimize the potential for clogging, frequent maintenance and inspection practices are required. Waste sand, gravel, filter fabric, or filter media must be disposed of properly and in accordance with all applicable laws.

Advanced BMPs Covered

Maintenance Concerns

- *Pollutant Breakthrough*
- *Clogged Sand Media*
- *Trash and Debris Accumulation*
- *Vector Control*

Targeted Constituents

Sediment	■✱
Nutrients	●
Trash	■
Metals	■
Bacteria	▲
Oil and Grease	■
Organics	■

Legend (Removal Effectiveness)

● Low ▲ Medium ■ High

✱ Requires Pretreatment

Note: The removal effectiveness ratings shown in the table are for properly designed, sited, and maintained BMPs; some configurations will have variations in pollutant effectiveness.

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Inspection Activities	Suggested Frequency
☐ During the first year of operation, inspect chambers quarterly to ensure that the system is functioning properly. ☐ Inspect sand filters after every major storm in the first few months after construction to ensure that the system is functioning properly.	Post construction
☐ Ensure that filter surface, inlets, and outlets are clear of debris. ☐ Ensure that the contributing area is stabilized and mowed, with clippings removed. ☐ Check to ensure that the filter surface is not clogging. ☐ Ensure that activities in the drainage area minimize oil/grease and sediment entry to the system. ☐ Inspect the facility once during the wet season after a large rain event to determine whether the facility is draining completely within 96 hr.	Quarterly, and after major storms
☐ Inspect for standing water, sediment, trash and debris, structural damage, and to identify potential problems.	Semi-annual
☐ Check to see that the filter bed is clean of sediments and the sediment chamber contains no more than six inches of sediment. ☐ Make sure that there is no evidence of deterioration of concrete structures. ☐ Inspect grates (if used). ☐ Inspect inlets, outlets, and overflow spillway to ensure good condition and no evidence of erosion. ☐ Ensure that flow is not bypassing the facility. ☐ Ensure that no noticeable odors are detected outside the facility.	Annual
☐ Maintenance Activities	Suggested Frequency
☐ Remove trash and debris from the sedimentation basin (Austin design), the riser pipe, and the filter bed as needed. ☐ Prevent grass clippings from washing into the filter. ☐ Remove trash from inlet grates to maintain the inflow capacity of the media filter. ☐ Upstream vegetation should be maintained as needed. ☐ Make structural changes or repairs as needed to eliminate pools of water that stand longer than 96 hrs to prevent mosquito production, particularly during the warmer months of the year. Identify and eliminate sources of non-stormwater runoff that feed standing water pools. Coordinate with the local mosquito and vector control agency to control mosquitoes, if necessary.	Frequently (as needed)
☐ Clean filter surface semiannually; or more often if watershed is excessively erosive. ☐ Replace sorbent pillows (Multi-Chamber Treatment Train only).	Semi-annual
☐ Repair or replace any damaged structural parts. ☐ Stabilize any eroded areas.	Annual
☐ Remove accumulated sediment in the sedimentation chamber every 10 years or when the sediment occupies 10-20% of the basin volume or accumulates to a depth of six inches, whichever is less. ☐ Remove top 2 in. of media filter and dispose of properly if facility drain time exceeds 96 hr. Restore media depth to 18 in. when overall media depth drops to 12 in.).	As needed

Additional Information

In general, media filters are preferred over infiltration practices, such as infiltration trenches, when contamination of groundwater with conventional pollutants is of concern. This usually occurs in areas where underlying soils alone cannot treat runoff adequately - or ground water tables are high. In most cases, media filters can be constructed with impermeable basin or chamber bottoms, which help to collect, treat, and release runoff to a storm drainage system or directly to surface water with no contact between contaminated runoff and groundwater. In regions where evaporation exceeds rainfall and a wet pond would be unlikely to maintain the required permanent pool, a media filtration system can be used.

Special considerations are required for media filters to be effective in cold climates. In cold climates, filters can be used, but surface or perimeter filters will not be effective during the winter months, and unintended consequences might result from a frozen filter bed. Using a larger under drain system to encourage rapid draining during the winter months may prevent freezing of the filter bed. Also, the sediment chamber should be larger in cold climates to account for road sanding.

References

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Water Quality Inlet TC-50

General Description

Water quality inlets (WQIs), also typically called trapping catch basins, oil/grit separators or oil/water separators, consist of one or more chambers that promote sedimentation of coarse materials and separation of free oil (as opposed to emulsified or dissolved oil) from stormwater. Some WQIs also contain screens to help retain larger or floating debris, and many of the newer designs also include a coalescing unit that helps promote oil/water separation.

These devices are appropriate for capturing hydrocarbon spills, but provide very marginal sediment removal and are not very effective for treatment of stormwater runoff. WQIs typically capture only the first portion of runoff for treatment and are generally used for pretreatment before discharging to other best management practices (BMPs).

Inspection/Maintenance Considerations

High sediment loads can interfere with the ability of the WQI to effectively separate oil and grease from the runoff. During periods of high flow, sediment can be re-suspended and released from the WQI into surface waters if this in the only BMP on site prior to discharge. Maintenance of WQIs can be easily neglected because they are underground. Establishment of a maintenance schedule is helpful for ensuring proper maintenance occurs. The required maintenance effort will be site-specific due to variations in sediment and hydrocarbon loading. Since WQI residuals contain hydrocarbon by-products, they may require disposal as hazardous waste. Many WQI owners coordinate with waste haulers to collect and dispose of these residuals.

Advanced BMPs Covered

Maintenance Concerns

- *High Sediment Loads*
- *Hazardous Waste*
- *Vector Control*
- *Pollutant Release*

Targeted Constituents

Sediment	●
Nutrients	●
Trash	▲
Metals	●
Bacteria	●
Oil and Grease	▲
Organics	●

Legend (Removal Effectiveness)

● Low ▲ Medium ■ High

✱ Requires Pretreatment

Note: The removal effectiveness ratings shown in the table are for properly designed, sited, and maintained BMPs; some configurations will have variations in pollutant effectiveness.

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Inspection Activities	Suggested Frequency
☐ Inspect regularly to determine if maintenance is required.	Monthly during the wet season, or after significant rain events
☐ Contact the local mosquito and vector control agency if mosquito breeding is observed or suspected.	As needed

Maintenance Activities	Suggested Frequency
☐ Clean out and dispose of accumulated oil, grease, and sediments. Remove accumulated trash and debris. The clean out and disposal techniques should be environmentally acceptable and in accordance with local regulations.	Annual, before the wet season, or more frequent as needed

Additional Information

Water quality inlets are most effective for drainage areas of 1 acre or less. They are often used in industrial applications such as airport runways, equipment washdown areas, and gas station parking lots. WQIs can be situated at the ground surface or underground, and they are available as pre-manufactured or cast-in-place units, typically constructed with reinforced concrete. They should be water-tight to prevent possible groundwater contamination, and should be sited such that vactor trucks can easily access and remove sediment and pollutants.

Since WQIs can be relatively deep, they may be designated as confined spaces. Caution should be exercised to comply with confined space entry safety regulations if it is required.

References

California Department of Transportation. *Treatment BMP Technology Report (CTSW-RT-09-239.06),* 2010. Available online at: http://www.dot.ca.gov/hq/env/stormwater/pdf/CTSW-RT-09-239-06.pdf.

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Multiple Systems TC-60

General Description

A multiple treatment system uses two or more treatment control BMPs in series to enhance pollutant removal and minimize maintenance efforts. There are many different combinations of treatment control BMPs to consider, and selection should be based on site-specific conditions and needs. Examples of multiple systems include:

- ☐ Water quality inlet combined with a media filter, infiltration basin, or infiltration trench;
- ☐ Vegetated swale or bioretention unit combined with a media filter, infiltration basin, or infiltration trench;
- ☐ Vegetated buffer strip combined with a vegetated swale;
- ☐ Extended detention zone on a wet pond; and
- ☐ Extended detention basin or media filter combined with a harvest and reuse system.

Inspection/Maintenance Considerations

Each of the separate treatment processes will require maintenance as described in the previous fact sheets. For example, a multiple system comprised of a biofilter combined with an infiltration basin would require the inspection and maintenance considerations outlined on the fact sheet for each process.

Inspection Activities	Suggested Frequency
☐ Refer to individual treatment control fact sheets	As needed

Maintenance Activities	Suggested Frequency
☐ Refer to individual treatment control fact sheets	As needed

Advanced BMPs Covered

- *Refer to Individual Treatment Control (TC) Fact Sheets*

Maintenance Concerns

- *Refer to Individual Treatment Control (TC) Fact Sheets*

Targeted Constituents

- *Refer to Individual Treatment Control (TC) Fact Sheets*

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Biotreatment MP-20

General Description

Biotreatment systems are manufactured BMPs that mimic treatment provided by natural systems with a smaller footprint. Physical straining, biological and chemical reactions in the mulch, root zone, and soil matrix, and infiltration into the underlying subsoil are the main treatment processes. Biotreatment cells reduce peak discharge and runoff volume by detaining water through surface ponding, storage in soil and gravel layers, and evapotranspiration. They can be designed to incorporate infiltration to underlying soils and/or an underdrain system that collects treated stormwater and directs it to the storm drain.

Examples of biotreatment systems include manufactured wetlands and planter box biofilters that can incorporate a wide range of vegetation from grasses to trees.

Inspection/Maintenance Considerations

To maintain treatment performance longevity, pretreatment systems should be installed at sites with high loads of sediment, trash, and floatables. If pretreatment is provided then maintenance consideration must be given to remove accumulated materials.

Biotreatment systems require frequent landscaping maintenance, including harvesting of wetland vegetation and planter box irrigation in dry climates. Maintenance tasks may be conducted by a landscaping contractor, who may already be hired at the site. Refer to TC-21, Constructed Wetland, TC-32, Bioretention, and specific manufacturer recommendations for more information.

Advanced BMPs Covered

Maintenance Concerns

- *Vegetation/Landscape Maintenance*
- *Mulch and Planting Media Replacement*
- *Clogged Soil or Outlet Structures*
- *Invasive/Exotic Plant Species*
- *Vector Control*

Targeted Constituents*	
Sediment	✓
Nutrients	✓
Trash	✓
Metals	✓
Bacteria	✓
Oil and Grease	✓
Organics	✓

**Removal Effectiveness varies for different manufacturer designs. See New Development and Redevelopment Handbook-Section 5 for more information.*

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Inspection Activities	Suggested Frequency
☐ Inspect during the dry season to determine if irrigation of plants is necessary.	As needed
☐ Inspect to ensure vegetation is well established. If not, either prepare soil and reseed or replace with alternative species. Install erosion control blanket if necessary. ☐ Check for debris and litter, and areas of sediment accumulation. ☐ Inspect health of trees and shrubs.	Semi-annual
☐ Inspect to verify that invasive species of wetland plants is not occurring.	Annual
Maintenance Activities	**Suggested Frequency**
☐ Water plants daily for at least 2 weeks.	At project completion
☐ Remove litter and debris.	Monthly
☐ Remove sediment. ☐ Remulch void areas. ☐ Treat diseased trees and shrubs. ☐ Mow turf areas. ☐ Repair erosion at inflow points. ☐ Repair outflow structures. ☐ Unclog underdrain. ☐ Regulate soil pH regulation. ☐ Repair undercut areas, erosion to banks, and bottom as required. ☐ Make structural changes or repairs as needed to eliminate pools of water that stand longer than 96 hrs to prevent mosquito production, particularly during the warmer months of the year. Identify and eliminate sources of non-stormwater runoff that feed standing water pools. Contact the local mosquito and vector control agency if mosquito breeding is observed or suspected.	As needed
☐ Remove and replace dead and diseased vegetation.	Semi-annual
☐ Add mulch. ☐ Replace tree stakes and wires. ☐ Supplement wetland plants if a significant portion have not established (at least 50% of the surface area). ☐ Remove nuisance plant species.	Annual
☐ Mulch should be replaced every 2 to 3 years or when bare spots appear or infiltration rates are reduced. Remulch prior to the wet season.	Every 2-3 years, or as needed
☐ Harvest plant species if vegetation becomes too thick causing flow backup and flooding. More frequent plant harvesting may be required by local vector control agencies.	5- to 7-year maintenance (or more frequently as required)

References

California Department of Transportation. *Treatment BMP Technology Report (CTSW-RT-09-239.06),* April, 2010. http://www.dot.ca.gov/hq/env/stormwater/pdf/CTSW-RT-09-239-06.pdf.

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Stormwater Filter MP-40

General Description

Manufactured stormwater filters are typically underground systems that utilize membranes of various materials or cartridges filled with different types of media to filter stormwater runoff. For cartridge systems, the media used can be inert, such as sand or gravel, or adsorptive, such as peat or manufactured media. The effectiveness of these systems depends on the type of membrane or media being implemented, the filter loading rate, and the characteristics of the influent stormwater. For some systems, the water chemistry will also determine the effectiveness of the filter in removing dissolved constituents. Pretreatment is recommended to prevent clogging and premature failure of the filter.

Inspection / Maintenance Considerations

Stormwater filters may exhibit decreased effectiveness after a single year of operation, depending on the activities occurring in the drainage area and filter loading. Stormwater filters clog easily when subjected to high sediment loads. Sediment reducing pretreatment practices, such as vegetated buffer strips or vegetated swales, placed upstream of the filter should be maintained properly to reduce sediment loads into filter.

Maintenance efforts will need to focus on basic housekeeping practices such as removal of sediment and debris accumulations to prevent clogs and/or ponds of standing water. To minimize the potential for clogging, frequent maintenance and inspection practices are required. Waste sand, gravel, membranes, or filter media must be disposed of properly and in accordance with all applicable laws.

Stormwater filters can become a nuisance due to mosquito or midge breeding if not properly designed and maintained. Installations should dewater completely (recommended 96 hour or

Advanced BMPs Covered

Maintenance Concerns

- *Pollutant Breakthrough*
- *Clogged Membrane/Media*
- *Sediment, Trash, and Debris Accumulations*
- *Vector Control*

Targeted Constituents*

Sediment	✓
Nutrients	✓
Trash	✓
Metals	✓
Bacteria	✓
Oil and Grease	✓
Organics	✓

**Removal Effectiveness varies for different manufacturer designs. See New Development and Redevelopment Handbook-Section 5 for more information.*

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less residence time) to prevent creating mosquito and other vector habitats.

Inspection Activities	Suggested Frequency
☐ During the first year of operation, inspect chambers quarterly to ensure that the system is functioning properly. ☐ Inspect filters after every major storm in the first few months after construction to ensure that the system is functioning properly.	Post construction
☐ Ensure that filter surface, inlets, and outlets are clear of debris. ☐ Ensure that the contributing area is stabilized and mowed, with clippings removed. ☐ Check to ensure that the filter surface is not clogging. ☐ Ensure that activities in the drainage area minimize oil/grease and sediment entry to the system. ☐ Inspect the facility once during the wet season after a large rain event to determine whether the facility is draining completely within 96 hr.	Quarterly, and after major storms
☐ Inspect for standing water, sediment, trash and debris, structural damage, and to identify potential problems. ☐ Contact the local mosquito and vector control agency if mosquito breeding is observed or suspected.	Semi-annual
☐ Check to see that the filter area is clean of sediments and the sediment chamber contains no more than six inches of sediment. ☐ Make sure that there is no evidence of deterioration of concrete structures. ☐ Inspect grates (if used). ☐ Inspect inlets, outlets, and overflow spillway to ensure good condition and no evidence of erosion. ☐ Ensure that flow is not bypassing the facility. ☐ Ensure that no noticeable odors are detected outside the facility.	Annual
Maintenance Activities	**Suggested Frequency**
☐ Remove trash and debris from the sedimentation basin (Austin design), the riser pipe, and the filter area as needed. ☐ Prevent grass clippings from washing into the filter. ☐ Remove trash from inlet grates to maintain the inflow capacity of the media filter. ☐ Upstream vegetation should be maintained as needed.	Frequently (as needed)
☐ Clean filter surface semiannually; or more often if watershed is excessively erosive. ☐ Replace sorbent pillows (Multi-Chamber Treatment Train only).	Semi-annual
☐ Repair or replace any damaged structural parts. ☐ Stabilize any eroded areas.	Annual
☐ Remove accumulated sediment in the sedimentation chamber every 7-10 years or when the sediment occupies 10-20% of the chamber volume or accumulates to a depth of six inches, whichever is less. ☐ Remove top 2 in. of media filter and landfill if facility drain time exceeds 72 hr. Restore media depth to 18 in. when overall media depth drops to 12 in.).	As needed

References

California Department of Transportation. *Treatment BMP Technology Report (CTSW-RT-09-239.06),* April, 2010. http://www.dot.ca.gov/hq/env/stormwater/pdf/CTSW-RT-09-239-06.pdf.

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Wet Vault MP-50

General Description

A wet vault is a vault with a permanent water pool, generally 3 to 5 feet deep. The vault may also have a constricted outlet that causes a temporary rise of the water level (i.e., extended detention) during each storm. This live volume generally drains within 12 to 48 hours after the end of each storm.

Inspection / Maintenance Considerations

Maintenance of wet vaults requires special equipment. Each manufacturer provides storage capacities with respect to sediments and floatables, with recommendations on the frequency of cleaning as a function of the percentage of the volume in the unit that has been filled by these materials. A loss of dissolved pollutants may occur as accumulated organic matter (e.g., leaves) decomposes in the units. If regular maintenance is not performed, accumulated sediment may cause noxious gases to form. Because wet vaults hold standing water between storms, they can become a nuisance due to mosquito breeding.

It is important to recognize that as storage of accumulated sediment occurs directly in the operating area of the wet vault, treatment efficiency will decline over time given the reduction in treatment volume. Whether this is significant depends on the design capacity. Some manufactured wet vaults have relatively little sediment storage and therefore must be cleaned frequently (e.g., annually) while others have sufficient capacity to reduce cleaning frequency. Vault maintenance procedures must meet OSHA confined space entry requirements.

Sediment should be tested for toxicants in compliance with current disposal requirements if land uses in the catchment include commercial or industrial zones, or if visual or olfactory indications of pollution are noticed.

Advanced BMPs Covered

Maintenance Concerns

- *Sediment, Trash, and Debris Accumulations*
- *Vector Control*

Targeted Constituents*

Sediment	✓
Nutrients	✓
Trash	✓
Metals	✓
Bacteria	
Oil and Grease	✓
Organics	✓

**Removal Effectiveness varies for different manufacturer designs. See New Development and Redevelopment Handbook-Section 5 for more information.*

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Inspection Activities	Suggested Frequency
☐ Inspect the unit twice during the first wet season of operation, setting the cleaning frequency accordingly.	Post construction
☐ Inspect for floating debris, sediment buildup, and accumulated petroleum products.	Annual
☐ Contact the local mosquito and vector control agency if mosquito breeding is observed or suspected.	As needed

Maintenance Activities	Suggested Frequency
☐ Remove sediment that has accumulated in the vault after construction in the drainage area is complete.	Post construction
☐ The recommended frequency of cleaning differs with the manufacturer, ranging from one to two years. ☐ Maintenance consists of the removal of accumulated material with a vactor truck. It may be necessary to remove and dispose the floatables separately due to the presence of petroleum product. Annual maintenance is typical.	Annual, or per manufacturers recommendations
☐ Remove floating debris and accumulated petroleum products as needed. Floating oil should be removed from wet vaults that are used as oil/water separators when oil accumulation exceeds one inch.	Annual, or more frequent as needed

References

California Stormwater Quality Association. *Stormwater Best Management Practice Handbook, New Development and Redevelopment,* 2003. https://www.casqa.org/resources/bmp-handbooks/new-development-redevelopment-bmp-handbook.

Gravity Separators MP-51

General Description

Gravity separators: (alternatively, swirl concentrators, swirl or vortex separators, or hydrodynamic separators) are gravity separators, and in principle are essentially wet vaults. The difference from wet vaults, however, is that the gravity separator is round, rather than rectangular, and the water moves in a centrifugal fashion before exiting. By having the water move in a circular fashion, rather than a straight line as is the case with a standard wet vault, it is possible to obtain significant removal of suspended sediments and attached pollutants with less space. They can provide effective pretreatment when paired with filtration devices, such as media filters or bioretention systems.

Gravity separators were originally developed for combined sewer overflows (CSOs), where they are used primarily to remove coarse inorganic solids. Gravity separation has been adapted to stormwater treatment by several manufacturers.

Inspection/Maintenance Considerations

Gravity separators require routine removal of accumulated sediment, trash, and debris. As some of the systems have standing water that remains between storms, gravity separators can become a nuisance due to mosquito breeding. Also, a loss of dissolved pollutants may occur as accumulated organic matter (e.g., leaves) decomposes in the units.

Advanced BMPs Covered

Maintenance Concerns

- *Sediment, Trash, and Debris Accumulations*
- *Vector Control*

Targeted Constituents*	
Sediment	✓
Nutrients	✓
Trash	✓
Metals	✓
Bacteria	
Oil and Grease	
Organics	

*****Removal Effectiveness varies for different manufacturer designs. See New Development and Redevelopment Handbook-Section 5 for more information.*

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Inspection Activities	Suggested Frequency
☐ Inspect the unit twice during the first wet season of operation, setting the cleaning frequency accordingly.	Post construction
☐ Inspect for floating debris, sediment buildup, and accumulated petroleum products.	Annual
☐ Contact the local mosquito and vector control agency if mosquito breeding is observed or suspected.	As needed
Maintenance Activities	**Suggested Frequency**
☐ Remove sediment that has accumulated in the vault after construction in the drainage area is complete.	Post construction
☐ The recommended frequency of cleaning differs with the manufacturer, ranging from one to two years. ☐ Maintenance consists of the removal of accumulated material with a vactor truck. It may be necessary to remove and dispose the floatables separately due to the presence of petroleum product. Annual maintenance is typical.	Annual, or per manufacturers recommendations
☐ Remove floating debris and accumulated petroleum products as needed. Floating oil should be removed from wet vaults that are used as oil/water separators when oil accumulation exceeds one inch.	Annual, or more frequent as needed

References

California Department of Transportation. *Treatment BMP Technology Report (CTSW-RT-09-239.06),* April, 2010. http://www.dot.ca.gov/hq/env/stormwater/pdf/CTSW-RT-09-239-06.pdf.

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Drain Inlet Insert MP-52

General Description

Drain inlet inserts, also known as catch basin, drop inlet or curb inlet inserts, are used to remove pollutants at the point of entry to the storm drain system. There are a multitude of inserts of various shapes and configurations including baffles, baskets, boxes, fabrics, sorbent media, screens, and skimmers. The effectiveness of drain inlet inserts depends on their design, application, loading, and frequency of maintenance to remove accumulated sediment, trash, and debris.

Inspection / Maintenance Considerations

Routine inspection and maintenance is necessary to maintain functionality of drain inlet inserts and to prevent re-suspension and discharge of accumulated pollutants. Maintenance activities vary depending on the type of drain inlet insert being implemented; refer to the manufacturer's recommendations for more information.

Advanced BMPs Covered

Maintenance Concerns

- *Sediment, Trash, and Debris Accumulations*
- *Pollutant Re-suspension and Discharge*

Targeted Constituents*

Sediment	✓
Nutrients	✓
Trash	✓
Metals	✓
Bacteria	
Oil and Grease	✓
Organics	✓

**Removal Effectiveness varies for different manufacturer designs. See New Development and Redevelopment Handbook-Section 5 for more information.*

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Inspection Activities	Suggested Frequency
☐ Verify that stormwater enters the unit and does not leak around the perimeter.	After construction.
☐ Inspect for sediment, trash, and debris buildup and proper functioning.	At the beginning of the wet season and after significant storms
Maintenance Activities	**Suggested Frequency**
☐ Remove accumulated sediment, trash, and debris. ☐ Replace sorbent media.	At the beginning of the wet season and as necessary

References

California Department of Transportation. *Treatment BMP Technology Report (CTSW-RT-09-239.06),* April, 2010. http://www.dot.ca.gov/hq/env/stormwater/pdf/CTSW-RT-09-239-06.pdf.

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Appendix G: General Permit